Andrew Catalog 37

ANDREW®

Systems Planning / Product Specifications / Services

In A Communicating World . . . Andrew Is Everywhere

Service First! Team

The ***Andrew Customer Service*** Department offers sales support and technical assistance by calling our convenient, toll-free number! We accept FAX inquiries too!

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- ***Check Order Status***
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Call from:

United States, Canada and Mexico
(Except Network Products* and Wireless Accessory Products**)

Telephone, Toll Free.....**1-800-255-1479**
FAX, Toll Free.....**1-800-349-5444**
FAX.....**(708) 349-5444**

United Kingdom

Telephone, Toll Free.....**0800-250055**
FAX.....**+44 0118 9794005**

Republic of Ireland

Telephone, Toll Free.....**1-800-535358**
FAX.....**+44 0118 9794005**

Australia

Telephone, Toll Free.....**1800-803 219**
FAX.....**61 3 9357-9110**

New Zealand

Telephone, Toll Free.....**0800-441 747**
FAX.....**61 3 9357-9110**

Other Locations - See page 784.

***Network Products** - Includes LAN Products, Midrange Solutions, and Advanced Wiring Management Solutions. For further information see page 17.

Telephone, Toll Free.....**1-800-328-2696**
Telephone.....**(708) 349-3300**
FAX.....**(708) 349-5673**

****Wireless Accessory Products** - MAXIM® wireless accessories for cellular and PCS phones. For further information, see pages 18-25.

Telephone, Toll Free.....**1-800-458-2820**
Telephone.....**(630) 250-9900**
FAX.....**(630) 250-9917**

Emergency Technical Assistance

For emergency assistance, 24 hours a day:

Call From	To	Telephone Number	FAX Number
North America (toll free)	U.S.A.	1-800-255-1479	1-800-349-5444
Any Location (International)	U.S.A.	(708) 349-3300	(708) 349-5410
Europe/Africa	U. K.	+44 1592 782612	+44 1592 782380

ANDREW.

About this Catalog

This Catalog describes most major products and services available from Andrew. It includes ordering information, detailed descriptions, specifications, planning guides and technical data. Andrew wants to make it easy for you to receive the right product for your application.

How to Find Information

- **Catalog Section Guide**. Pages 2 and 3. Catalog 37 is divided into nineteen sections which correspond with product categories or the markets where products are used. The sections are color coded and separated by divider pages.
- **Table of Contents.** See below.
- **Alphabetical Index.** Page 780.
- **Index by Type Number.** Page 762. Product Type Numbers are listed in alphanumeric sequence.
- **Section Indexes.** An index is located on the first page of each product section.

Prices and Shipping Information

In many parts of the world, Catalog 37 is accompanied by a published price list. Approximate shipping dimensions and weights are also included. Contact Andrew for additional information.

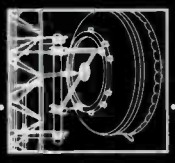
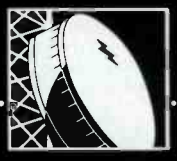
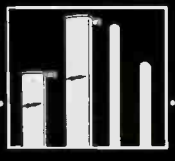
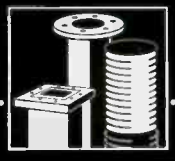
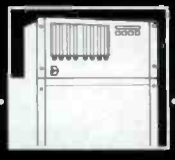
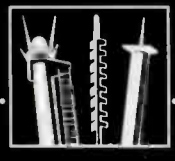
Other Questions?

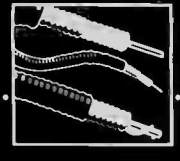
We believe you will find Catalog 37 a useful and informative resource. If you have any questions or problems not covered in this publication, please contact us!

Table of Contents

Catalog 37 Section Guide





Page Numbers

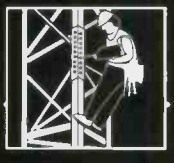
Catalog 37 *Section Guide*











ON EVERY CONTINENT

IN EVERY MAJOR MARKET

AT THE HEART OF MODERN NETWORKS

Andrew Is Everywhere

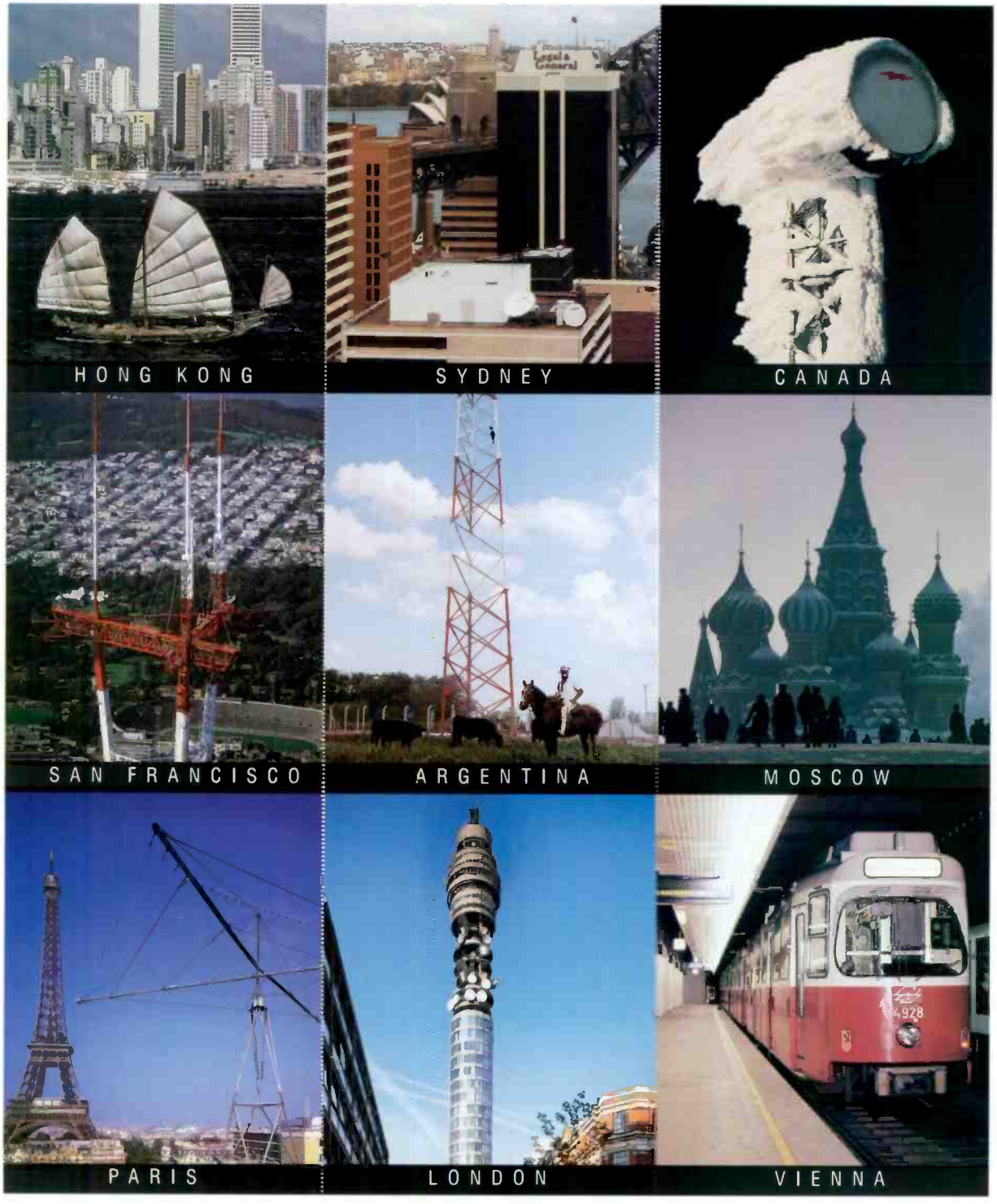
For nearly 60 years, we've been designing and supplying electronic communications products, systems and services that improve the speed, quality and reliability with which individuals, businesses, and governments can transmit voice, video and data signals. Through the years, we have been consistently at the forefront of every major technological development, including today's explosion of wireless communications systems services.

Our One Company Mission

With more than 4,000 dedicated employees, more than 700 million dollars in sales, and a growing list of global manufacturing, sales, and distribution locations, Andrew Corporation is uniquely positioned to provide our customers with innovative, value driven solutions and services, no matter where in the world they're located. Although we offer a diverse range of communication technologies serving a variety of markets, we're driven by a single company-wide mission to provide customers with products that embody leading edge technology, unmatched quality and superior performance. We strive to fulfill this mission by delivering total customer satisfaction, with every order and on every project.

Our Quality Guarantee

The Andrew "Flash" trademark can be seen everywhere. It is brightly emblazoned on antennas atop ships, towers, mountaintops, derricks, platforms, and gantries in every corner of the world as well as on cable, consoles, equipment shelters and computer networking equipment. It is the benchmark of quality wherever it appears. It is proudly displayed on Andrew products as our guarantee of complete satisfaction, and our signature of commitment in providing consistently superior products.


HONG KONG
SYDNEY
CANADA
SAN FRANCISCO
ARGENTINA
MOSCOW
PARIS
LONDON
VIENNA

Serving the Global Need for

Andrew products and systems expertise play an integral role in extending and expanding the reach of communications into new markets, allowing exciting and powerful communication services to reach new customers. Examples of Andrew innovation can be found in virtually every corner of the globe.

In Argentina, Andrew products and systems expertise were instrumental in developing the WIRELESS COMMUNICATIONS infrastructure of this emerging nation. Andrew constructed a comprehensive system in record time, supplying everything from microwave antennas, towers, and shelters, to HELIAX® coaxial cable, waveguide and connectors.

In the Hong Kong Metro, Andrew is providing an advanced DISTRIBUTED COMMUNICATIONS system that allows RF signals to radiate within confined areas. Metro riders will be able to use their cellular phones without interruption in service, while metro workers use the same system for routine and emergency communications.

Throughout the USA, Andrew products are important components within LAND MOBILE RADIO systems which are expanding rapidly to meet the growing demand for paging, faxing, and emergency two-way radio communications services.

CELLULAR system owners and operators around the world trust Andrew transmission products and systems to deliver reliable voice transmissions while preventing loss of valuable air time due to system failure.

In almost every global BROADCAST market, Andrew earth station and broadcast antennas provide critical transmission links, bringing news, information, entertainment and education to millions.

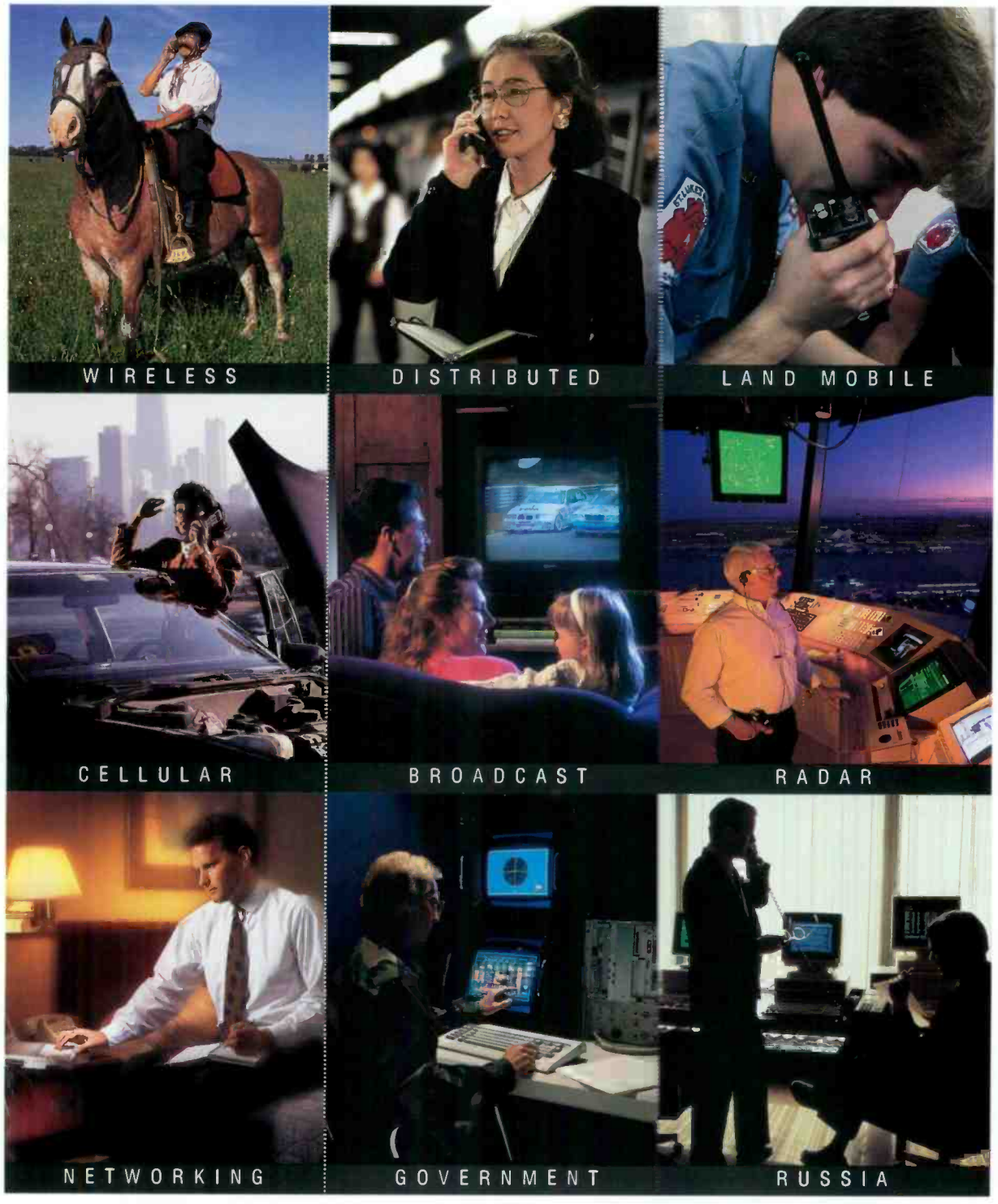
At airports worldwide, air traffic controllers rely on Andrew RADAR antennas to provide critical weather and wind profiling information.

Users of IBM midrange and mainframe equipment look to Andrew NETWORKING systems to provide them a wide range of computer connectivity solutions for their growing number of local and enterprise-wide area networks.

Many GOVERNMENTS use Andrew defense electronic products for intelligence gathering in strategic surveillance operations.

In RUSSIA, Andrew has formed partnerships with key Russian organizations to provide the most modern and extensive voice, video and data communications networks.

Communication Solutions



Markets We Serve

Andrew Products Deliver

While Andrew Products are found in countless markets and applications worldwide, they all share some noteworthy distinctions. Each is engineered to meet exacting standards, rigorously tested to guarantee quality, and efficiently manufactured to deliver a level of performance and value that always meets and consistently exceeds our customers' expectations.

Andrew Antennas Are Everywhere

Andrew is the world's largest manufacturer of TERRESTRIAL MICROWAVE antennas with products that range in frequency from 300 MHz to 57 GHz. They carry local and long distance telephone, video, and data traffic. They're also found in private networks used by utilities or emergency service providers.

Andrew has introduced a new line of innovative, patented BASE STATION antennas designed specifically to capture the world's growing demand for PCS/PCN, cellular and rural telephone applications.

Andrew BROADCAST antennas are recognized throughout the broadcasting industry for transmitting high quality UHF and VHF television signals. Andrew is also the major supplier of wireless cable TV antennas for developing countries and rural areas.

Andrew offers the industry's largest selection of Intelsat Type Approved EARTH STATION antennas used by major broadcasters for television broadcasts as well as other service providers for voice and data communications.

Andrew RADAR antennas help guide commercial and military aircraft safely to their destinations by providing critical position and weather data. They are also used to protect national borders by monitoring aircraft movement in defined areas.

Andrew Transmission Solutions - The Clear Choice

Andrew has earned its reputation as the world's premier provider of transmission system solutions. Andrew designs and tests each component to reduce intermodulation and optimize the mechanical and electrical performance of every system application. HELIAX® coaxial cable, connectors, cable assemblies, and accessories have established a standard of performance, value and worldwide availability by which all others are measured. Wireless communications providers, original equipment manufacturers, and broadcasters count on HELIAX cable products in countless locations around the world.

With many major installations already complete, RADIAX® cable systems are internationally accepted as one of the most effective ways to introduce communications within buildings and other restricted environments such as underground metro tunnels and subway systems.

With the growing demand for bandwidth-intensive applications, Andrew FIBER OPTIC CABLE offers another proven solution for delivering reliable analog and digital RF transmissions.

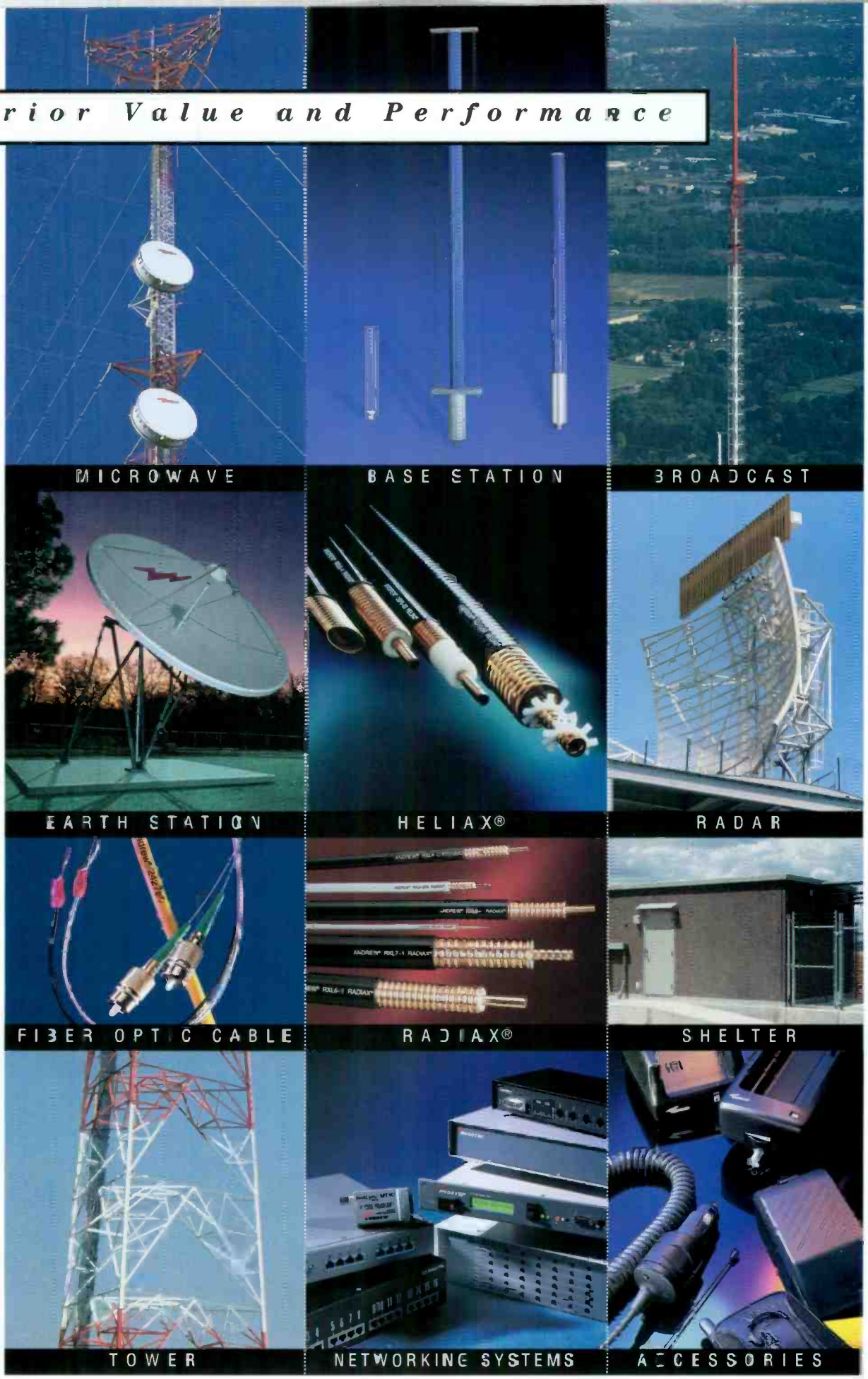
Andrew TOWERS AND SHELTERS provide the foundation upon which many wireless communications systems are built. Andrew towers are available in a variety of designs, while Andrew shelters incorporate new technology that make them lighter, and consequently, easier and more affordable to ship.

New Initiatives for New Markets

Andrew NETWORKING systems permit connectivity between dissimilar computers and peripheral equipment found in IBM host environments, client-server applications, and Apple Macintosh environments. Andrew products provide connectivity solutions for WANs, LANs, PCs and terminals.

Andrew offers a full range of WIRELESS TELEPHONE ACCESSORIES. All are designed to provide mobile phone users with maximum value, performance, convenience and safety.

Superior Value and Performance



Products We Offer

A t A n d r e w ,

We recognize that in today's fast paced, competitive environment, it takes more than just a quality product to be a leader in the industry. That's why we're committed to meeting our customers' highest expectations by offering the best products backed by the most responsive service in the industry. So whatever our customers need, whenever and wherever they need them, Andrew will respond.

A Global Manufacturing, Distribution, Service and Support Network

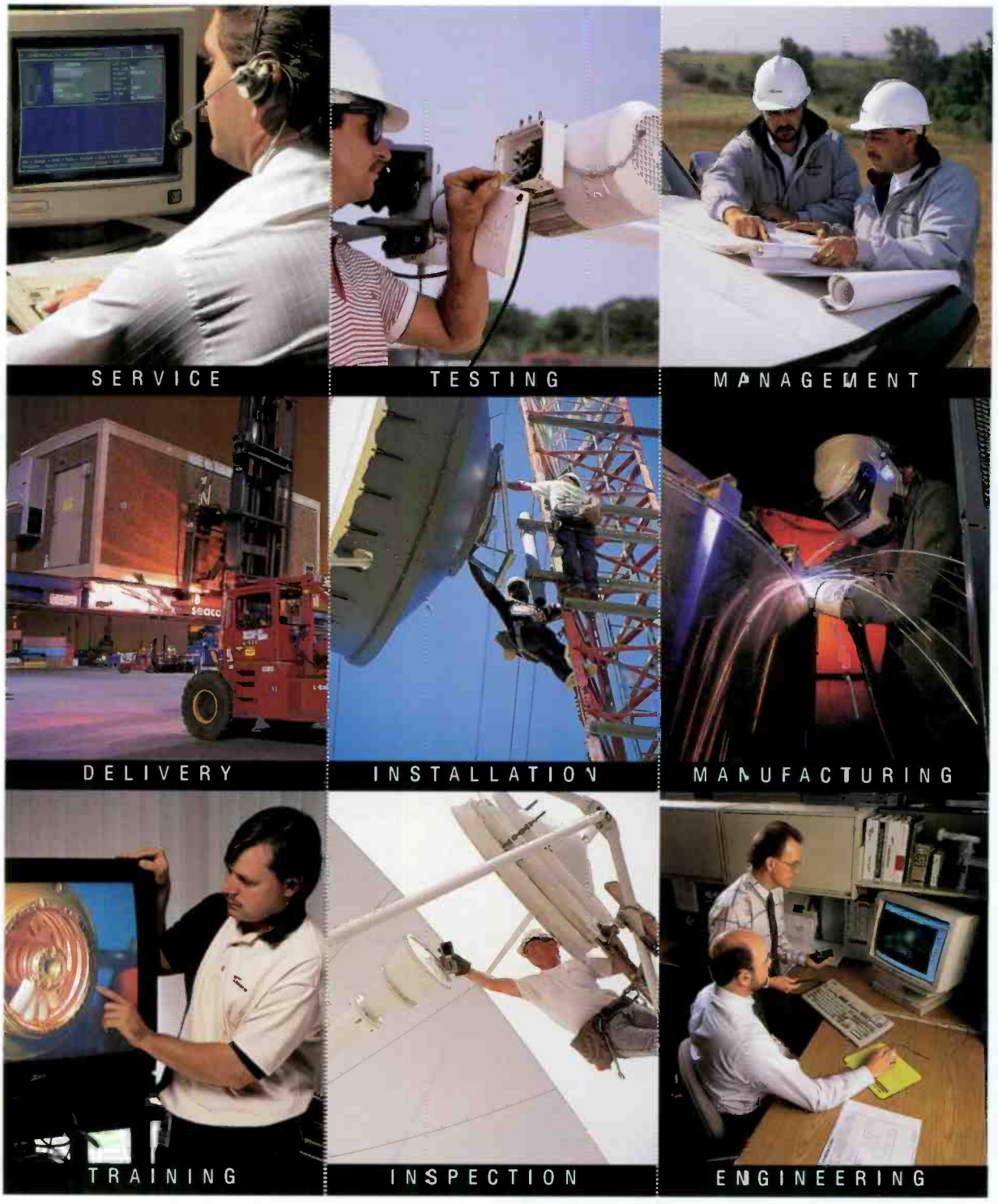
At Andrew, we believe the only way to truly service our global customers is to be close to them at all times. As a result, we continue to expand our GLOBAL NETWORK of manufacturing facilities, distribution points and sales offices to ensure timely response and cost-effective delivery of all Andrew products and services. No matter where our customers are located, we're ready to provide them with the highest quality products, accurate and helpful technical information, and custom training and consultation whenever needed.

Andrew Offers Total Systems Solutions

While recognized around the world as a leading manufacturer, Andrew is also a full service systems integrator. With years of worldwide experience and expertise, Andrew offers many complete TURNKEY SYSTEM SOLUTIONS, can support a competitive OEM system or can provide a customer's choice of one or more individual services including system design, engineering, installation, testing, and maintenance.

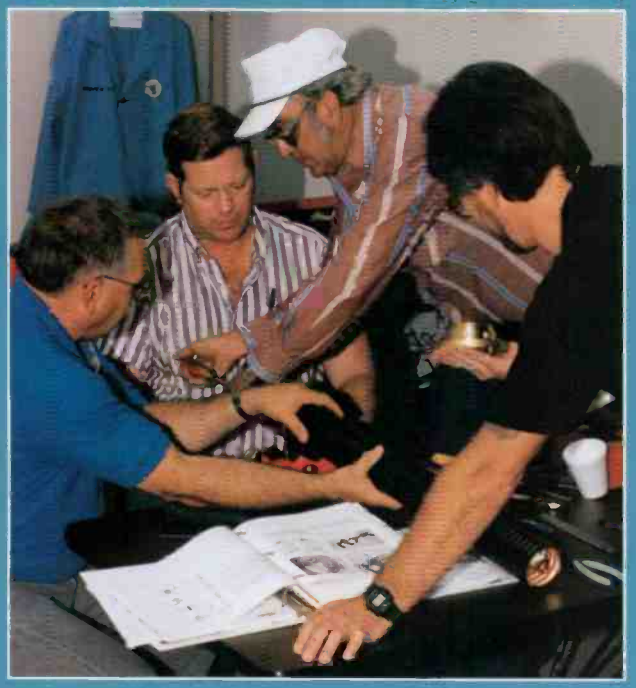
P r i m a r y A n d r e w L o c a t i o n s

Service Comes First



Services We Deliver

Andrew Institute Communications



We are Committed to Serving You

The Andrew institute offers specialized training on all aspects of the installation and testing of Andrew products for its customers worldwide. At Institute workshops, we teach the most current assembly and installation techniques in the industry. Using hands-on instruction, installers learn how to obtain the highest possible level of performance with every Andrew product installed. The Andrew Institute was founded to provide training on transmission line assembly, cable preparation and connector attachment. Since its inception the Institute curriculum has expanded to include those topics that best meet the needs of our customers.

This is What They Have Said

"The general feeling of cooperation and attentiveness to our company needs was obvious and much appreciated."

Cellnet

"You showed us how to do connectors properly. Very informative. Learned a lot about Andrew products, different types of cable, connectors. Discovered the Andrew tool box - great investment."

Canadian Broadcasting Company - Alberta

"I feel competent handling the products the training covered. Now other communications technicians within my group are requesting my assistance."

Maine Department of Public Safety

Technology Training

Institute Instructors

Andrew Institute is staffed by experienced, certified instructors who have been selected from a variety of disciplines within Andrew ranging from Quality Assurance and Manufacturing to Cable Assembly Production.

These instructors have been called on to share their expertise with major OEMs and telecommunications operators with on-site problem solving and installation instruction. Their experience and thorough working knowledge of RF systems ensures our Institute coursework will provide attendees an education beyond their expectations.

Institute Alumni

Users of Andrew products worldwide are gaining valuable new skills that have increased their effectiveness and the performance of the systems they support. A partial list of past Institute attendees includes:

Motorola
U.S. Navy
R.T. Masts
Cellular One
Ericsson
British Telecom
Ford Aerospace
Northern Telecom
AT&T
U.S. Tower
Vodafone

Andrew Institute Covers the World to Meet Your Needs

The Andrew Institute gladly offers on-site training around the world. Workshops are customized to meet any level of technical training required by terrestrial microwave, broadcast and wireless operators. Andrew will supply all the tools, materials and instruction documentation that will be necessary for your course.

Regular Institute sessions are also conducted monthly at Andrew locations in Canada, the United States, Scotland and Brazil. These more formalized training sessions cover the aspects of Andrew product preparation, assembly, and installation. Performance issues also are discussed and the use of innovative new products is demonstrated. We welcome the opportunity to serve you. We can bring Andrew Institute training to your location or you can visit Andrew. Please contact our Customer Service Center for information on the latest course offerings and schedules.

Current Topics Include:

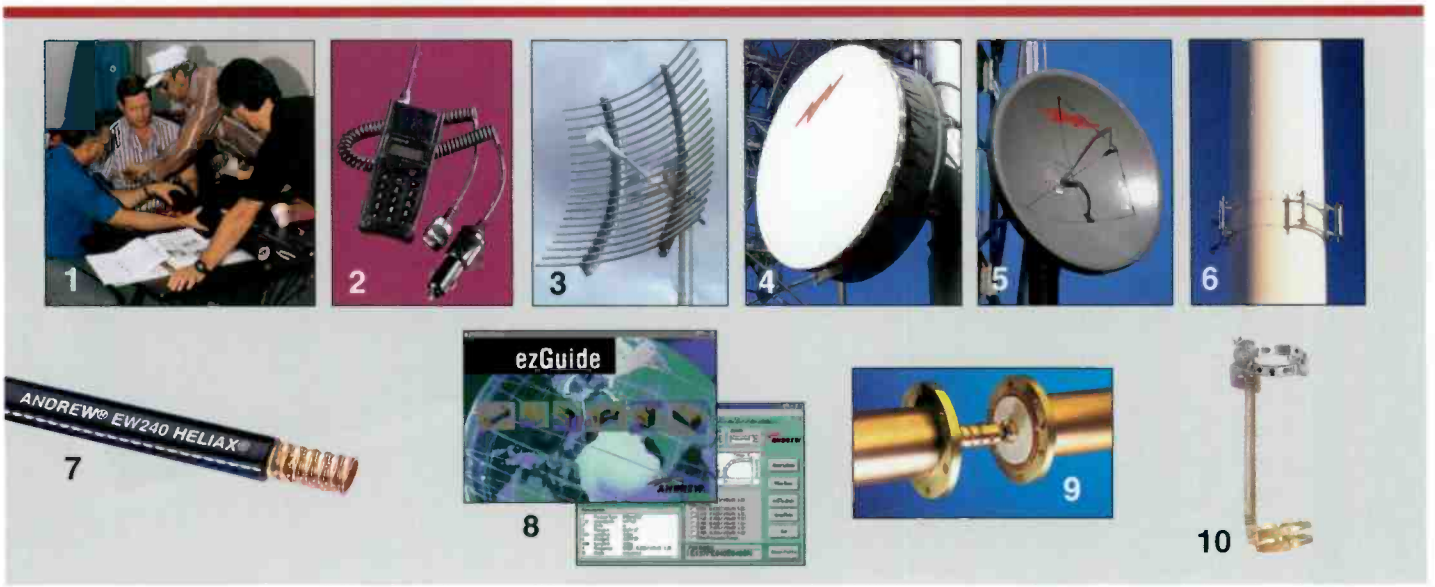
- *HELIAX® transmission line preparation*
- *TMW antenna fundamentals*
- *How to maintain quality*
- *How to install grounding kits, weatherproofing kits and splices*
- *Troubleshooting VSWR and intermodulation problems*
- *New tools that make attachment procedures faster and easier*

A New Industry Standard

More and more, customers are mandating that technicians installing their systems complete training such as that offered by the Andrew Institute. Upon completion of the Andrew Institute training, attendees will become registered with Andrew has having completed Institute coursework and having been trained and instructed in the proper manner of handling Andrew antennas and transmission line products.

What's New in Catalog 37?

Here is a sampling of the many new products and features included in this Catalog.



1 Andrew Institute Communications Technology Training. Specialized training on all aspects of installation and testing of Andrew products for customers worldwide. See page 12.

2 New Wireless Telephone Accessories. Andrew offers the Maxim® line of accessories for cellular and PCS phones, including antennas, portable hands-free kits, chargers, batteries, cable kits, leather cases, mounts, and cradles. See page 18.

3 KPR Series GRIDPAK® Antennas. New GRIDPAK antennas for rural telephony systems. Feature 1/2" HELIAX cable as part of the antenna feed system. See page 55.

4 HSX Series High Cross Polarization Antennas. New full line of high performance antennas feature very high cross polarization characteristics. XPD of 40 dB is ideal for SDH high capacity microwave systems. See page 52.

5 PAR Series Unshielded Antennas - FCC Category A. These antennas meet Category A requirements for FCC Parts 21, 94, and 101, for the 6, 10, and 11 GHz frequency bands. See page 54.

6 Base Station Antennas. New line of base station antennas for PCS/PCN, paging, cellular, and GSM. Antenna types include panel antennas, omni antennas, and optical fiber fed antenna systems. See pages 152-165.

7 New HELIAX® Elliptical Waveguide, EW240 for 24.0-26.5 GHz. Use with new high-performance ValuLine® microwave antenna systems. Provides an alternative to direct radio/antenna integration for installations in confined areas. See page 210.

New PDR70 Flange Connectors for EWP77 Elliptical Waveguide. Types 277DEMT/277DEMP provide another option for EWP77, 7.125-8.50 GHz connectors. EWP77 connectors are also available with PDR84, PBR84, CPR112G, or UG type flanges. See page197.

Broadband 7/8" EIA Connectors for EW20 Elliptical Waveguide. Types E20MB-014 and E20MP-014 connectors are for 2.1-2.7 GHz broadcast antenna systems. See page 181.

8 ezGuide™ Software - New Functional Numbering System for rigid rectangular waveguide components. ezGuide Software automatically creates your ordering Type Number using easy point-and-click menu options. No more charts, tables, or order forms! See page 220.

9 Extra Long Life 3-1/8" Rigid Transmission Line for Broadcast. HRLine® rigid line eliminates undependable bullets for twice the longevity of standard line – now in 3-1/8" size. See page 344.

10 Labor-Saving Hinged Hangers for Rigid Transmission Line. New vertical spring hangers for 6-1/8" and 3-1/8" rigid line are hinged to open from left or right side, saving installation labor. See pages 342 and 350.

New Broadband HMD Series Antennas allow construction of a complete MMDS system with two instead of four antennas. Operates both 2150-2163 and 2500-2686 MHz bands on the same antenna. All standard patterns are available. See page 324.

New Dual Input HMD Series Antennas feature a unique design that mounts two omnidirectional antennas into a single radome, saving space and the costs associated with installing and maintaining two antennas. Available in dual 8- or 12- bay configurations, these antennas offer global wireless cable operators simultaneous operation covering bands from 1900-2686 MHz. See page 325.

Earth Station Antennas. New antennas include an INTELSAT and Eutelsat Type Approved 2.4-meter Prime Focus VSAT. Also new are X-band capabilities for the 3.6-, 3.7-, 4.5-, 4.6- and 7.6-meter antennas and a complete line of receive-only antennas ranging from 1.8- to 4.5-meters. See pages 360-404.

Earth Station Antenna and Systems Certifications. New certifications include Russian Homologation Certification and ISO 9000 Certification.

What's New in Catalog 37?

Here is a sampling of the many new products and features included in this Catalog.

Eleven New Sizes of HELIAX® Coaxial Cable

11 New Extraflexible Cable. EFX2-50 (3/8") has corrugations that are deep, like superflexible cables and annular like LDF cables. See page 454

12 Three New LDF Cable Sizes. LDF1-50 (1/4", 50 ohm) and LDF12-50 (2-1/4" 50 ohm) and LDF5-75 7/8", 75 ohm. See pages 456, 479, and 539.

13 New HST Series Cables. These superflexible air cables are for high power, high temperature, plenum applications. They are available in three sizes, HST1-50 (1/4"), HST2-50 (3/8"), and HST4-50 (1/2"). See pages 484, 488, and 505.

14 Two New HS-RP Series Sizes. Superflexible plenum cables HS2RP-50 (3/8") and HS4RP-50 (1/2") are for high power, high temperature applications. See pages 486 and 502.

15 New High Power, High Temperature, Plenum Cable. HLT4-50T, 1/2" air dielectric has an annularly corrugated outer conductor. See page 499.

16 New High Power 5" HELIAX Coaxial Cable. Type HJ9HP-50 has the power handling of 6-1/8" cable, over most broadcast frequencies, together with the installability and wind loading of 5" cable. See page 529.

New HELIAX Connectors

17 RingFlare Connectors feature a unique, expandable clamping ring that automatically flares the cable as the connector is tightened. See page 427.

18 Connector Inner Contacts for LDF5-50A cable have been redesigned for faster and easier installation. See page 427.

19 Improved EIA Flange HELIAX Cable Connectors. New EIA flange connectors for 3", 4", and 5" cable are easier to install and have excellent VSWR performance. See pages 524, 526, 528, and 530.

Connectors for New LDF1-50, EFX2-50, and LDF12-50 Cables. See pages 455, 457, and 480.

Many New Connector Interfaces for Existing Cables.

More HELIAX Cable Accessories

20 Hoisting/Support Grip. Hoists the LDF series cable into position on a monopole tower, then provides permanent support for the cable. See page 553.

21 Hanger Blox™ Cable Hangers support multiple cable runs and make most efficient use of space on the tower. See page 556.

22 Sureground™ Grounding Kits. Install in half the time. They feature a pre-formed, clip-on grounding strap for easy, snap-on installation. See page 559.

23 T-Series Arrestor Plus® Lightning Surge Protectors. Compact design is ideal for installation in tight places. See page 563.

24 Gas Tube Surge Arrestors. Multistage gas tube technology provides excellent surge protection and the ability to pass direct current. See page 564.

25 ArrestorPort Plus™ Integrated Wall Entry/Grounding System. A wall entry and grounding system in one. See page 566.

26 Reel Pax™ Cable Packaging System. Up to 500 feet of HELIAX superflexible cable in a carton. It makes handling, dispensing, and cutting cable easier and neater. See page 570.

What's New in Catalog 37?

Here is a sampling of the many new products and features included in this Catalog.

27 Installer Pax™ Bulk Packs. HELIAX® connectors and accessories in bulk packs minimize storage requirements, decrease waste, and reduce shipping costs. See page 570.

28 GPS Antenna Kit. Includes everything required to establish GPS capabilities for PCS applications. See page 546.

29 Composite Fiber Optic Cables for Indoor Cellular and PCS Antenna Remoting. Provide uplink and downlink signals while providing power for antennas from UPS protected equipment room for greater system reliability. Available with plenum and riser ratings. See page 598.

30 Composite Fiber Optic Cables for Outdoor Antenna Remoting. Designed for harsh environmental conditions to provide a fiber optic alternative to traditional antenna remoting methods. See page 602.

31 Fiber Optic Cable for Tunnels, Train Stations, and areas requiring low smoke/zero halogen emissions. Certified to meet IEC 332 parts 1 and 3, BS 6425 part 1, and IEC 1034. See page 608.

32 BCA Series 28 GHz Broadband Communications Antenna Products High performance broadband antennas for Local Multipoint Distribution Systems (LMDS). The BCA Series antennas provide high gain and supurb pattern control for LMDS hubs to maximize subscriber coverage. The BCA Series includes both omnidirectional and sector designs. See page 659.

33 The Multi-Service Antenna System (MAS) is the first in-building wireless communications system capable of supporting multiple frequencies over a single backbone antenna system. The MAS system provides a single vendor solution that includes RADIAX® multi-frequency radiating cable, a modular wireless hub, and various electronic modules. The hub incorporates wireless access points compatible with key manufacturers and an SNMP-based network management module with a WAN access router. See page 662.

APEX™ - Andrew Preemptive Executive APEX is a real-time operating system designed for embedded microcontrollers in telecommunication applications. APEX provides a modular design with "plug-in" components to expand the system to include networking, file systems and other run-time facilities. See page 669.

34 SELECTAmp 1600. Extend paging services into previously blocked areas with this new unidirectional amplifier. The amplifier is channelized for high selectivity. This allows for the rejection of any other paging services in the area. The SelectAmp 1600 operates in the 929-932 MHz range and will pass up to four frequencies selected by the operator. See page 682.

35 ACE1100. For in-building applications of 800/900MHz cellular and trunked radio services, the ACE1100 is configured with the high power output necessary to minimize signal interference in multi-carrier distribution systems. See page 683.

36 ACE1300. For off-air pick up and retransmission of 800/900MHz cellular and trunked radio services, the ACE1300 is configured with a 10 watt feed forward/error corrected power amplifier stage which reduces distortion products in multi-carrier systems and provides comparable performance to 25 watt units. See page 681.

37 Two New RADIAX® Radiating Cable Series. Aluminum Series RADIAX Cables are similar in construction to Premium Series cables, except they have a corrugated aluminum outer conductor. They are available in 7/8" and 1-1/4" sizes. High Performance Series, available in 7/8", 1-1/4" and 1-5/8" sizes, achieve low variations in coupling and wideband performance. They are ideal for applications in the Cellular, PCS / DCS-1800 and WLAN frequency ranges. See page 702.

38 The Illuminator™ is a fiber optic active antenna system for AMPS cellular applications. It delivers high quality RF signals inside open buildings and throughout multistoried office complexes. See page 734.

39 Andrew Tower Top Systems provide an overall signal increase of 15 dB for wireless band applications. See page 735.

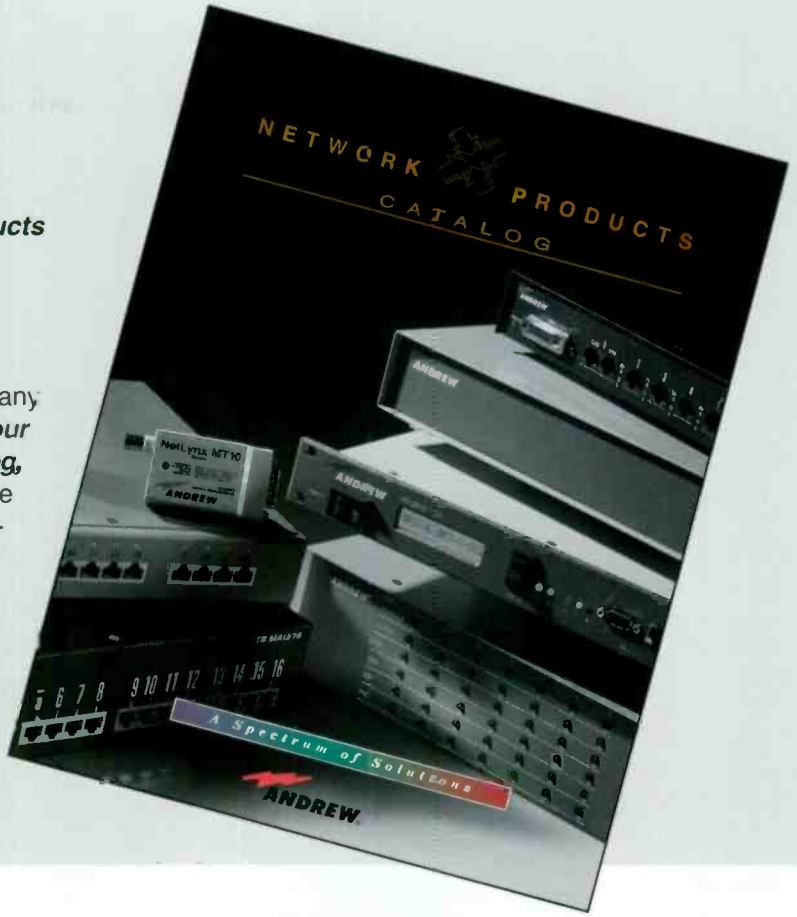
40 CPS Continuous Positioning System™ combines the uninterrupted positioning capability of a dead reckoning system with the absolute positioning of GPS. See page 753.

Network Products

Solutions for Today and the Future!

- *Token ring LAN/WAN systems*
- *IBM Midrange computer connectivity products*
- *Remote access solutions*
- *Wiring management solutions*

If you need token ring network equipment or any other computer connectivity products, ***ask for your free copy of the Andrew Network Products Catalog, Bulletin 3143.*** This Catalog is a comprehensive guide to all of the Andrew Network Products offerings for connecting and inter-connecting your token ring, midrange and mainframe systems. It includes product selection and planning information for midrange emulation cards and software, gateways, frame relay solutions, token ring switches, and the many other Andrew Network Products.



LAN Products -

The Andrew Token Ring System

The token ring Local Area Network (LAN) has become an industry standard to connect PCs, mainframes and minicomputers all on one network. Andrew offers a full line of products to design and build a token-ring LAN.

Cabling. The Andrew token ring is designed to use standard intra-building unshielded, twisted-pair (UTP) wire (Type 3), the IBM® cabling system, including shielded cable Types 1 and 2, and fiber optic cable.

Network Design. Andrew token ring components feature long distance capability for cost-efficient design of large systems such as those serving multiple buildings in a campus environment.

Compatibility. Andrew systems and components are based on the IEEE 802.5 Token Ring Standard and are fully compatible with the IBM token-ring network. They can be used exclusively or combined with IBM or third party hardware and software products for optimum system design.

Midrange Solutions

Midrange Emulation Cards. Connect your PC to your AS/400 or System/3X. Andrew emulation cards come complete with memory-resident emulation software so you can switch between your DOS programs and multiple host sessions with a single keystroke.

Midrange Emulation Software. Andrew Emerald Series emulation software is a complete set of solutions for IBM Midrange host connections. This comprehensive set of Windows-based client software applications provides users with 5250 workstation and printer emulation, drag-and-drop file transfer, and customizable interfaces.

Advanced Wiring Management Solutions

The Andrew Advanced Wiring Management Solution uses unshielded, twisted-pair (Type 3) wiring for all connections between a computer controller or host and all system devices, including terminals, workstations and printers. Baluns are used for conversion from coaxial or twinax cable to twisted-pair wiring at the controller and each network device. Wiring connections are conveniently made in wiring closets using patch panels, punch down blocks and standard telephone wiring components.

Wireless Accessory Products

INDEX

Wireless Accessory Products

Introducing MAXIM® Wireless Accessories

for Cellular and PCS Phones

Expanded Line of Quality Accessories

With MAXIM wireless accessories, there are no shortcuts to quality. Each MAXIM product is subjected to rigorous testing in the industry's leading quality assurance facility. There, the products are sent through extensive environmental, electrical and durability evaluations. And once products are assembled and packaged, each shipment is randomly tested again.

Our Commitment

MAXIM accessories are built to be the best performing accessories you can buy. We back this claim with lifetime warranties on all chargers, savers, antennas, saver/chargers, rapid chargers and leather cases. All of our battery packs are backed by at least a one-year warranty.

All MAXIM accessories are built with only quality components to assure top performance far into the future.

We use the latest technology when designing and testing our products. Using sophisticated test equipment and software enables us to bring products to market under the highest quality conditions in the industry.

Impactful packaging, performance tips and phone identifiers combine to make product selection easy.

All MAXIM brand products are shipped on a timely basis.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

Extended Life Batteries

Batteries that Create the Performance Standard

A battery's quality is only as good as the internal components used to build it. Industry-leading quality standards guarantee MAXIM® batteries will outperform all others.

1 YEAR WARRANTY 1 YEAR

Custom molded cavities provide a tight, custom fit for each phone model.

Built-in temperature sensor protects the battery from overheating.

Welded nickel strips ensure maximum current flow between cells.

Top quality, individually-tested cells provide maximum talk time.

Rugged case withstands the most abusive day-to-day conditions.

Leather Cases

Personalize and Protect Portable Phones

LIFETIME WARRANTY LIFETIME

Genuine, glove quality leather cushions against impact and provides a sure grip.

Leather covered clip on back allows easy attachment to belts, purses and portfolios.

Nylon stitching provides tear-resistant construction.

Lycra elastic in strategic stress points ensures a secure, tailored fit.

For availability by phone model, or to order, call: (630) 250-9900 or FAX (800) 458-2820

Wireless Accessory Products

Portable Hands-Free Kit

The Safest Way to Use a Portable Phone

MAXIM® Portable Hands-Free Kits allow callers to focus on the road, not the phone through convenient hands-free features. The kit requires no installation and is simple to use.

- *Adjustable volume control and privacy mode allow personal conversation on some models.*

Integrated speaker/charger provides unlimited talk time and restores power to the phone's battery.

Wireless microphone attaches easily to the car's visor for close proximity to the caller and superior sound quality.

3 YEAR WARRANTY 3 YEAR

Battery Saver/Charger

The Power to Keep Customers Talking

MAXIM® Saver/Chargers connect to the cigarette lighter to provide unlimited talk time while charging the battery.

- *Restores battery power in 90 to 120 minutes on most phones.*

Variable rate charging technology protects the battery from overheating.

Rugged cable won't stretch out of shape over time.

LIFETIME WARRANTY LIFETIME

For availability by phone model, or to order, call: (630) 250-9900 or FAX (800) 458-2820

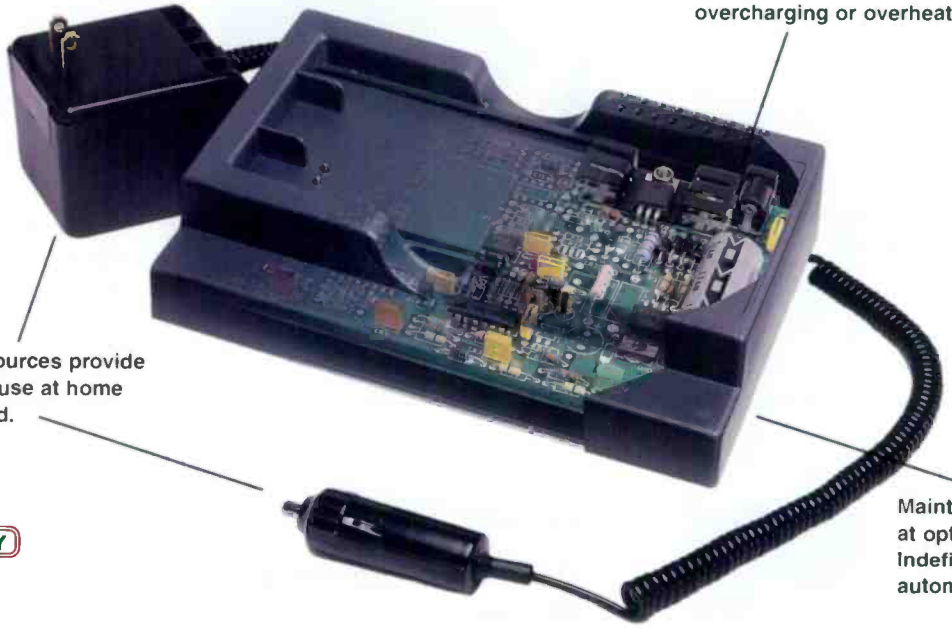
Desktop Chargers

Complete Charging Control

MAXIM® Desktop Chargers restore both NiCd and NiMH battery power in one hour or less. They also maintain the battery's full power once the charging cycle is completed.

- *Pulse technology exercises the battery to prevent memory effect in NiCd batteries.*

Built-in temperature sensor protects the battery from overheating. Top off your battery anytime with no concern for overcharging or overheating.



Two power sources provide flexibility for use at home or on the road.

Maintains your battery at optimum charge level indefinitely in the automatic mode.

LIFETIME WARRANTY LIFETIME

Travel Charger

LIFETIME WARRANTY LIFETIME

Lightweight Charger Restores Battery Power in Two Hours or Less

Lightweight and compact, the MAXIM® Travel Charger offers convenient, rapid charging technology.

- *Flexible design allows caller to use phone while charging.*

Convenient "flip" prongs plug into any standard wall outlet and retract for convenient carrying.

LED indicator glows red while battery is charging then turns green when battery is ready.

For availability by phone model, or to order, call: (630) 250-9900 or FAX (800) 458-2820

Wireless Accessory Products

DriveTime® Kits

Dramatically Improves Flip Phone™ Performance

A car's steel body panels and tinted windows can reduce a phone's signal strength up to 90% when used without an external antenna. The DriveTime Kits' external antenna eliminates the car's shielding effects to dramatically improve in-car performance.

LIFETIME WARRANTY LIFETIME

Innovative adapter allows easy connection to both the external antenna and rubber spike antenna.

External antenna expands calling range and reduces static and dropped calls.

Rubber spike maintains a vertical position to allow maximum transmit and receive capability.

ACC adapter allows easy connection to window, glass, magnet and roof mounted antennas.

DriveTime® Cables

Conveniently Improves Portable Phone Performance

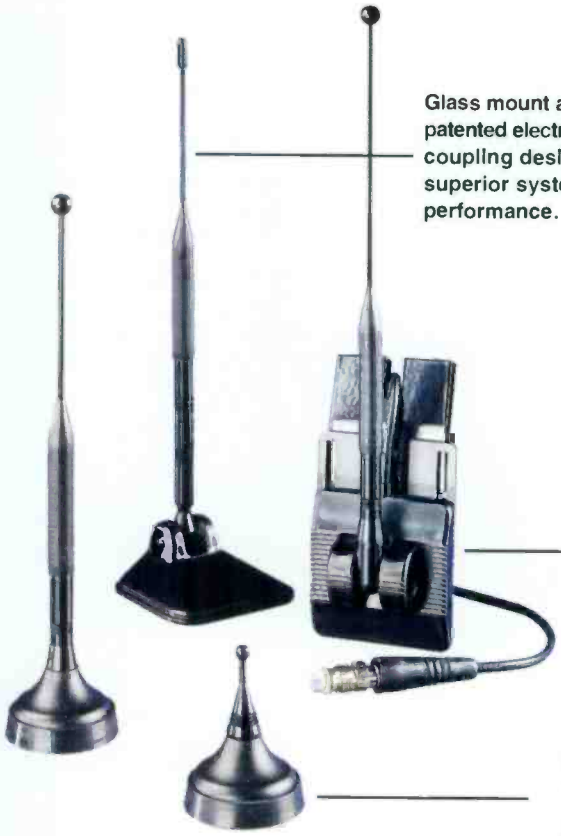
The DriveTime Cable allows easy connection to an external antenna. This connection dramatically improves performance by extending battery life and calling range while reducing static and dropped calls.

Custom-fit adapter conveniently connects the phone to an external antenna.

LIFETIME WARRANTY LIFETIME

Connection to an external antenna extends the phone's battery life by reducing the amount of power required to receive and transmit calls.

For availability by phone model, or to order, call: (630) 250-9900 or FAX (800) 458-2820



Glass mount antenna's patented electromagnetic coupling design offers superior system performance.

Window Klip and Magnet Mount offer enhanced signal quality, yet can be easily removed for transport or storage.

Roof mount antennas use the car as a "ground plane" to offer the best antenna performance possible.

Antennas for Portable Phones

The Critical Link to the Wireless System

A car's steel body panels and tinted windows can reduce a phone's signal strength up to 90% without an external antenna. MAXIM® antennas eliminate the car's shielding effects to expand calling range while reducing static and dropped calls.

LIFETIME WARRANTY LIFETIME

Mounts and Cradles

Provide Safe, Convenient Placement of Portable Phones

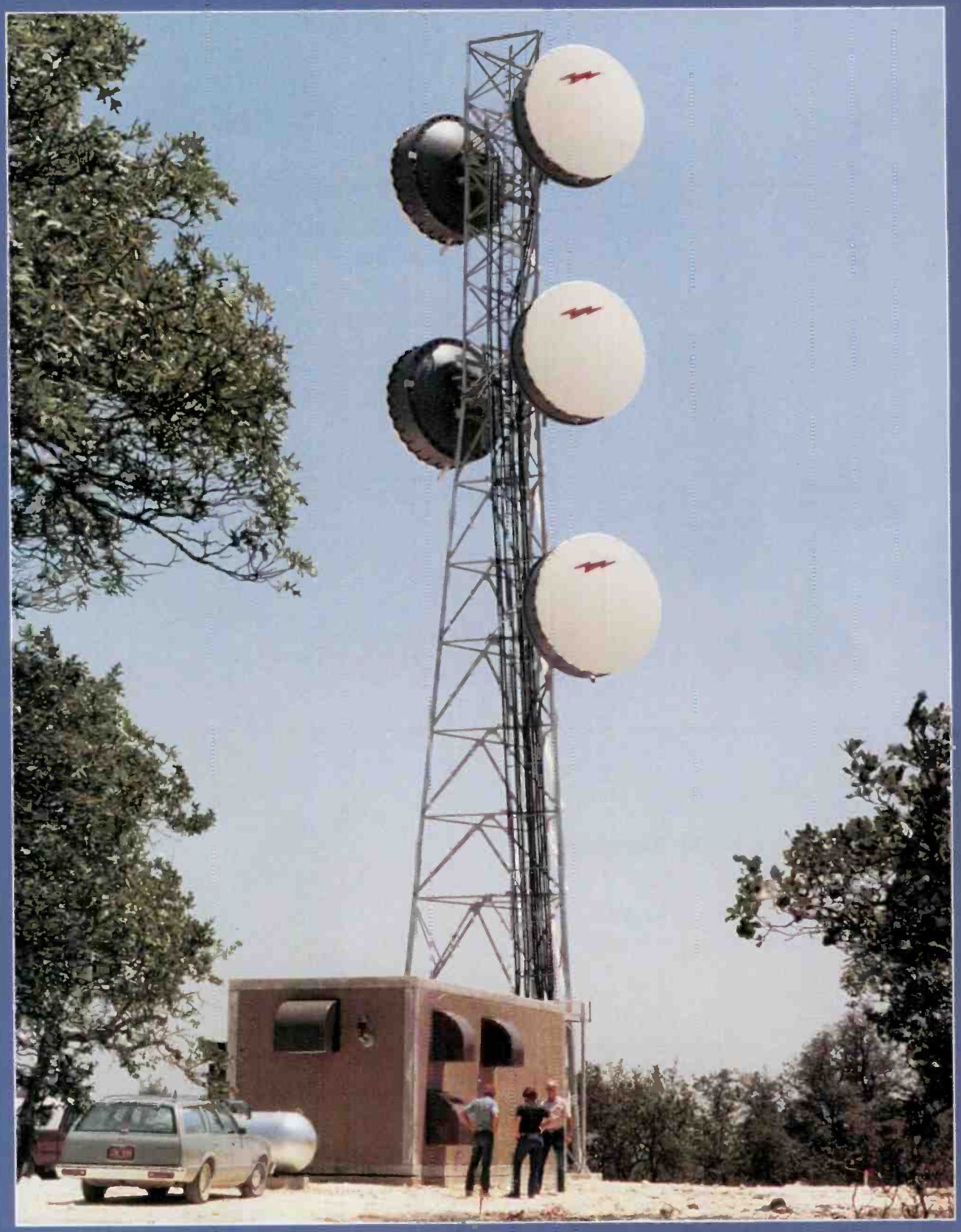
The MAXIM® line includes a complete selection of mount and cradle kits for all new phone models.

LIFETIME WARRANTY LIFETIME

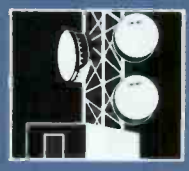
Cradle offers easy accessibility to phone at the touch of a button.

Mount options offer flexibilty to adapt to various angles without loosening.

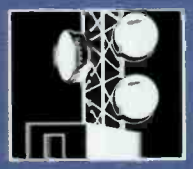
For availability by phone model, or to order, call: (630) 250-9900 or FAX (800) 458-2820



Microwave and Wireless Turnkey Systems



INDEX



Microwave and Wireless Turnkey Systems

Microwave, Cellular and PCS Systems

Andrew has been an industry leader in the design, manufacture and supply of telecommunications equipment since 1937. We have available a complete line of premium quality microwave, cellular and PCS equipment for all radio applications.

We know what it takes to meet today's design and installation requirements and to quickly get your system generating maximum revenue. It takes "The Andrew Advantage: Products Plus Services."

The Andrew Advantage

The Andrew Advantage is premium products backed by a team of professionals dedicated to excellence. Andrew designs, manufactures and stocks thousands of high performance components. These components are engineered to work together, giving the most cost effective solutions for your system. As a single source supplier, we provide system preplanning and design, site preparation, installation, testing, and program management.

Our involvement in your project is flexible and we will handle whatever amount of responsibility you want to give us. We can supply the individual component parts, or take your concept from a paper proposal to a complete communication system on time, to specification, and within budget. Whatever your needs might be, use the "Andrew Advantage" to your advantage.

Andrew Products

- *Microwave Antennas*
- *Base Station Antennas for Cellular and PCS*
- *HELIAX® Coaxial Cable*
- *HELIAX® Elliptical Waveguide*
- *Circular Waveguide*
- *Rectangular Waveguide*
- *Towers*
- *Cellular Platforms and Mounts*
- *Equipment Shelters*
- *Transmission Line Support Systems*
- *Transmission Line Bridges*
- *Pressurization Equipment*

Andrew Services

- *System Engineering*
- *Program Management*
- *Site Civil Engineering*
- *Transportation*
- *Tower Erection*
- *Shelter Installation*
- *Electronics Installation*
- *Antenna Installation*
- *Transmission Line Installation*

Microwave and Wireless Turnkey Systems

Andrew professionals assist you in the initial planning of your project.

When you choose Andrew for your Terrestrial Microwave, Cellular or Turnkey System, you get products and services that lead the industry in quality and reliability.

Turnkey Services

Andrew Turnkey Systems Management Teams have the proven capability and expertise to completely coordinate and manage your next project. In addition to supplying all of the materials and components, Andrew can provide people to help in preplanning and design, site preparation, installation, and testing. Since every project is unique, you can pick and choose from any or all of our services to meet your specific requirements.

Program Planning and Design

In order for you to have the most cost-effective system, Andrew will supply a team of experienced professionals who will assist you when you begin the initial planning stages of your project. This group will work with you so your project is completed on time and on budget.

Preplanning can avoid costly delays by ensuring that you have achieved the best component interface designs which will provide the highest system performance at the least cost to you. Accurate material lists are supplied which can eliminate the need for last minute shipments. And preplanning results in more efficient use of field time.

The Andrew difference begins on the drawing board. Andrew engineers have extensive experience in all aspects of system design, development and practical installation. Our laboratories are fully equipped, and the latest equipment is employed for the most effective designs possible. Computer modeling guarantees a high level of performance in actual service. Conservative design approaches provide reliable operation under extreme conditions.

Program Management

Andrew can provide a Program Manager who assumes responsibility for the implementation, installation, testing, and inspection of your project. Working with the Program Manager, experienced engineering and support personnel will integrate all services and system components supplied by Andrew or others. The Program Manager will monitor all crews and their performance and report progress to you.

We provide complete site preparation including site clearing and grading, construction of foundations for earth station antennas, towers, equipment buildings, electrical work, fence installation, construction of access roads, site clean up and debris disposal.

Ongoing inspections by our experienced field supervisors, site superintendents and field inspectors ensure that Andrew provided products and services meet our strict standards and meet your project requirements.

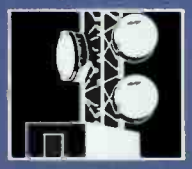
Since communication with all parties is an essential part of any project, daily status reports from the field are received to monitor progress. Weekly status updates are given to you.

This total coordination saves time and money by eliminating schedule conflicts, extra personnel and material oversights.

Since Andrew can supply you with a wide range of systems management programs and capabilities, you can be assured that Andrew professionals will have your project completed on time and within your budget. You can depend on Andrew products and services for a top performing system.

Emergency Assistance

When you are faced with an emergency, Andrew is ready to help. Technical assistance is available 24 hours a day. HELIAX® coaxial cable and elliptical waveguide shipments are normally possible within hours for emergency situations.



Microwave and Wireless Turnkey Systems

Andrew trucks deliver all system equipment to any accessible site.

Antenna installation by experienced field service people.

Field Services

Andrew can provide complete field service capabilities for delivery, installation, testing, site preparation and program management for all your systems applications.

Andrew Field Service performs all aspects of site construction including:

- *System engineering, installation preplanning, scheduling and program management*
- *Site civil work such as site clearing and grading, access road construction, fencing and grounding*
- *Tower and building foundation construction*
- *Delivery to site of all system equipment*
- *Tower erection*
- *Antenna and transmission line installation*
- *Factory installation of radio racks, wiring, power source equipment and other equipment in concrete shelters*
- *Installation of concrete shelters and on-site power connection*
- *System testing and guarantees*

Field services are also available individually. Antenna system installations by Andrew Field Service offer several advantages. Crews are self-contained and arrive fully equipped. Ongoing inspections and continuous field supervision help yield a maximum effort and proper installation. Field services include delivery to the site, installation, site civil work and system testing.

Site Preparation

Andrew has the engineering expertise and the field service experience to handle all details necessary for site construction. These include installation of equipment shelters, site clearing and grading, construction of tower and building foundations, tower erection, electrical work, installation of fences and construction of access roads.

Delivery

Andrew Field Service trucks can delivery any product to any accessible site. Off-loading of equipment at the site is provided by Andrew.

Installation

Proper installation of a tower and the associated antenna and transmission lines takes experienced field service people. Andrew personnel are experienced in every aspect of erecting towers and installing shelters, antennas, and feeder systems. They are familiar with every tower member, every assembly drawing, and every procedure.

Installation crews are equipped with all the necessary tools, rigging equipment and test equipment to ensure an efficient and trouble-free installation.

Testing

After installation is completed, Andrew tests each antenna/transmission line system for VSWR across the specified operating band. A pressure integrity test is performed on pressurized systems.

System Performance Guarantees

System guarantees are offered when the complete system is furnished by Andrew and the installation is performed by Andrew Field Services.

Andrew products are designed to minimize the causes of inter-modulation, return loss and echo distortion.

Andrew antenna/transmission line systems can be used for fully loaded frequency plans. Optional guarantees for inter-modulation noise levels can be provided on request.

System Components

The wide range of products from Andrew promotes efficient system design. The large number of antenna/transmission line combinations allow you to design a system that meets performance objectives at minimum cost.

Towers

An Andrew tower lowers the costs associated with your tower over the life of the installation. Lower maintenance costs are built into Andrew towers. The open formed plate leg and angle design allow inspection of 100% of the tower's galvanized surfaces, facilitating easy, proper inspections. Costly design and tear down expenses are avoided with Andrew towers which can be designed now to integrate your future expansion plans.

Shelters

When you select an Andrew concrete equipment shelter, you get custom-design at pre-engineered prices. Our computer-aided design means your custom requirements can be quickly and economically incorporated into our standard shelters. Andrew modular and multi-piece shelter designs allow for economical system expansion. All Andrew shelters are guaranteed for 10 years.

Microwave Antennas

Andrew has the industry's largest selection of microwave antennas for frequencies ranging from 335 MHz to 58.2 GHz. They are available in diameters of 2 to 15 ft (0.6 to 4.6 m) and in several performance levels. This wide variety of antennas means easier and more efficient system design.

Base Station Antennas

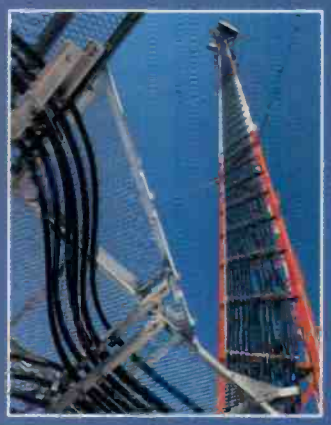
Andrew designs and manufactures patented base station antennas which are setting new industry standards for electrical and mechanical performance. Andrew base station antennas are the ideal choice for wireless applications, including PCS/PCN, Paging, Cellular, GSM, SMR and ESMR.

Microwave Transmission Lines

HELIAX® coaxial cable and elliptical waveguides are the standard of the industry. Both are available in a wide variety of sizes and have connectors to match all common industry standard flanges.

Andrew circular waveguide is recommended for very long vertical runs in systems where multi-band capability is needed or where low attenuation is critical. A single waveguide run can carry two polarizations. By using circular waveguide, you can also use smaller antennas, which reduce tower loading and save antenna cost.

Microwave and Wireless Turnkey Systems



DryLine® dehydrator and line monitor.

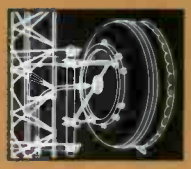
Andrew has three sizes covering frequency bands in the 3.58 - 19.7 GHz range.

Andrew offers a full line of rectangular waveguide components for use in HELIAX® elliptical waveguide and circular waveguide systems

Pressurization Equipment

Pressurization of your antenna system reduces your risk of damage and costly interruption of services. This means lower operating and maintenance costs over the life of the system. The wide variety simplifies system design and reduces cost. Andrew equipment includes basic dehydrators, monitors and a full line of accessories and related equipment.

Microwave and Wireless System Planning



INDEX

Microwave Antenna System Planning

Wireless System Planning

System Using Air-Dielectric HELIAX® Coaxial Cable

Andrew offers complete site construction, including towers, equipment shelters, antennas, transmission lines, pressurization equipment, civil work and all the services necessary to provide you with a turnkey microwave system.

- *Have a single point of responsibility . . . Andrew.*
- *Accelerate your installation time.*
- *Prevent scheduling conflicts.*
- *Minimize installation costs.*
- *Decrease operating costs over the life of the system.*

Microwave Antenna Systems

The wide range of available antenna performance levels offered as standard products promotes cost efficient system design. Availability of HELIAX® coaxial cable in long continuous lengths simplifies installation and provides for convenient stocking on site. Low VSWR minimizes group delay distortion and noise.

Typical System. The typical antenna system peak VSWR listed in the table is measured at the radio equipment end connector. The antenna, 150 ft (45 m) of HELIAX cable, and connectors are included. Contributions due to a molded radome and the optional jumper are not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Towers

Because we manufacture all the system components, Andrew has a unique understanding of how to design a tower to properly support transmission lines and hold antennas on path under the most severe conditions.

Equipment Shelters

Andrew concrete equipment shelters use a computer-aided design system to incorporate quickly and conveniently your custom requirements into our line of standard, pre-engineered shelters. Optional factory pre-equipped shelters minimize on-site installation time and construction costs.

To Complete Your Microwave Site

Transmission Line System – Pressurized

Item No.	Description	7/8" Below 1700 MHz	7/8" Above 1700 MHz	1-1/4" Above 1700 MHz	1-5/8" Above 1700 MHz	1-5/8" Low VSWR Above 1700 MHz
	Antenna Input	7/8" EIA	7/8" EIA	7/8" EIA	7/8" EIA	7/8" EIA
	Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm
5	**HELIAX Air-Dielectric Cable**	HJ5-50	HJ5P-50	–	HJ7P-50A	HJ7SP-50A
5	**HELIAX Foam-Dielectric Cable**	–	–	LDF6P-50*	–	–
6	**7/8" EIA Flange Connector**	75AR	75ART	L46S	87ST	87ST
6	**7/8" EIA Flange Connector**	75AG	75AGT	L46S	87SGT	87SGT
	N Female Alternate Connector	H5PNF	H5TNF	L6PNF	H7TNF	
7	**Grounding Kit (3-points)**	204989-2	204989-2	204989-3	204989-4	204989-4
8	**Hanger Kit of 10**	42396A-5	42396A-5	42396A-1	42396A-2	42396A-2
9	**Cable Boot**	48939-1	48939-1	48939-3	48939-4	48939-4
9	**Feed-Thru Plate**	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)
10	**Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)**					
	1700-2300 MHz	–	200834A-3	200834A-3	200834A-3	200834A-3
	2500-2700 MHz	–	200834A-3	200834A-3	200834A-3	200834A-3
10	**Optional Jumper, N Plug/N Plug, 3 ft (1 m)**					
	Below 1427 MHz	L4-NMNM-3	–	–	–	–
	1427-1535 MHz	L4P4-PNMNM-3	–	–	–	–
	1700-2300 MHz	–	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3
	2300-2700 MHz	–	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3
11	**Hoisting Grip**	19256B	19256B	29961	24312A	24312A
	Typical Antenna System					
	Peak VSWR (R.L., dB)	1.15 (23.1)	1.10 (26.4)	1.18 (21.6)	1.18 (21.6)	1.13 (24.3)
	Based on Antenna VSWR (R.L., dB)	1.10 (26.4)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)

*Type LDF6P-50 includes pressure path for use with air-dielectric antennas. **Number of openings.

System Planning Worksheet

Duplicate this sheet or ask for Andrew Bulletin 8732.

Antenna System Components

Antennas: Shielded, Standard Parabolic, Grid and GRIDPAK®
Transmission Lines: HELIAX® Air-Dielectric Coaxial Cable

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
Antenna Equipment						
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
Transmission Lines and Accessories						
4	Jumper Cable Assembly (optional)					
5	HELIAX Coaxial Cable					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Cable Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Round Member Adaptor Kit					
	Ceiling Adaptor					
	Nylon Cable Tie Kit					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
10	Jumper Cable Assembly (optional)					
11	Hoisting Grip					

*G=Gray, O=Orange, W=White (shielded and standard parabolic antennas)

(Continued)

Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
Pressurization Equipment (for Air-Dielectric Systems)					
12	Dehydrator				
Total Antenna System Estimate FOB Factory					

Customer Name _____

Contact _____

Project _____

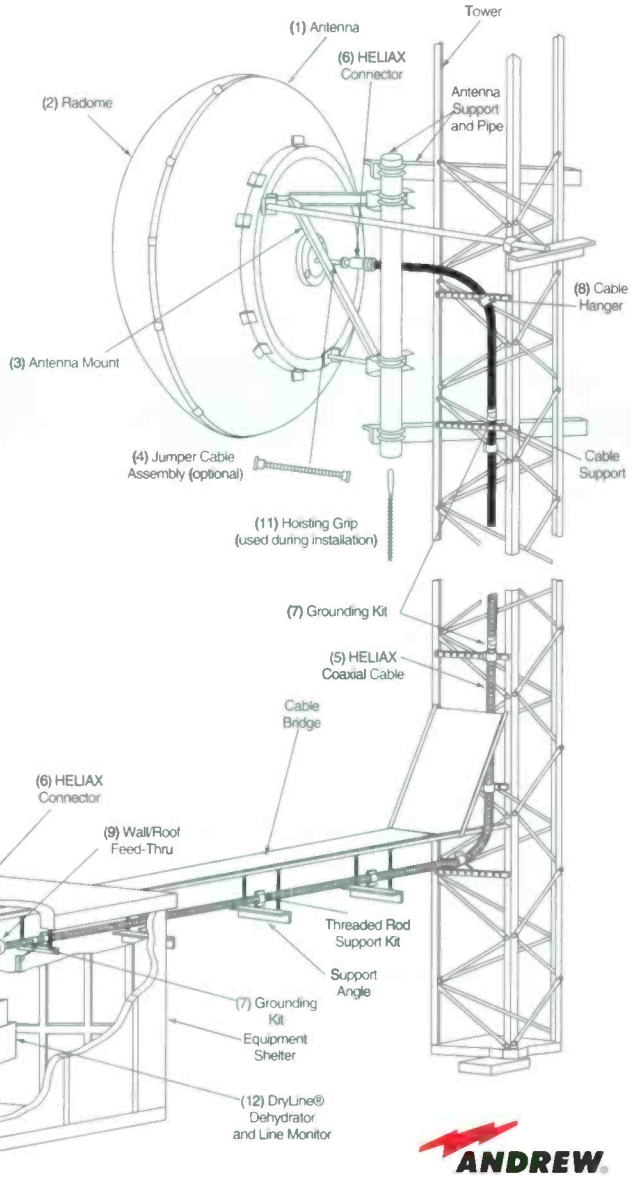
Quotation No. _____

Telephone No. _____

Customer Ref. No. _____

Site Name _____

Points to Site(s) _____



Prepared By:

_____

Date:

_____

Telephone No.:

_____

System Using Foam-Dielectric HELIAX® Coaxial Cable

Andrew offers complete site construction, including towers, equipment shelters, antennas, transmission lines, pressurization equipment, civil work and all the services necessary to provide you with a turnkey microwave system.

- *Have a single point of responsibility . . . Andrew.*
- *Accelerate your installation time.*
- *Prevent scheduling conflicts.*
- *Minimize installation costs.*
- *Decrease operating costs over the life of the system.*

Microwave Antenna Systems

Andrew "F" series unpressurized antennas combined with low-VSWR HELIAX® foam-dielectric cable eliminate the need for pressurization equipment. "F" series antennas have a special flange which has dielectric material up to the flange face eliminating any space where moisture can collect. The result is easier and lower cost installation and lower maintenance costs.

Typical System. The typical antenna system peak VSWR listed in the table is measured at the radio equipment end connector. The antenna, 150 ft (45 m) of HELIAX cable, and all cable components (4) through (6) are included. Contributions due to a molded radome and the optional jumper are not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Towers

Because we manufacture all the system components, Andrew has a unique understanding of how to design a tower to properly support transmission lines and hold antennas on path under the most severe conditions.

Equipment Shelters

Andrew concrete shelters use a computer-aided design system to incorporate your custom requirements into our line of standard, pre-engineered shelters quickly and conveniently. Optional factory pre-equipped shelters minimize on-site installation time and construction costs.

To Complete Your Microwave Site

	Pages
Equipment	
Towers	616-647
Equipment Shelters	648-655
Antennas	48-151
HELIAX® Coaxial Cables, Low VSWR	170-171
Services	
System Design Assistance	757
Program Management	758
Foundations	30
Delivery and Assembly	30
Installation	30
System Testing	30

Transmission Line System – Unpressurized

Item No.	Description	7/8" Below 1427 MHz	1/2" Above 1427 MHz	7/8" Above 1427 MHz	1-1/4" Above 1427 MHz	1-5/8" Above 1427 MHz
	Antenna Input	"F" Flange	"F" Flange	"F" Flange	"F" Flange	"F" Flange
	Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm
4	**Optional Jumper, "F" male/"F" male 3 ft (1 m)**					
	1700-2300 MHz	–	–	L4P3-FMFM-3	–	L4P3-FMFM-3
5	**HELIAX Foam-Dielectric Cable**	LDF5-50A	LDF4P-50A-(*)	LDF5P-50A-(*)	LDF6P-50-(*)	LDF7P-50A-(*)
6	**"F Flange Connector, male, top**	L45F	L44F	L45F	L46F	L47F
6	**"F" Flange Connector, female top**	48041	209865	48041		201942
6	**7/8" EIA Flange Connector, bottom**	L45R	L44R	L45R	L46R	
6	**N Female Alternate Connector, bottom**	L5NF	L4NF	L5NF	L6PNF	L7PNF
7	**Grounding Kit (3-points)**	204989-2	204989-1	204989-2	204989-3	204989-4
8	**Hanger Kit of 10**	42396A-5	42311A	42396A-5	42396A-1	42396A-2
9	**Cable Boot**	48939-1	48939-5	48939-1	48939-3	48939-4
9	**Feed-Thru Plate**	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)
10	**Optional Jumper, 7/8" EIA/N Plug, 3 ft (1 m)**					
	1700-2300 MHz	–	–	200834A-3	200834A-3	200834A-3
10	**Optional Jumper, N Plug/N Plug, 3 ft (1 m)**					
	Below 1427 MHz	L4-NMNM-3	–	–	–	–
	1427-1535 MHz	–	–	L4P4-PNMNM-3	L4P4-PNMNM-3	L4P4-PNMNM-3
	1700-2300 MHz	–	–	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3
	2300-2700 MHz	–	–	L4P3-PNMNM-3	L4P3-PNMNM-3	L4P3-PNMNM-3
11	**Hoisting Grip**	19256B	430094	19256B	29961	24312A
	Typical Antenna System					
	Peak VSWR (R.L., dB)	1.19 (21.2)	1.19 (21.2)	1.21 (20.5)	1.22 (20.0)	1.22 (20.0)
	Based on Antenna VSWR (R.L., dB)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)

* Select detail corresponding to specific frequency band. **Number of openings.

System Planning Worksheet

Duplicate this sheet or ask for Andrew Bulletin 8732.

Antenna System Components

Antennas: Shielded, Standard Parabolic, Grid and GRIDPAK®
Transmission Lines: HELIAX® Foam-Dielectric Coaxial Cable

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
	Antenna Equipment					
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
	Transmission Lines and Accessories					
4	Jumper Cable Assembly (optional)					
5	HELIAX Coaxial Cable					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Cable Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Round Member Adaptor Kit					
	Ceiling Adaptor					
	Nylon Cable Tie Kit					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
10	Jumper Cable Assembly (optional)					
11	Hoisting Grip					

*G=Gray, O=Orange, W=White (shielded and standard parabolic antennas)

Customer Name _____

Contact _____

Project _____

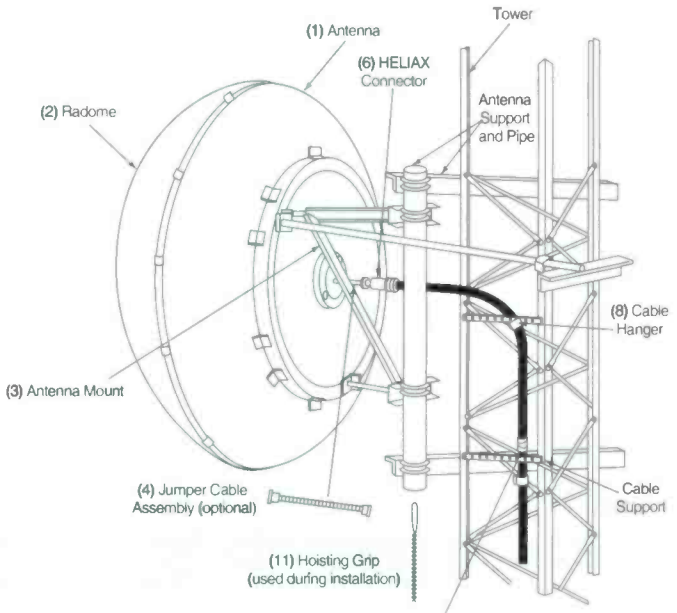
Quotation No. _____

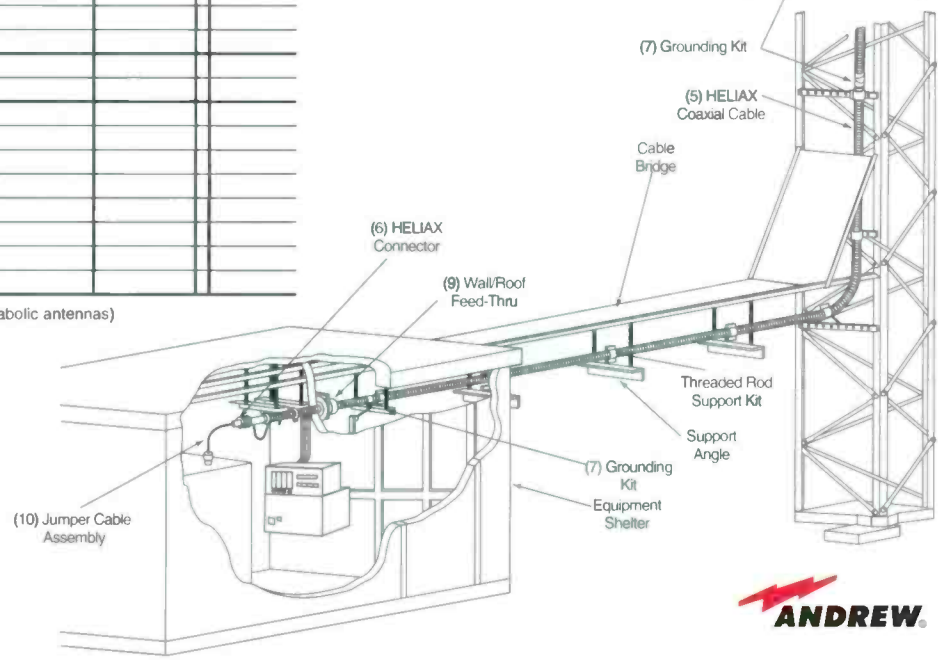
Telephone No. _____

Customer Ref. No. _____

Site Name _____

Points to Site(s) _____





Prepared By:

_____

Date:

_____

Telephone No.:

_____

System Using HELIAX® Elliptical Waveguide, 8.5 GHz and Below

Andrew offers complete site construction, including towers, equipment shelters, antennas, transmission lines, pressurization equipment, civil work and all the services necessary to provide you with a turnkey microwave system.

- *Have a single point of responsibility . . . Andrew.*
- *Accelerate your installation time.*
- *Prevent scheduling conflicts.*
- *Minimize installation costs.*
- *Decrease operating costs over the life of the system.*

Microwave Antenna Systems

The wide range of available antenna performance levels offered as standard products promotes cost efficient system design. Long continuous lengths, good flexibility and availability of a broad range of accessories simplify system planning, minimize installation cost and make HELIAX® elliptical waveguide the most popular waveguide in the microwave industry.

Low-VSWR antennas and low-VSWR waveguide components are recommended for long-haul or high channel density CCIR systems.

Typical Systems. The antenna system peak VSWR listed is measured at the pressure window. Contributions due to a 150 ft (45 m) elliptical waveguide run and all waveguide components, except for optional flex section and elbow, are included. A planar radome, where applicable, is included; an optional molded radome is not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Towers

Because we manufacture all the system components, Andrew has a unique understanding of how to design a tower to properly support transmission lines and hold antennas on path under the most severe conditions.

Equipment Shelters

Andrew concrete equipment shelters use a computer-aided design system to incorporate quickly and conveniently your custom requirements into our line of standard, pre-engineered shelters. Optional factory pre-equipped shelters minimize on-site installation time and construction costs.

To Complete Your Microwave Site

	Pages
Equipment	
Towers	616-647
Equipment Shelters	648-655
Antennas	48-151
HELIAX® Coaxial Cables	170-173
Pressurization Equipment	250-285
Services	
System Design Assistance	757
Program Management	758
Foundations	30
Delivery and Assembly	30
Installation	30
System Testing	30

Transmission Line System Components

Item No.	Description	3.4 to 4.2 GHz	4.4 to 5.0 GHz	5.6 to 6.425 GHz	6.425 to 7.125 GHz	7.125 to 7.750 GHz	7.125 to 8.5 GHz
	Waveguide Flanges, EIA	CPR229G	UG-148C/U	CPR137G	CPR137G	CPR137G	CPR112G
	IEC	PDR40	PDR48	PDR70	PDR70	PDR70	PDR84
4	Flex-Twist Section, 2 ft (600 mm)	WFTP229-24	WFT187-24	WFTP137-24	WFTP137-24	WFTP137-24	WFTP112-24
	Waveguide Flanges, EIA or MIL	F229PC024PCA	F187PA0240BA	F137PC0240CA	F137PC0240CA	F137PC0240CA	F112PC0240CB
	IEC	F229MH0600HA	F187MH0600HA	F137MH0600HS	F137MH0600HS	F137MH0600HS	F112MH0600HA
5	Elliptical Waveguide	EWP37	EWP43	EWP52	EWP63	EWP64	EWP77
6	Connector, Top	137DET	143DCT	252DET	163DET	164DET	177DET
6	Connector, Bottom	137DET	143DCT	252DET	163DET	164DET	177DET
7	Grounding Kit (3-points)	204989-5	204989-10	204989-4	204989-4	204989-3	204989-3
8	Hanger Kit of 10	42396A-4	42396A-16	42396A-8	42396A-7	42396A-1	42396A-11
9	Waveguide Boot	48939-37	48939-44	48939-52	48939-63	48939-64	48939-77
9	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)
10	90° Elbow–EIA**						
	E Bend	E229PC080C080SN	E187PC070C070AN	E137PC040C040SN	E137PC040C040BN	E137PC040C040CN	E112PC040C040CN
	H Bend	H229PC080C080SN	H187PC070C070AN	H137PC040C040SN	H137PC040C040BN	H137PC040C040CN	H112PC040C040CN
11	Pressure Window, EIA	55001-229	55000-187	55001-137	55001-137	55001-137	55001-1
	IEC	223306-40	223306-48	223306-70	223306-70	223306-70	223306-84
12	Hoisting Grip	31535	31535	24312A	24312A	29961	19256B
	Typical Antenna System Peak VSWR (R.L., dB)	1.10 (26.4)	1.09 (27.3)	1.08 (28.3)	1.08 (28.3)	1.08 (28.3)	1.08 (28.3)
	Based on Antenna VSWR (R.L., dB)	1.06 (30.7)	1.05 (32.3)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)	1.06 (30.7)
	and Frequency Range, GHz	3.7-4.2	4.4-5.0	5.925-6.425	6.425-7.125	7.125-7.750	7.725-8.500

*Specify number of openings.

System Planning Worksheet

Duplicate this sheet or ask for Andrew Bulletin 8731. For horn antennas, ask for Bulletin 8733.

Antennas: Shielded and Standard Parabolic
Transmission Lines: HELIAX® Elliptical Waveguide

Antenna System Components

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
	Antenna Equipment					
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
	Transmission Lines and Accessories					
4	Flex Section (optional)					
5	HELIAX Elliptical Waveguide					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Waveguide Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Adaptor					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
	Flex Section (optional)					
10	90° Elbow					
	Other					
11	Pressure Window					

*G=Gray, O=Orange, W=White

(Continued)

Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
	Hoisting Grip				
	Bending Tool Kit				
	Other				
	Pressurization Equipment				
12	Dehydrator				
	Total Antenna System Estimate FOB Factory				

Customer Name _____

Contact _____

Project _____

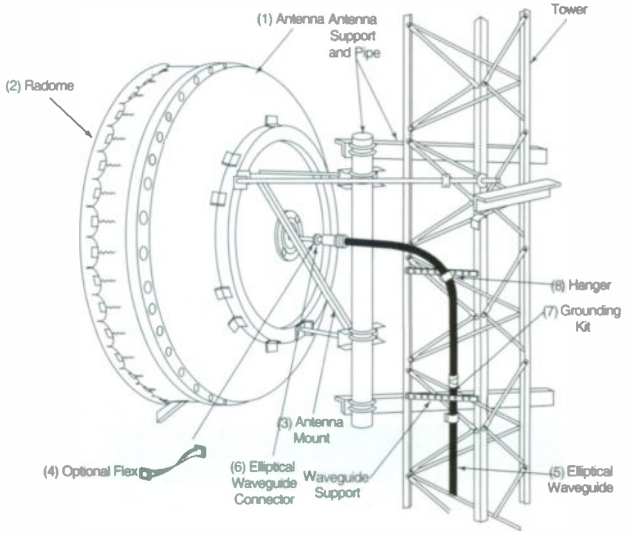
Quotation No. _____

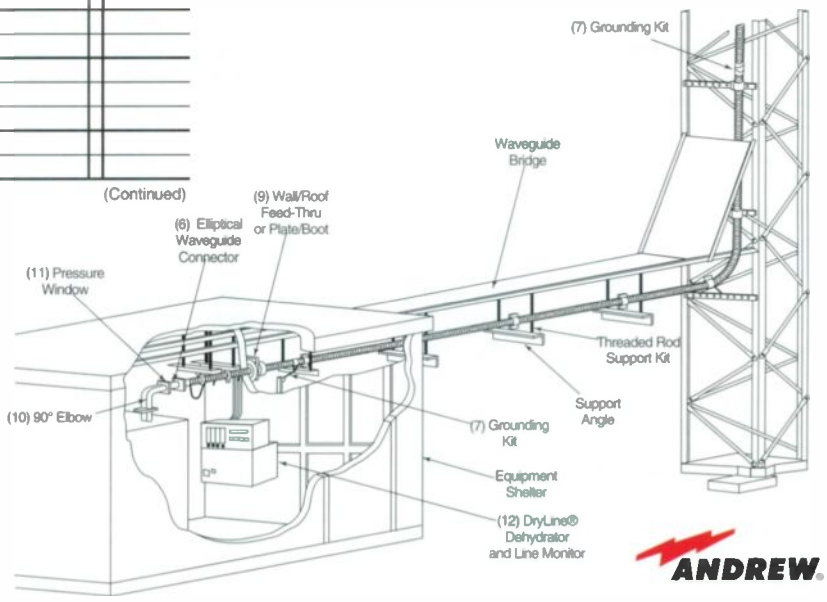
Telephone No. _____

Customer Ref. No. _____

Site Name _____

Points to Site(s) _____





Prepared By: _____

Date: _____

Telephone No.: _____

System Using HELIAX® Elliptical Waveguide, 10.5 GHz and Above

Andrew offers complete site construction, including towers, equipment shelters, antennas, transmission lines, pressurization equipment, civil work and all the services necessary to provide you with a turnkey microwave system.

- *Have a single point of responsibility . . . Andrew.*
- *Accelerate your installation time.*
- *Prevent scheduling conflicts.*
- *Minimize installation costs.*
- *Decrease operating costs over the life of the system.*

Microwave Antenna Systems

The wide range of available antenna performance levels offered as standard products promotes cost efficient system design. Long continuous lengths, good flexibility and availability of a broad range of accessories simplify system planning, minimize installation cost and make HELIAX® elliptical waveguide the most popular waveguide in the microwave industry.

Low-VSWR antennas and low-VSWR waveguide components are recommended for long-haul or high channel density CCIR systems.

Typical Systems. The antenna system peak VSWR listed is measured at the pressure window. Contributions due to a 150 ft (45 m) elliptical waveguide run and all waveguide components, except for optional flex section and elbow, are included. A planar radome, where applicable, is included; an optional molded radome is not included.

The components listed in the tables are examples, not complete product listings. See the referenced pages for complete descriptions, specifications, ordering information, and alternate components.

Towers

Because we manufacture all the system components, Andrew has a unique understanding of how to design a tower to properly support transmission lines and hold antennas on path under the most severe conditions.

Equipment Shelters

Andrew concrete equipment shelters use a computer-aided design system to incorporate quickly and conveniently your custom requirements into our line of standard, pre-engineered shelters. Optional factory pre-equipped shelters minimize on-site installation time and construction costs.

To Complete Your Microwave Site

Transmission Line System Components

Item No.	Description	10.5 to 11.7 GHz	12.2 to 13.25 GHz	14.4 to 15.35 GHz	17.7 to 19.7 GHz	21.2 to 23.6 GHz	24.0 to 26.5 GHz
	Waveguide Flanges, EIA	CPR90G	WR75 choke/cover	UG-541/U†††	UG-546A/U†††	UG-546A/U†††	–
	IEC	PDR100	PDR120	PBR140	PBR220	PBR220	PBR220
4	Flex-Twist Section, 2 ft (600 mm)	WFTP90-24	WFT75-24	WFT62W-24	WFT42N-24	WFT42W-24	–
	Waveguide Flanges, EIA or MIL	F090PC024PCB	F075PA0240BS	F075PA0240BS	F042PA0240BS	F042PA0240BS	–
	IEC	F090MH0600HA	F075MH0600HA	FO75MH0600HS	F042MK0600KS	F042MK0600KS	F042MK0600KS
5	Elliptical Waveguide	EWP90	EWP127A	EWP132	EWP180	EW220	EW240
6	Connector, Top	190DET	1127DCT	1132DCT	1180DCT	1220ASC	1240SCM
6	Connector, Bottom	190DET	1127DCT	1132DCT	1180DCT	1220ASC	1240SCM
7	Grounding Kit (3-points)	204989-2	204989-2	204989-2	204989-1	204989-1	223158
8	Hanger Kit of 10	42396A-5	42396A-9	42396A-9	43211	43211	242940
9	Waveguide Boot	48939-90	48939-127	48939-132	48939-180	48939-220	48939-240
9	Feed-Thru Plate	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)	48940-(*)
10	90° Bend, E Plane	E090PC030C030SN	E075PY030Y030SN	E075PY030Y030SN	E042PA030B030SN	E042PA030B030SN	–
	H Plane	H090PC030C030SN	H075PY030Y030SN	H075PY030Y030SN	H042PA030B030SN	H042PA030B030SN	–
11	Pressure Window, EIA	55001-90	55000A-75	55000A-75	55000A-42	55000A-42	–
	IEC	223306-100	110088	110089	112588	112588	112588
	Hoisting Grip	29958	29958	29958	43094	43094	43094
	Typical Antenna System Peak VSWR (R.L., dB)	1.07 (29.4)	1.11 (25.7)	1.10 (26.4)	1.11 (25.7)	1.11 (25.7)	1.11 (25.7)
	Based on Antenna VSWR (R.L., dB)	1.06 (30.7)	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
	and Frequency Range,GHz	10.7-11.7	12.7-13.25	14.4-15.35	17.7-19.7	21.2-23.6	24.0-26.5

*Specify number of openings. ††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

System Planning Worksheet

Duplicate this sheet or ask for Andrew Bulletin 8731.

Antennas: Shielded and Standard Parabolic
Transmission Lines: HELIAX® Elliptical Waveguide

Antenna System Components

Item No.	Description	Color* (G,O,W)	Type No.	Quantity	Unit Price	Extended Price
Antenna Equipment						
1	Antenna					
	Optional Strut					
	Termination Load					
2	Radome					
3	Mount					
Transmission Lines and Accessories						
4	Flex Section (optional)					
5	HELIAX Elliptical Waveguide					
6	Connector, Top					
	Bottom					
7	Grounding Kit					
8	Waveguide Hanger Kit					
	Hardware Kit					
	Angle Adaptor Kit					
	Adaptor					
	Threaded Rod Support Kit					
9	Wall-Roof Feed Thru or Plate/Boot					
	Flex Section (optional)					
10	90° Elbow					
	Other					
11	Pressure Window					

*G=Gray, O=Orange, W=White

(Continued)

Item No.	Description	Type No.	Quantity	Unit Price	Extended Price
	Hoisting Grip				
	Bending Tool Kit				
	Other				
Pressurization Equipment					
12	Dehydrator				
Total Antenna System Estimate FOB Factory					

Customer Name _____

Contact _____

Project _____

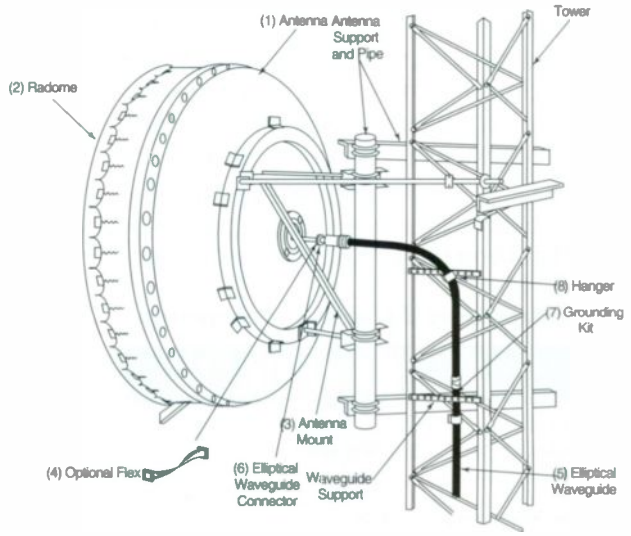
Quotation No. _____

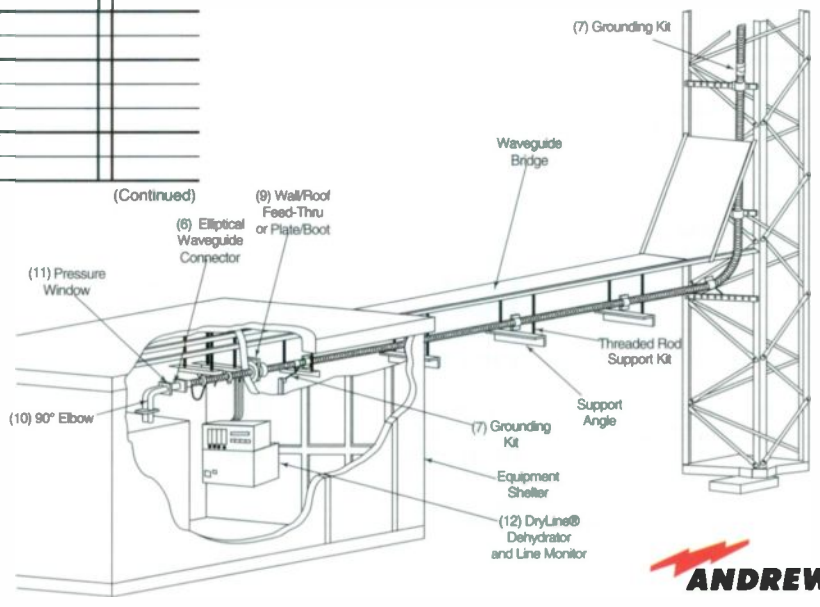
Telephone No. _____

Customer Ref. No. _____

Site Name _____

Points to Site(s) _____





Prepared By: _____

Date: _____

Telephone No.: _____

System Using Circular and Elliptical Waveguide

Andrew offers complete site construction, including towers, equipment shelters, antennas, transmission lines, pressurization equipment, civil work and all the services necessary to provide you with a turnkey microwave system.

- *Have a single point of responsibility . . . Andrew.*
- *Accelerate your installation time.*
- *Prevent scheduling conflicts.*
- *Minimize installation costs.*
- *Decrease operating costs over the life of the system.*

Microwave Antenna Systems

The wide range of available antenna performance levels offered as standard products promotes cost efficient system design. Circular waveguide offers lowest attenuation, dual polarization and multi-band capability. It is frequently the choice for long vertical feeder runs.

Typical Systems. The typical antenna system peak VSWR is measured at the pressure window (item 17). The circular waveguide run is 300 feet (91 m) and the elliptical run is 25 feet (8 m). A 1.06 VSWR (except -127 Series 1.10) antenna with planar radome and all waveguide components shown, except the optional elbow, are included.

The typical microwave antenna systems described below are examples only, not complete product listings. See referenced pages for further information.

System Planning Worksheet. Ask for Andrew Bulletin 8740.

Towers

Because we manufacture all the system components, Andrew has a unique understanding of how to design a tower to properly support transmission lines and hold antennas on path under the most severe conditions.

Equipment Shelters

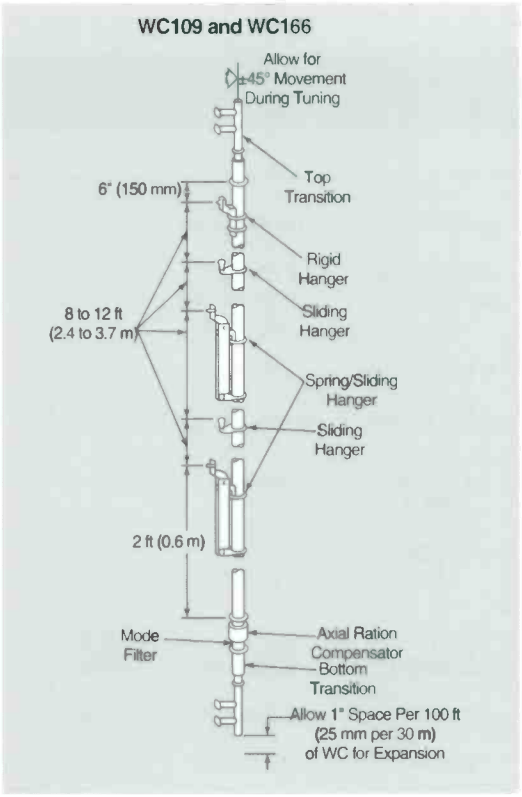
Andrew concrete equipment shelters use a computer-aided design system to incorporate quickly and conveniently your custom requirements into our line of standard, pre-engineered shelters. Optional factory pre-equipped shelters minimize on-site installation time and construction costs.

To Complete Your Microwave Site

Transmission Line Components

Item No.	Description	5.6 to 6.425 GHz	6.425 to 7.125 GHz	7.125 to 8.5 GHz	10.5 to 11.7 GHz	12.2 to 13.25 GHz	17.7 to 19.7 GHz
	Circular Waveguide	WC166	WC166	WC166	WC109	WC109	WC109
1	**Flextwist Section, 2 ft (600 mm), EIA type flanges**	F137PC0240CA	F137PC0240CA	F112PC0240CB	F090PC0240YS	F075PY0240YS	F042PA0240BS
2	**Dual-Pol. Transition w/o mode filter**	62866A-1	64147A-1	64703A-1	64100A-107	68998	160516-177
3	**Circular Waveguide Straight Section**	49608-240	49608-240	49608-240	54346-240	54346-240	54346-240
4	**Rigid Hanger**	69932	69932	69932	19007A-109	19007A-109	19007A-109
5	**Sliding Hanger**	69933	69933	69933	19008A-109	19008A-109	19008A-109
6	**Spring/Sliding Hanger**	69934	69934	69934	19009A-109	19009A-109	19009A-109
7	**Axial Ratio Compensator**	57568	57568	57568	54348	54348	54348
8	**Dual-Pol. Transition with mode filter**	65236-1	65238-1	65316-1	65241-107	68999	160515-177
9	**EW Connector**	252DET	163DET	177DET	190DET	1127DCT	1180DCT
10	**Elliptical Waveguide**	EWP52	EWP63	EWP77	EWP90	EWP127A	EWP180
11	**EW Sliding Support**	200970	200970	200970	200970	200970	200970
12	**EW Hanger**	42396A-8	42396A-7	42396A-11	42396A-5	42396A-9	43211
13	**Grounding Kit**	204989-4	204989-4	204989-3	204989-2	204989-2	204989-1
14	**Waveguide Boot**	48939-52	48939-63	48939-77	48939-90	48939-122	48939-180
15	**Feed-Thru Plate**	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)	48940-(**)
16	**EW Connector**	252DET	163DET	177DET	190DET 1	1127DCT	1180DCT
17	**Pressure Window–EIA**	55001-137	55001-137	55001-112	55001-90	55000A-75	55000A-42
18	**90° Bend–EIA***, E Plane**	E137PC0240C040SN	E137PC040C040BN	E112PC040C040CN	E09030C030SN	E075PY030Y030SN	E042PA030B030SN
	H Plane	H137PC0240C040SN	H137PC040C040BN	H112PC040C040CN	H09030C030SN	H075PY030Y030SN	H042PA030B030SN
	Typical Antenna System Peak VSWR (R.L., dB)	1.12 (24.9)	1.12 (24.9)	1.13 (24.3)	1.11 (25.6)	1.13 (24.3)	1.15 (23.2)

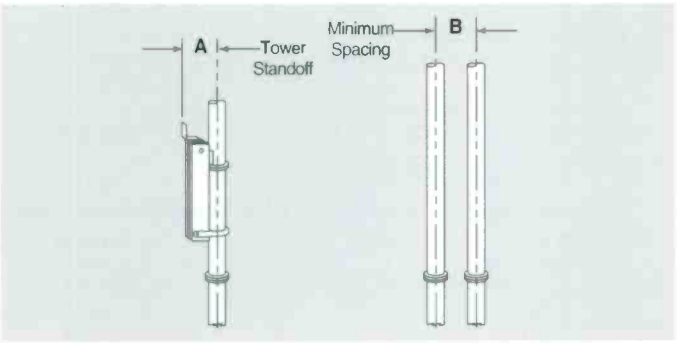
Specify number of openings. * See page 224 for IEC and miter bend information

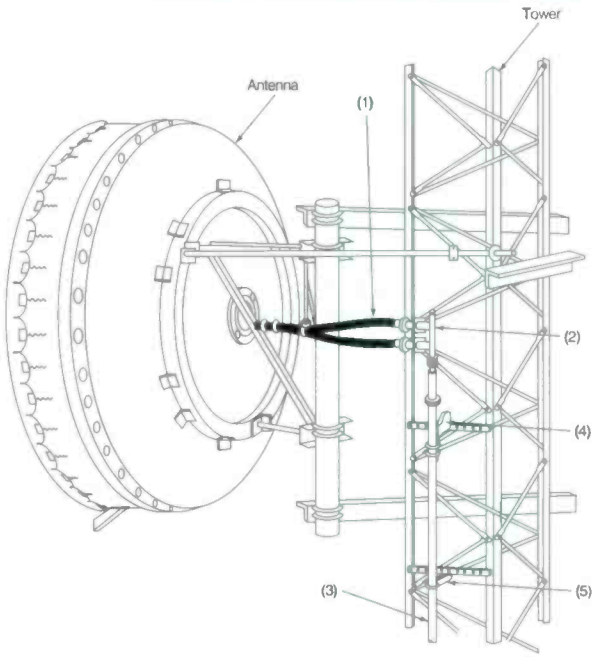


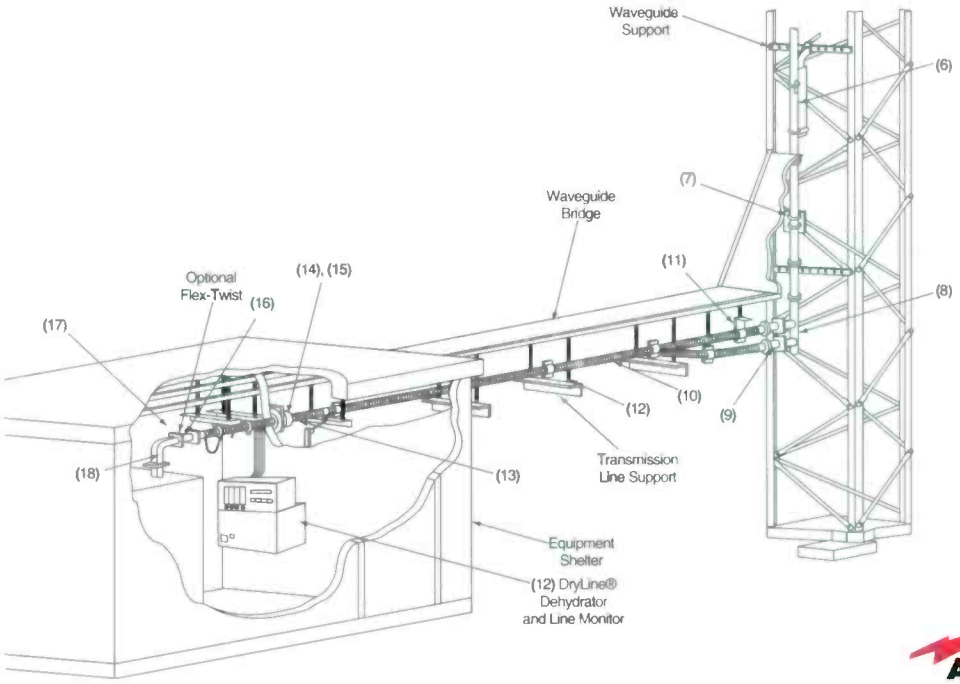
- Position hangers as illustrated above
- Attach top rigid hanger to member capable of supporting entire run
- Maximum deviation from true straight should be 1.5 in per 20 ft (38 mm per 6 m)
- Position elliptical waveguide sliding support 18-24 in (455-610 mm) from bottom transition
- Top transition must be positioned at 90° multiple of bottom transition and allow ±45° rotation during tuning
- Position first elliptical waveguide hanger 18-24 in (455-610 mm) from elliptical waveguide sliding support

Tower Standoff and Minimum Spacing

Waveguide Type	A Tower Standoff in (mm)	B Minimum Spacing in (mm)
WC109	2.9 (73)	4.9 (124)
WC166	3.1 (78)	5.8 (147)



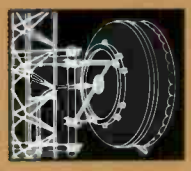




Transmission Line Components

Item No.	Description	1/2"	7/8"	1-1/4"***	1-5/8"	2-1/4"
	Unpressurized Feeder System					
1	**HELIAX® Foam-Dielectric Cable**					
	824-894 MHz, 1.2 VSWR	**LDF4P-50A-1***	–	**LDF6P-50-1A**	**LDF7P-50A-1A**	–
	824-960 MHz, 1.1 VSWR	**LDF4P-50A-1***	**LDF5P-50A-9A**			–
	880-960 MHz, 1.2 VSWR	**LDF4P-50A-1***	–	**LDF6P-50-3A**	**LDF7P-50A-2A**	–
	880-960 MHz, 1.1 VSWR	**LDF4P-50A-2†**	**LDF5P-50A-9A**	**LDF7P-50-2A**	**LDF7P-50A-1A**	–
	(Similar to)	(LDF4-50A)	(LDF5-50A)	(LDF6-50)	(LDF7-50A)	–
	Attenuation at 890 MHz dB/100 ft (dB/100 m)	2.20 (7.22)	1.23 (4.03)	0.907 (2.98)	0.767 (2.52)	–
	Attenuation at 960 MHz dB/100 ft (dB/100 m)	2.29 (7.51)	1.28 (4.20)	0.945 (3.10)	0.800 (2.62)	–
2	**Connectors with Silver Plated Body and Gold Plated Inner Contacts**					
	N Male	**L4PNM**	**L5PNM**	**L6PNM**	**L7PNM**	–
	N Female	**L4PNF**	**L5PNF**	**L6PNF**	**L7PNF**	–
	7-16 DIN Male***	**L4PDM-C**	**L5PDM**	**L6PDM**	**L7PDM**	–
	7-16 DIN Female***	**L4PDF**	**L5PDF**	**L6PDF**	**L7PDF**	–
	7/8" EIA (unplated)	**L44R**	**L45R**	**L46R**	**L47R**	–
3	**Optional Jumper Cables Selected 1/2" LDF foam and superflexible versions offered**					
4	**Grounding Kits**					
	a) 2 ft ground wire, factory attached crimp lug	**204989-1**	**204989-2**	**204989-3**	**204989-4**	–
	b) 3 ft ground wire, field attachable crimp lug (requires crimping tool 207270)	**204989-21**	**204989-22**	**204989-23**	**204989-24**	–
	c) 3 ft ground wire, field attachable mechanical lug	**204989-31**	**204989-32**	**204989-33**	**204989-34**	–
5	**Hangers, kits of 10**					
	Standard	**43211**	**42396A-5**	**42396A-1**	**42396A-2**	–
	Snap-In	**206706-1**	**206706-2**	**206706-3**	**206706-4**	–
6	**Transmission Line Support**	Support angle and threaded rod kit				
7	**Wall/Roof Feed Thru**	Single and multiple entrance boots/plates versions offered				
	Hoisting Grip	**43094**	**19256B**	**29961**	**24312A**	–
	Reference Pages	464-464	465-468	469-473	474-478	–
	Pressurized Feeder System					
1	**HELIAX® Air-Dielectric Cable**					
	824-894 MHz, 1.2 VSWR	**HJ4P-50-5††**	**25831-3**	–	**25816A-31**	**207760**
	880-960 MHz, 1.2 VSWR	**HJ4P-50-5††**	**25831-6**	–	**25816A-32**	**207760-2**
	880-960 MHz, 1.1 VSWR	–	**25831-7**	–	**25816A-33**	**207760-3**
	(Similar to)	(HJ4-50)	(HJ5-50)	–	(HJ7-50A)	(HJ12-50)
	Attenuation at 890 MHz, dB/100 ft (dB/100 m)	2.5 (8.22)	1.19 (3.92)	–	0.66 (2.16)	0.55 (1.81)
	Attenuation at 960 MHz, dB/100 ft (dB/100 m)	2.6 (8.52)	1.24 (4.07)	–	0.68 (2.25)	0.57 (1.89)
2	**Connectors with silver plated body and gold plated inner contacts**					
	N Male	**H4PNM**	**H5PNM**	–	–	–
	N Female	**H4PNF**	**H5PNF**	–	**H7PNF**	**H12PNF**
	7/8" EIA (unplated)	**74ARG**	**75AR**	–	**87S**	**82S**
	7-16 DIN Male***	**H4PDM**	**H5PDM**	–	**H7PDM**	**H12PDM**
	7-16 DIN Female***	–	**H5PDF**	–	–	–
3	**Optional Jumper CablesSelected 1/2" LDF foam and superflexible versions offered**					
4	**Grounding Kits**					
	a) 2 ft ground wire, factory attached crimp lug	**204989-1**	**204989-2**	–	**204989-4**	**204989-5**
	b) 3 ft ground wire, field attachable crimp lug (requires crimping tool 207270)	**204989-21**	**204989-22**	–	**204989-24**	**204989-25**
	c) 3 ft ground wire, field attachable mechanical lug	**204989-31**	**204989-32**	–	**204989-34**	**204989-35**
5	**Hangers, kits of 10**					
	Standard	**43211**	**42396A-5**	–	**42396A-2**	**42396A-4**
	Snap-In	**206706-1**	**206706-2**	–	**206706-4**	–
6	**Transmission Line Support**	Support angle and threaded rod kit				
7	**Wall/Roof Feed Thru**	Single and multiple entrance boots/plates versions offered				
	Hoisting Grip	**43094**	**19256B**	–	**24312A**	**31535**
	Reference Pages	490-492	511-513	–	517-519	520-522

* Tested full band of 824-960 MHz, Max vs VSWR 1.12. **1-1/4" foam cable can provide a pressure path to the antenna. † 870-960 MHz. †† 824-960 MHz.
*** Silver plated body and inner contact.

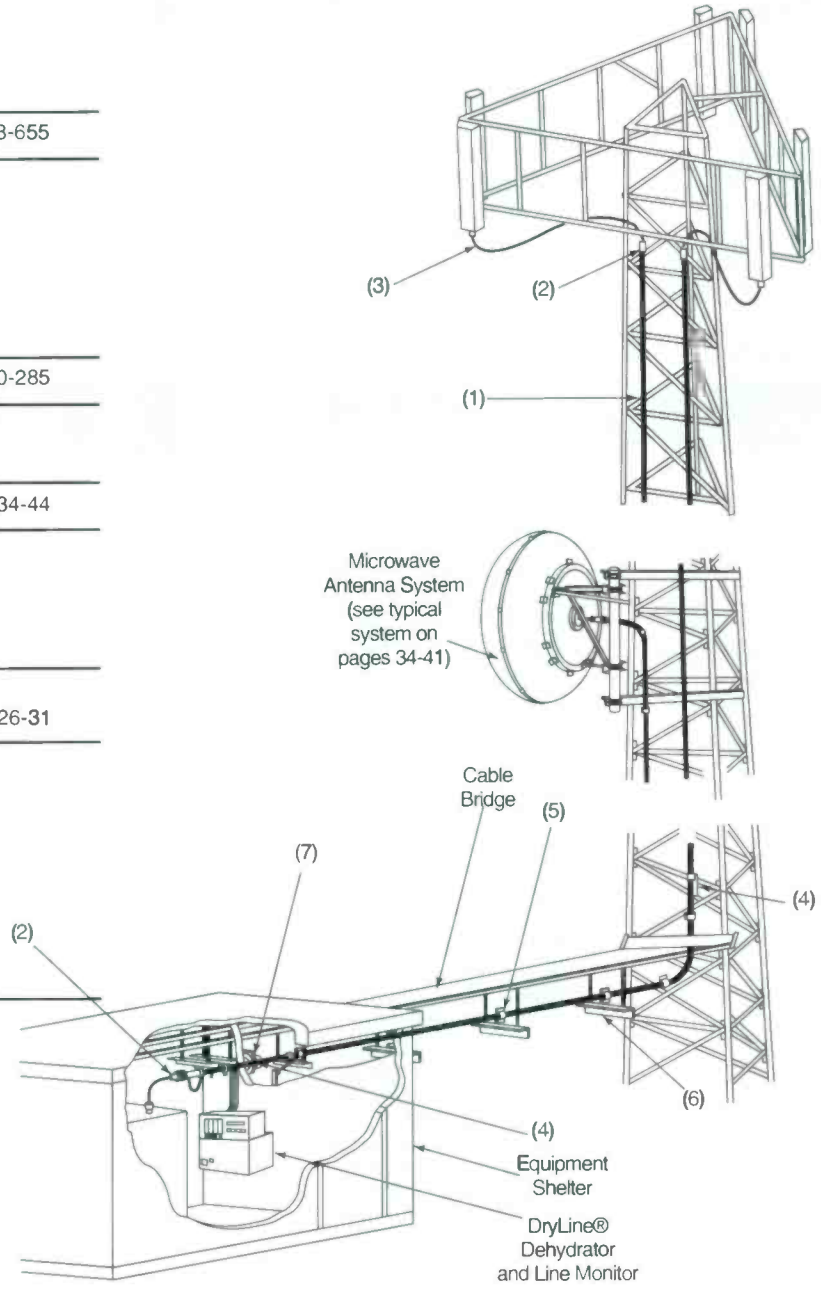


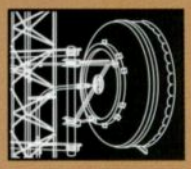
System Equipment

Description	See Pages
Tower	616-647
Guyed	
Self-Supporting	
Cellular Antenna Platform	
Tower Accessories	
Light Kit	
Cable Support	
Cable Bridge	
Climbing Devices	
Epoxy Paint	
Grounding Systems	
Other tower options and accessories	
Equipment Shelters	648-655
Concrete	
Structural Options	
Door Options	
Basic Electrical System	
Optional Electrical Equipment	
Environmental Control Equipment	
Pressurization Equipment	250-285
Dehydrator, automatic	
Pressurization equipment and accessories	
Microwave Antenna System	34-44
Antennas	
Waveguides	
Coaxial Cables	
System Planning	
Engineering, Program Management and Field Services	26-31
System Design Assistance	
Program Management	
Foundation/Civil	
Freight	
Delivery and Assembly	
Installation	
Path Alignment	
System Testing	

Wireless System Planning

The typical wireless system shown in the illustration may be used as a guide in planning your system. Recommended transmission line components are tabulated on page 46. Other system equipment is located in other sections of this Catalog. Refer to the table.





Microwave and Wireless System Planning

HELIAX® coaxial cables are ideal for use in wireless systems. The cables on this page are specially tested and selected for use in the 824-894 and 880-960 MHz bands to meet maximum VSWR values listed in the table. Use of these cables assure optimum performance for wireless applications. Connectors, accessories, and all electrical and mechanical specifications for the similar standard cables apply. Reference pages are listed in the table.

HELIAX® Coaxial Cables for Wireless Systems

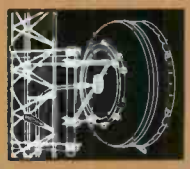
Cable Type	Foam Dielectric Cables				Air Dielectric Cables			
Nominal Size	1/2"	7/8"	1-1/4"	1-5/8"	1/2"	7/8"	1-5/8"	2-1/4"
Order Type Number,								
824-894 MHz, 1.2 VSWR	LDF4P-50A-1*	LDF5P-50A-9A	205360-1	42151A-18	HJ4P-50-5*	25831-3	25816A-31	207760
880-960 MHz, 1.2 VSWR	LDF4P-50A-1*	LDF5P-50A-9A	205360-10	42151A-19	HJ4P-50-5*	25831-6	25816A-32	207760-2
880-960 MHz, 1.1 VSWR	LDF4P-50A-2†	LDF5P-50A-9A	205360-11	42151A-20	–	25831-7	25816A-33	207760-3
Similar to Standard Cable	LDF4-50A	LDF5-50A	LDF6-50	LDF7-50A	HJ4-50	HJ5-50	HJ7-50A	HJ12-50
Attenuation dB/ft 100 ft (100 m)								
894 MHz	2.20 (7.22)	1.23 (4.03)	0.907 (2.98)	0.767 (2.52)	2.50 (8.22)	1.19 (3.92)	0.658 (2.16)	0.553 (1.81)
960 MHz	2.29 (7.51)	1.28 (4.20)	0.945 (3.10)	0.800 (2.62)	2.60 (8.52)	1.24 (4.07)	0.684 (2.25)	0.576 (1.89)
Reference Pages	461-464	465-468	469-473	474-478	490-492	511-513	517-519	520-522

*824-960 MHz † 870-960 MHz

HELIAX Jumper Cables for Wireless Systems

Cable Type	Connectors	Length ft (m)	Insertion Loss 890 MHz, dB	Type No.
For Antenna Connection - 824 - 894 MHz				
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	3 (0.91)	0.2	L4P1-NMNM-3
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	6 (1.82)	0.3	L4P1-NMNM-6
1/2" LDF Foam	N Plug (Male)/N Plug (Male)	10 (3.04)	0.4	L4P1-NMNM-10
1/2" Superflexible	N Plug (Male)/N Plug (Male)	3 (0.91)	0.2	F4P4-NMNM-3
1/2" Superflexible	N Plug (Male)/N Plug (Male)	6 (1.82)	0.3	F4P4-NMNM-6
1/2" Superflexible	N Plug (Male)/N Plug (Male)	10 (3.04)	0.5	F4P4-NMNM-10
For Equipment Room Connection - 824 - 894 MHz				
1/2" Superflexible	N Plug (Male)/N Plug (Male)	15 (4.57)	0.7	F4P4-NMNM-15
1/2" Superflexible	N Plug (Male)/N Plug (Male)	20 (6.09)	0.8	F4P4-NMNM-20
1/2" Superflexible	N Plug (Male)/N Plug (Male)	25 (7.62)	1.0	F4P4-NMNM-25
1/2" Superflexible	N Plug (Male)/N Plug (Male)	30 (9.14)	1.2	F4P4-NMNM-30
1/2" Superflexible	N Plug (Male)/Right Angle N Plug (Male)	10 (3.04)	0.5	F4P4-NMNR-10
1/2" Superflexible	N Plug (Male)/Right Angle N Plug (Male)	15 (4.57)	0.7	F4P4-NMNR-15
1/2" Superflexible	N Plug (Male)/Right Angle N Plug (Male)	20 (6.09)	0.8	F4P4-NMNR-20
1/2" Superflexible	N Plug (Male)/Right Angle N Plug (Male)	25 (7.62)	1.0	F4P4-NMNR-25
1/2" Superflexible	N Plug (Male)/Right Angle N Plug (Male)	30 (9.14)	1.2	F4P4-NMNR-30
Variable Lengths - 824-960 MHz†				
1/2" LDF Foam	N Plug (male)*/N Plug (male)*	–	–	L4P1-PNMNM-(**)
1/2" LDF Foam	N Plug (male)*/Right Angle N Plug (male)*	–	–	L4P1-PNMNR-(**)
1/2" LDF Foam	7-16 DIN Plug/7-16 DIN Plug	–	–	L4P1-PDMDM-(**)
1/2" LDF Foam	7/8" EIA/7/8" EIA	–	–	LDF4PX-RR-1
1/2" Superflexible	N Plug (male)*/N Plug (male)*	–	–	F4P4-PNMNM-(**)
1/2" Superflexible	N Plug (male)*/Right Angle N Plug (male)*	–	–	F4P4-PDMDM-(**)
1/2" Superflexible	7-16 DIN Plug/7-16 DIN Plug	–	–	F4P4-7M7M-(**)

*Connector includes silver-plated body and gold-plated inner contact. **Specify length up to 50 feet (15 m) in feet. †Max. VSWR 1.20.



System Planning Software

The Andrew Antenna System Planner (AASP) and the Microwave Antenna System Planner (MASP) are Windows® based programs that allow the user to design cellular, PCS, and microwave systems quickly and accurately. A system engineered with the AASP may include Andrew antennas, HELIAX® coaxial cables and jumper assemblies, installation accessories, and global positioning system (GPS) kits. A system engineered with the MASP may include Andrew antennas, HELIAX® waveguide assemblies, installation accessories, and pressurization equipment. Additionally, the system planners provide access to a miscellaneous component database to help users customize their list of materials for specific site requirements. The programs use a graphical interface to guide the user through the system design process. Upon completion, the programs generate a complete bill of materials.

The System Planning Software performs the following functions:

- *Speeds system designs by automatically checking component compatibility and connectivity.*
- *Gives the system designer the power to model different system configurations quickly and easily.*
- *Creates templates for future use.*
- *Generates a complete bill of materials needed for the specific design.*
- *Allows the system designer to add items to the bill of materials.*
- *Prepares output in formats exportable to many other common applications.*

Recommended System Requirements:

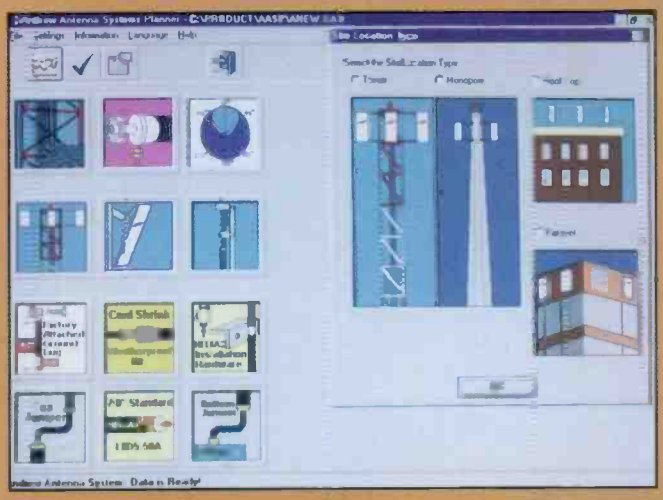
- *Personal computer using a 386 processor or higher*
- *6MB RAM or more*
- *Windows® 3.1 running in enhanced mode or Windows® 95*
- *VGA graphics adapter and monitor*
- *Mouse or other pointing device*

For more information on how the Andrew team can put our System Planning Software to work for you, call:

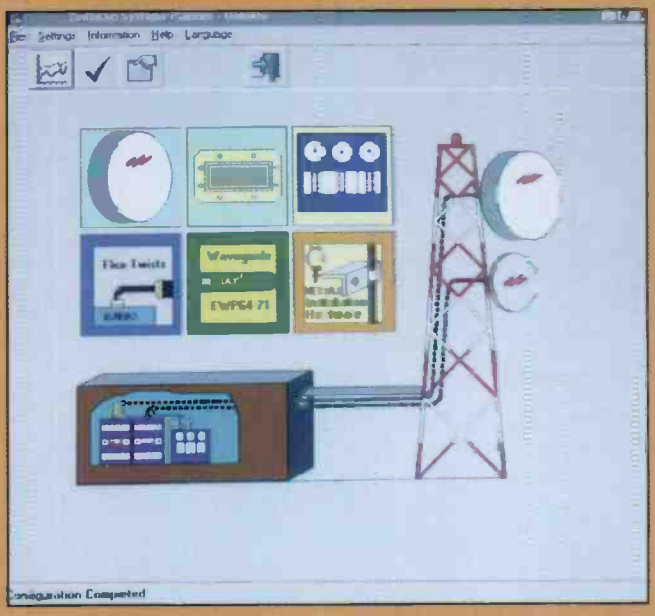
From North America: **1-800-255-1479**
fax: 1-800-349-5444

From any location: **1-708-349-3300**
fax: 1-708-349-5444

Windows is a registered trademark of Microsoft Corporation.



AASP



MASP

Microwave Antennas

INDEX

Described in this Section (pages 48-151)

Terrestrial Microwave Antennas

Certified ISO 9001 Facilities

All Andrew terrestrial microwave antenna products and associated accessories are designed, developed and produced under a quality system in accordance with ISO 9001.

With ISO 9001 certified facilities strategically located in Australia, Scotland and the U.S.A., Andrew is uniquely positioned to supply all your regional and global requirements for total quality designed and manufactured antenna system products, and to provide ongoing support through our network of dedicated customer service groups at these locations.

Microwave Antennas

Terrestrial Microwave Antenna Nomenclature

Andrew uses an alphanumeric numbering system for identification and ordering of terrestrial microwave antennas. Andrew Type Numbers describe antenna type, size and operating frequency band. The system is known worldwide, and many governments, PTTs and OEMs use Andrew terminology such as "UHX type performance" to specify antennas within their equipment procurement documents.

Example:

UHP	10	F	-	19	A
1	2	3		4	5

1. **Antenna Type.** The prefix is one, two, three or four letters that describe the antenna type. "X" within the prefix indicates **dual-polarized operation**.

Prefix	Antenna Type or Description
KP, MKP	Knockdown GRIDPAK Parabolic; Mini Knockdown GRIDPAK Parabolic
P, PX	Standard Parabolic-Unshielded
PL, PXL	Standard Parabolic, Low VSWR-Unshielded
FP, FPX	Standard Focal Plane Parabolic-Unshielded
HP, HPX	High Performance Parabolic-Shielded
HSX	High Performance Super High Cross Polarization Discrimination-Parabolic
UHP, UHX	Ultra High Performance Parabolic
UMX	Ultra High Performance Multiband Parabolic
HDX, HDH, HDV	High Performance Dual Beam-Parabolic
KPR	Knockdown GRIDPAK Parabolic-Rural Telephony
PAR	Standard Parabolic-Category A
VP, VPX	ValuLine®-Standard Parabolic
VHP, VHPX	ValuLine® - High Performance

2. **Antenna Size.** The number indicates antenna diameter in feet.
3. **Pressurization.** Antennas having an "F" following the antenna size include a foam-dielectric feed and do not require pressurization. All other antennas have air-dielectric feeds and require pressurization. See pages 250-285 for pressurization equipment.
4. **Frequency Band.** The numbers following the first hyphen are an abbreviated designation for the operating frequency band.

Abbreviation	Frequency Band
19	1.9 - 2.3 GHz
59	5.925 - 6.425 GHz
107	10.70 - 11.70

5. **Revision Letter.** The last character identifies product revisions. A change in revision letter indicates a change in electrical or mechanical specifications which affect antenna performance or the interface with other system equipment.

In the example above, **UHP10F-19A** is:

1. Ultra High Performance, single polarized,
2. 10 feet in diameter,
3. Foam dielectric
4. 1.9 - 2.3 GHz band,
5. A Revision.

Antenna Types

Shielded Antennas

Shielded antennas include a low-VSWR feed, shielded reflector with RF absorber, a planar radome and a vertical pipe mount. Because of their construction, this series of antennas affords superior radiation characteristics, rugged construction and high environmental survivability in even the most difficult system locations. Many are also available with one or two-piece reflectors for efficient and less costly shipping.

Ultra Series

Ultra High Performance Antennas

UHX® and UHP® Series Antennas provide high gain, low VSWR and superior radiation pattern performance for easier frequency coordination. They minimize frequency congestion problems because of a highly efficient beam-forming feed and superior pattern performance. UHX Series feature dual polarization. UHP Series are a single polarized version.

Ultra Multiband Antennas

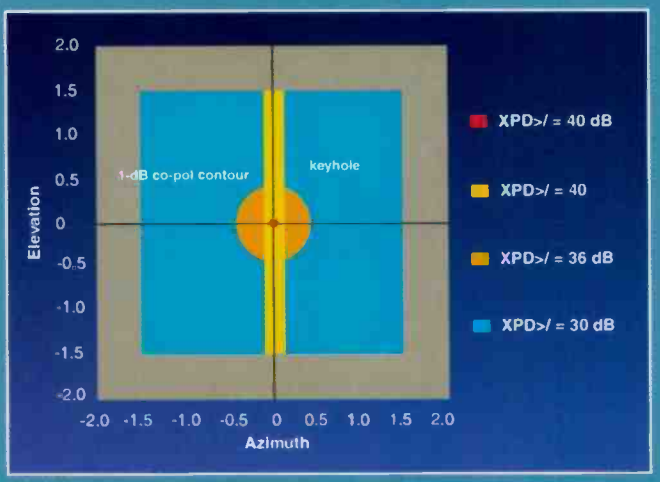
UMX® Series Antennas provide simultaneous dual-band, dual-polarized (4-port) operation in various frequency bands. These antennas can save considerable cost by reducing the installation expense and the amount of equipment required on systems with multiple frequency requirements. UMX antennas allow easy single to multiband transition without compromising high performance.

High Performance Series

High Performance Antennas

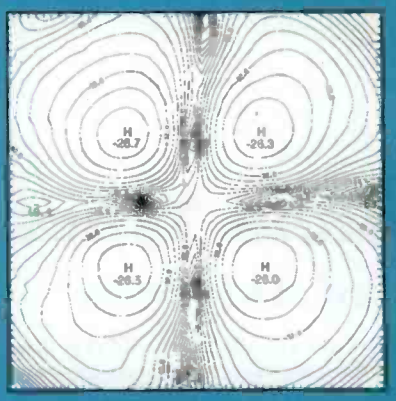
HP and HPX Series Antennas feature high performance at low lifetime cost. They are mechanically similar to the UHX ultra high performance antennas, except most models have feeds which do not include the beam-forming feature. HPX Series feature dual polarization; HP Series are a single polarized version.

Microwave Antennas

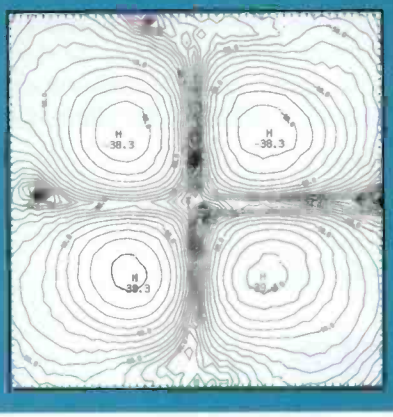


Keyhole specifications for XPD

Standard XPD performance



High XPD performance



NEW HSX Series Antennas - High XPD Microwave Antennas

HSX Series Antennas are high performance antennas which feature very high cross polarization discrimination (XPD) in both the azimuth and elevation planes. The guaranteed XPD for these antennas is 40 dB. These antennas are suitable for high capacity digital systems, utilizing transmission schemes such as Synchronous Digital Hierarchy (SDH).

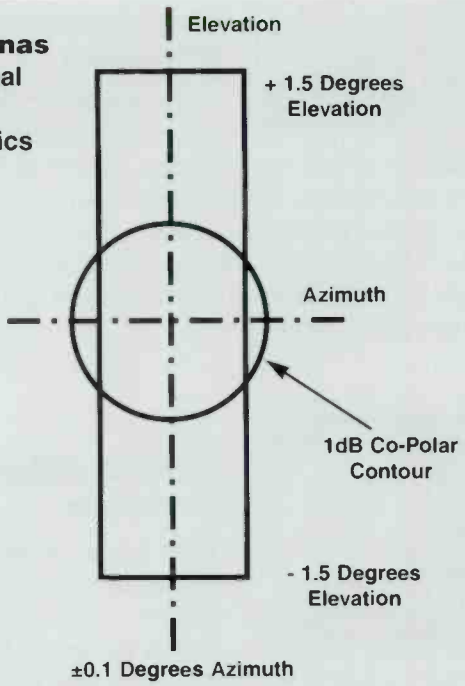
This performance is achieved through the use of an antenna feed horn with a unique ground plane design and strict quality control measures in the manufacturing of these feeds.

The cross polarization characteristics close to the boresight of the antenna are shown in the figure at right. These values apply for antennas up to the 11 GHz frequency band.

For antennas at frequency bands higher than 11 GHz, the XPD is greater than 36 dB within the circular -1 dB copolar contour and greater than 30 dB elsewhere.

The HSX Series antennas are available for frequency bands from 3.4 to 18 GHz.

HSX Antennas 2-Dimensional Cross-Polar Characteristics



- *40dB XPD at Antenna Boresight*
- *40dB* XPD Inside Rectangle (±0.1 degrees Azimuth, ±1.5 Degrees Elevation*
- *36dB XPD Inside the 1dB Co-Polar Contour*
- *30dB XPD Elsewhere*

* 36dB for 15ft Antennas

ValuLine® Antennas

A cost-effective solution for contemporary terrestrial microwave communications

Fast, easy installation

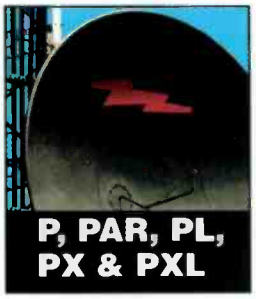
ValuLine antennas provide a cost-effective solution for contemporary terrestrial microwave communication systems operating in the 7 to 50GHz frequency bands. Available in standard unshielded (VP Series), high performance shielded (VHP Series), and dual polarized (VHPX Series) versions, ValuLine antennas range in diameter from 1 ft (0.3 m) to 6 ft (1.8 m).

Andrew developed ValuLine antennas to economically satisfy the performance needs of cellular, PCS/PCN, broadcast, and private user microwave applications while still delivering the superior electrical performance and overall quality traditionally expected of Andrew. ValuLine antennas meet the widely accepted EIA 195C and 222E standards for electrical, mechanical, and structural characteristics and are backed by a three year warranty.

Fast, easy installation is made possible by the simple pole mount which can be attached to pipes with diameters ranging from 1.9 in (48 mm) to 4.5 in (115 mm), depending on the antenna type. The antennas have a watertight pressurizable feed system or can be integrated directly to radio systems, providing solutions for many of the world's major radio manufacturers. Both antenna and radome are paintable to match local surroundings.

In order to reduce shipping costs to sites worldwide, ValuLine antennas are available from Andrew locations in Lochgelly, Scotland, Melbourne, Australia, Denton, Texas, and Sorocaba, Brazil. Standard Andrew design ensures product consistency and quality throughout the world.

Microwave Antennas



Standard Parabolic Antennas

P, PAR, PL, PX and PXL Series Standard Parabolic Antennas are unshielded parabolic antennas that provide economical and reliable service where high degrees of back and side radiation suppression are not necessary.

- *Low-VSWR versions minimize echo distortion for less noise on the system*
- *A vertical tower mount is included. Optional mounts and radomes can be ordered separately for versatility of installation*
- *Single and dual-polarized options available in most applicable frequencies*
- *Spun aluminum reflectors provide long term reliability and minimize environmental distortion to protect system investments*
- *Provide rugged, high-quality performance at low initial costs*
- *PAR Series - FCC Category A antennas for 6, 10, and 11 GHz bands*

Standard Focal Plane Antennas

FP and FPX Series Standard Focal Plane Antennas are ideal for use in higher capacity systems where improved F/B ratings are required.

- *Special deep reflectors and a unique beam-shaping feed or special edge geometry achieve efficient pattern performance. The antennas combine reasonable initial cost with very long-life performance, thus assuring long term economy.*
- *Single and dual-polarization options are available*
- *Includes a vertical tower mount for ease of tower interface*

Microwave Antennas

GRIDPAK® Antenna (KP Series)

GRIDPAK® Antenna (KPR Series)

Mini GRIDPAK Antenna (MKP Series)

Grid antennas provide lower windloading than solid antennas and are available for applications up to 2.7 GHz. GRIDPAK grid antennas are available in four different configurations for your unique applications and feature foam or air dielectric feeds.

GRIDPAK® Antennas

KP Series GRIDPAK Antennas are shipped completely disassembled.

- *patented grid rod retention design which ensures easy assembly and long life. U.S. Patent 5,291,212*
- *lower shipping costs due to knock-down design*
- *positive located feed ensures proper installation every time*
- *lighter weight than traditional welded grid antennas*
- *factory assembly available as an option*

NEW!

GRIDPAK® Antennas

KPR Series GRIDPAK Antennas are ideal for low capacity applications such as Rural Telephony

- *shipped completely disassembled*
- *feature an integral HELIAX jumper which is used as part of the antenna's feed system*

Mini GRIDPAK® Antennas

MKP Series mini-GRIDPAK Antennas are small, rectangular aperture antennas for low frequency applications (below 900 MHz)

GRIDPAK and Mini GRIDPAK antennas should be considered when low wind loads onto supporting structures are required and/or when low shipping cost is important.

Microwave Antennas

NEW!

KPR Series GRIDPAK® Antennas

The new line of GRIDPAK Antennas is suitable for low to medium capacity systems such as Rural Telephony Multi-access Radio Systems (MARS). These antennas feature the Andrew Corporation patented grid retention design and also incorporate a HELIAX® foam cable jumper assembly into the feed design. This feed assembly can be terminated with any connector that can be fit onto our LDF4-50A HELIAX coaxial cable. These antennas range in size from 3 ft (0.9 m) to 13 ft (4.0 m) in diameter and are available for three MARS frequency bands, 1.350-1.535 GHz, 1.427-1.535 GHz, and 2.3-2.5 GHz.

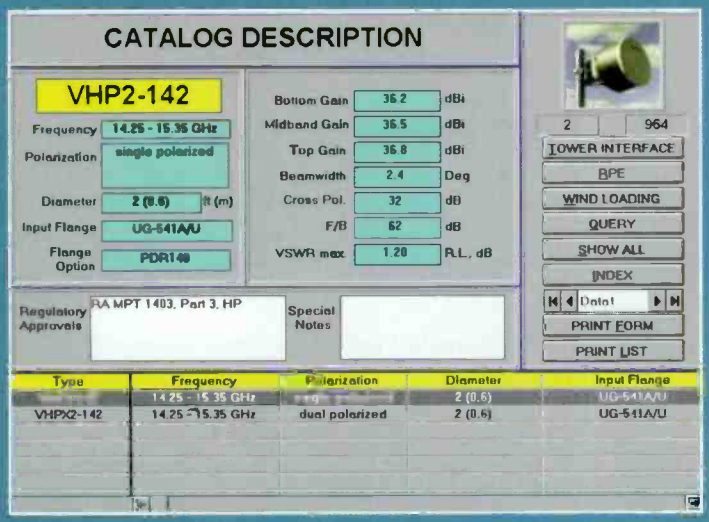
NEW!

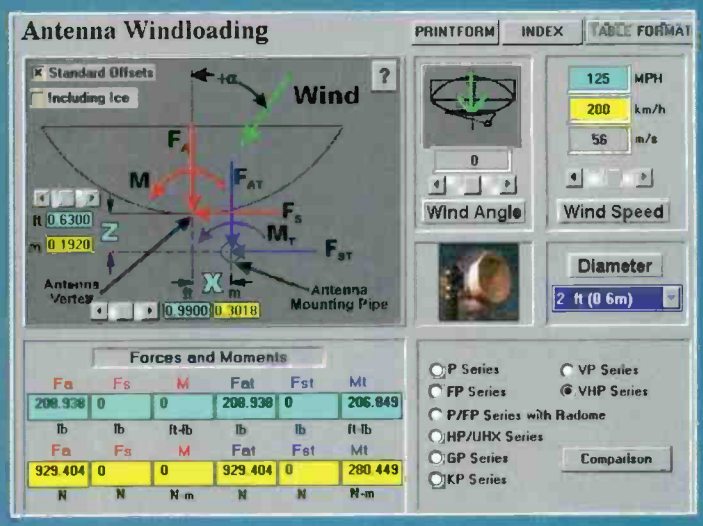
PAR Series Unshielded Antennas

This line of Antennas are unshielded designs that meet the FCC requirements for Category A under Parts 21, 94, and 101 (which will replace Parts 21 and 94) and thus provide an economic solution for microwave links requiring Category A compliance. These antennas feature a deeper reflector design than our standard P-Series antennas and exhibit a higher F/B ratio than the P-Series antennas, thus reducing the likelihood of adjacent hop interference. To reduce windloading, they can also be equipped with optional molded radomes.

These antennas meet the FCC requirements for the following frequency bands: 5.925-6.425 GHz, 6.425-7.125 GHz, 10.5-10.7 GHz, and 10.7-11.7 GHz.

Microwave Antennas





NEW!

ANTDES™ – Microwave Antenna Software

The new ANTDES Software is a database of all Andrew standard microwave antennas and contains information on nearly 1000 antennas. It contains all of the electrical and mechanical information for every microwave antenna. It also allows you to output wind-loading, mounting dimensions, and RPEs for any of these antennas. The system query function in the software also aids in selecting an antenna based on system requirements for gain, VSWR, F/B, and XPD for a given frequency.

NEW!

AntWind™ – Antenna Wind Loading Software

The new AntWind Software gives you the ability to tabulate the forces and moments for any given wind angle and design wind speed on any type and size of Andrew antenna. It also allows you to add loading for ice conditions.

Standard Antenna Construction

Point to Multipoint Wireless Communication Antennas

Reflectors

Antennas are supplied with either one-piece reflectors or with two-piece reflectors for on-site assembly. KP Series GRIDPAK® antennas are typically supplied completely disassembled or they can be shipped with factory assembled reflectors. Reflector options are dependent on antenna type, size and point of shipment.

Microwave Antenna Feeds

Product improvement research has produced an innovative feed hub which provides several important advantages over previous designs. The feed hub is fully compatible with previous Andrew microwave antennas manufactured after 1975 and other versions having an 8.5 in (216 mm) center hole in the reflector.

Simplified Installation. The unique design allows most feeds to be installed from either side of the reflector. This feature permits easy initial installation from the front of the reflector and makes it possible to change or inspect most feeds from the rear of the antenna.

Smooth, Accurate Polarization Adjustment. A conductive compound is used at the reflector/hub interface. The lubricating properties of this compound ensure smooth, accurate feed rotation.

Enhanced Electrical Performance. Positive RF seals at all critical interfaces reduce RF leakage to negligible levels and result in enhanced antenna electrical performance.

Improved Resistance to Corrosion. Potential corrosion in all areas critical to antenna system performance is effectively eliminated through the use of electro-chemically compatible materials and corrosion inhibiting compounds. The hub interface has been salt spray tested for more than 7500 hours and meets the corrosion resistance requirements of U.S. military specifications MIL-F-14072C, MIL-STD-889B and MSFC-SPEC-250A.

Feed Types. Coaxial feeds are used below 3 GHz and are air- or foam-dielectric type. "F" series antennas have foam-filled feeds that are designed for use with HELIAX® foam-dielectric cable. Guy lines or rods are included with all feeds except some antennas smaller than 12 ft (3.7 m), where they are unnecessary. All other feeds above 3 GHz are terminated with rectangular waveguide flanges. Most UHX® antennas employ a beamshaping feed design, which illuminates the parabolic reflector efficiency while maintaining sharp cutoff at the edge, resulting in outstanding radiation pattern characteristics without degradation in gain.

Radomes

Radomes are used to protect microwave antennas against accumulation of ice, snow, and dirt and to reduce wind loading. All Andrew shielded antennas include a planar radome (either flexible or molded). Antennas which include a radome are indicated in the antenna specification tables on pages 138-141. Optional molded radomes, listed on page 139, are available for most other solid reflector, standard unshielded parabolic antennas.

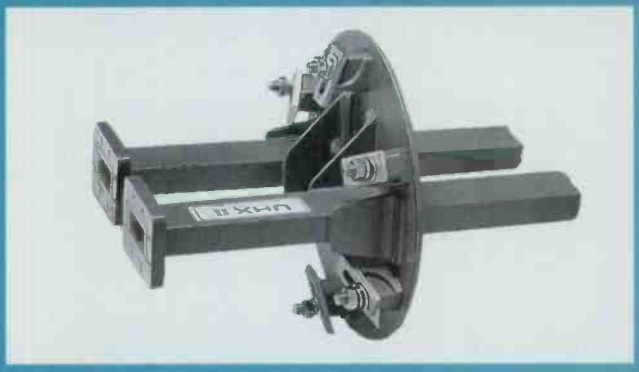
Molded Planar Radomes. Some high performance antennas are supplied with a molded radome. Molded planar radomes are painted to provide excellent water shedding and UV resistance properties.

Flexible Planar Radomes. Almost all Andrew shielded antennas include a flexible planar radome stretched across the opening of the shield. The radome flexes slightly in the wind readily shedding ice and snow in most environments.

Using a polymer-coated fabric of extreme durability, the TEGLAR® long-life radome excels in resistance to heat, rain, snow, fungus, ice accumulation, corrosive atmosphere, and ultra-violet light. The polymer surface readily sheds water and dirt. Performance under normal conditions is equal to, or better than, other designs, and under severe conditions is significantly better.

TEGLAR long-life radomes have an expected service life substantially greater than that of Hypalon radomes. Under severe local conditions such as high pollution, wind or solar radiation environments, the actual life of a Hypalon radome may be substantially reduced. In these types of environments, the optional TEGLAR radome offers significantly improved service life and is preferred.

The TEGLAR long-life radome is included as standard with certain shielded antennas as indicated in the antenna ordering tables. Others include a Hypalon coated nylon radome and the TEGLAR radome is optional.



Feed Hub used on Ultra High Performance, High Performance, Focal Plane and standard Antennas, 4-ft (1.2 m) and larger, with Waveguide Feeds.

Mounts

All microwave antennas are supplied with a vertical tower mount. Roof, vertical tilt and horizontal tilt mounts are available as options.

Shields

Cylindrical shields, attached to the reflector rim, improve the radiation pattern performance of parabolic antennas. RF absorbing material is placed at critical locations inside the shields to reduce unwanted side- and back-lobes.

Antenna Finish

Standard colors for microwave antennas and radomes are listed in the table below. Other colors in compliance with U.S. FCC and U.S. FAA regulations or special applications are available on request. Unless otherwise specified, radomes supplied with special color antennas will be the standard color.

For optional TEGLAR radome colors, see page 141.

Microwave Antenna and Radome Standard Colors

Description	Standard Color
Shielded Antennas	Gray
Radomes for Shielded Antennas	
4-15 ft (1.2-4.6 m)	White
Standard Antennas	Gray
Molded Radomes for Standard Antennas	Gray
GRIDPAK® and Mini GRIDPAK Antennas	Unpainted aluminum
ValuLine®	White

Microwave Antenna Selection Criteria

Andrew offers the industry's most comprehensive line of antennas for point-to-point microwave communication. The extremely wide range of available antennas permits the system designer to choose an antenna that is optimized for his requirements. Nearly 1000 different antennas are available from this catalog. In choosing an antenna, the following basic parameters should be considered:

Operating Frequency Band. The antennas on pages 65-113 are listed in order of ascending operating frequency. Antennas for simultaneous operation in two or more bands are offered on pages 114 and 115.

Radiation Patterns determine an antenna's ability to perform under conditions of radio congestion and also limit the route capacity. Radiation patterns are dependent on antenna series and size. A list of available antenna series, and a selector chart by radio congestion and route capacity are shown on the following page. An RPE comparison of various antenna series is illustrated below. For more information, see page 62.

Gain. For a given frequency band, gain is primarily a function of antenna size.

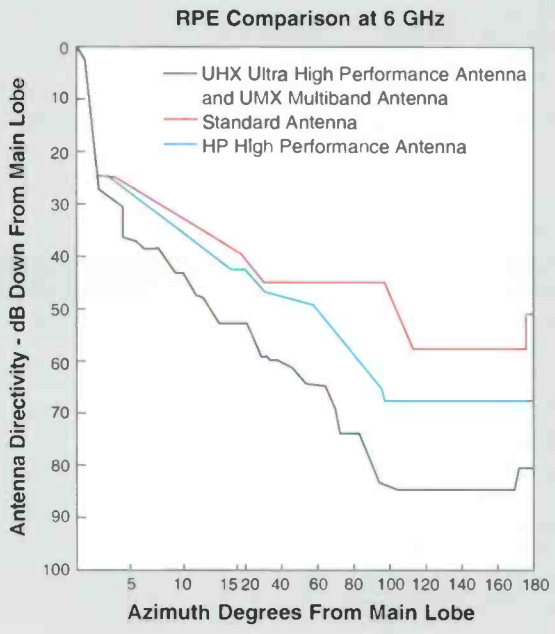
The gain of Andrew antennas is determined by either gain by comparison or by computer integration of the measured antenna patterns. Gain by integration allows for any additional signal losses such as ohmic, VSWR and cross-polarized losses. Both methods follow the recommended procedures as stated in EIA Standard 195C.

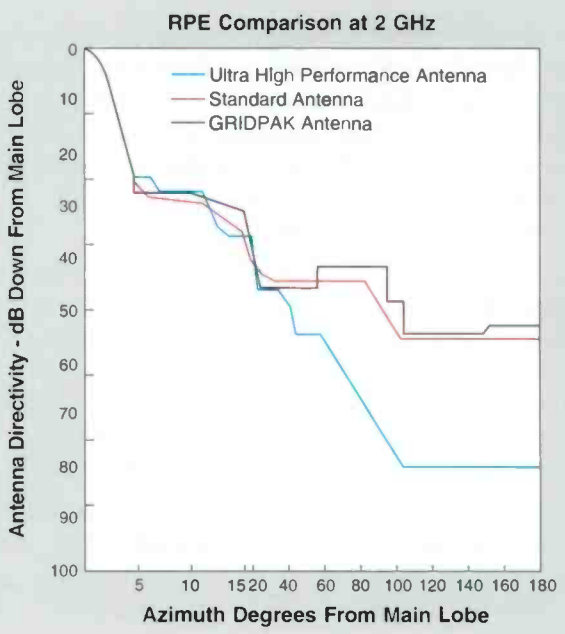
Polarization. Most antennas are available in both single- and dual-polarized versions. All can be used horizontally or vertically polarized and most have continuous polarization adjustment.

Pressurization. All antennas with air-dielectric coaxial feeds and antennas operating above 3.4 GHz should be pressurized. "F" series antennas eliminate the need for pressurization equipment, since the foam-filled feeds are completely void free and sealed to preclude the presence of moisture. The input is a special void-free, weatherproof flange that mates with Type F Flange, Type N, or 7-16 DIN style HELIAX® connectors. "F" series antennas are designed for use with HELIAX foam-dielectric coaxial cable and are available for frequency ranges from 890 MHz to 2.7 GHz.

Wind Load. Survival ratings are specified on page 63. Wind forces for various antenna types and sizes are tabulated on pages 133-135. GRIDPAK® antennas, available below 2.7 GHz, have significantly lower wind load than solid antenna types.

Shipping Considerations. KP Series GRIDPAK antennas are shipped disassembled, which results in very small shipping volume. Most 8 ft (2.4 m) and larger solid antennas are available in two piece versions to reduce shipping volume. Refer to the table on page 146.





Selector Chart

The Selector Chart categorizes antenna series by degree of radio congestion and route capacity.

Radio Congestion	Route Capacity: Very High	High	Medium	Low
Heavy	UMX® HSX	UMX HSX	UHP®	UHP HP
Medium	UHX® UMX HSX	HPX HSX FPX	HP FP	PL/PAR
Light	UHX UMX HSX	PXL	PL/PAR KP	PL/PAR KP KPR

Route Capacity

Very High Capacity. Multiple band operation with most of the possible RF channels in use as provided by dual polarization. Employs modulation methods which allow the highest baseband information rate per RF channel.

High Capacity. Uses most of the possible RF channels available from both polarizations in one frequency band or, in a dual-band configuration, uses most of the RF channels available from one polarization in each of the two bands. The modulation employed allows a baseband information rate per RF channel which is near maximum.

Medium Capacity. Has a baseband information rate usually near the maximum per RF channel but employs less than half of the RF channels available in the operating band.

Low Capacity. Usually assigned to bands with narrow bandwidth channelization. Generally employs only one or two of the available RF channels along with low baseband information rates.

Radio Congestion

Heavy. High interference potential from adjacent channel and possibly some co-channel situations. Wanted to unwanted angular separations ranging from acute, at distances approximating a normal path length, to side-on or larger angles at much closer spacings. General environment covers parallel or crossing paths, co-band junctions and terminals.

Medium. Moderate interference potential. Broadly acute angular separations between wanted and unwanted directions, distances involving two or more normal path lengths, at the closer angles, and RF channels generally spaced by a channel bandwidth or more. These conditions often are experienced in links and diverging feeder routes in the more populated rural areas.

Light. Low probability interference environment. No nearby systems operating close to the RF channel frequency assignment. Likely situations include remote area and low-population rural regions.

Antenna Electrical Specifications - General

Electrical Definitions

The following terms describe the electrical characteristics for Andrew microwave antennas. All rated electrical characteristics listed in the tables are guaranteed to be within the tolerances stated below. Factory measurements of these electrical characteristics are made under still, dry conditions using state-of-the art equipment and techniques ensuring high accuracy.

Frequency refers to the operating frequency band. These bands correspond with CCIR recommendations or common allocations used throughout the world. It is usually possible to tune antennas for slightly different frequency ranges while retaining the same electrical characteristics. Other ranges can be accommodated on special order.

VSWR. Maximum, is the guaranteed peak Voltage-Standing-Wave-Ratio within the operating band.

Isolation between inputs of single-band, dual-polarized antennas is 35 dB minimum unless otherwise specified.

Gain is stated in dBi (decibels over an isotropic radiator) at three frequencies: bottom, middle and top of band. Manufacturing tolerance for antenna gain is 0.2 dB unless otherwise specified. In the case of two-port, dual-polarized antennas, the specified gain refers to the average gain of the two ports, the gain of each port differing from the average gain by not more than 0.3 dB.

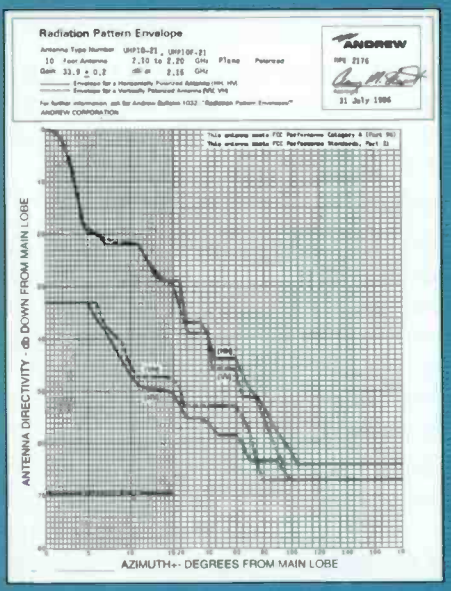
Front-to-Back Ratio in decibels. Denotes highest radiation relative to the main beam, at 180° ±40°, across the band. Production antennas do not exceed rated values by more than 2 dB unless stated otherwise.

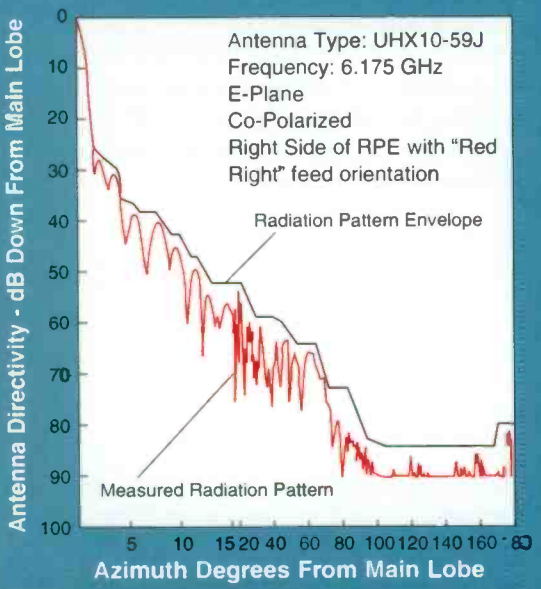
Half-Power Beamwidth is the nominal total width of the main beam at the -3 dB points.

Cross-Polarization Discrimination, in dB, is the difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam.

Power Rating. All microwave antenna feeds are rated at 150 watts.

Microwave Antennas





Radiation Pattern Envelopes

Radiation pattern envelopes (RPEs) published by Andrew present radiation pattern information in a form that is easy to use for planning radio systems. RPEs are available for all catalog microwave antennas. Copies are on file at the U.S. FCC, Industry Canada, BT, Telecom Australia, French CNET, and many other administrations throughout the world. U. S. FCC code numbers are assigned to Andrew antennas where applicable. Curves are presented in both rectangular coordinate graph and tabulated digital formats. RPEs for the antennas listed in this catalog are available in digital form on computer floppy disk.

Andrew RPEs represent the "worst peaks" envelope of radiation patterns, measured on selected units, which accurately represent the antenna type. Parallel and cross-polar patterns are measured for both horizontal and vertical polarizations. Close manufacturing control ensures this performance is maintained.

Parallel and cross-polar response are represented for both horizontal and vertical polarizations. The curves are identified as follows:

HH – Response of a horizontally polarized port to a horizontally polarized signal.

HV – Response of a horizontally polarized port to a vertically polarized signal.

VV – Response of a vertically polarized port to a vertically polarized signal.

VH – Response of a vertically polarized port to a horizontally polarized signal.

Preparation of RPEs. A complete set of radiation patterns comprises twelve measurements over the full 360° of azimuth rotation measured under still, dry conditions. These cover horizontal and vertical polarizations for each of three frequencies (bottom, middle and top) in the band, each of these in turn being measured for parallel polarized as well as cross polarized responses. Each of the four curves on the RPE is derived by superimposing the right and left side patterns for all three frequencies and then drawing an envelope composed of simple straight lines so as to encompass all peaks. The probability is high that an installed antenna will have better actual response at a specific angle and frequency than indicated on the RPE.

Asymmetrical Radiation Patterns. UHX® ultra high performance antennas have asymmetrical patterns with lower sidelobe levels on one side. For these antennas, RPEs are prepared for the full 360°. The superior half of the radiation pattern on either the right or left side of the antenna boresight can be used for interference evaluation to reduce potential interference. The UHX and HSX feed hubs are marked red to identify the superior side, and the hub can be rotated so as to place this side either right or left of boresight.

Guaranteed RPEs for Parabolic Antennas. Actual radiation patterns for production antennas, under still, dry conditions, will not have any peak exceeding the current RPE by more than 3 dB. An angular accuracy of ±1° is maintained throughout. This guarantee applies to all Andrew parabolic microwave antennas unless otherwise stated on the RPE.

Antenna Environmental Ratings

Standard Ratings. Microwave antennas, including mounts and radomes, where applicable, will withstand the simultaneous wind and ice conditions specified in the table below. Except where noted otherwise in the antenna listings, all antennas will remain operational within a temperature range of -50°C to 70°C (-58°F to 158°F), and meet all other requirements of EIA/TIA Standards 222E and 195C.

High Wind Survival. Special antenna designs with wind survival ratings up to 200 mph (320 km/h) are available. See page 142.

Corrosive Environments. Antennas designed for corrosive environments are also available. See page 142.

Wind Survival and Deflection Characteristics

Antenna Types	Survival Ratings Wind Velocity mph (km/h)	Radial Ice, in (mm)	Max. Deflection In 70 mph (110 km/h) Wind, degrees
Standard Antennas			
Without Radome	125 (200)	1 (25)	0.1
With Standard Radome	125 (200)	1 (25)	0.1
UHX®, UMX®, UHP, HSX and HP Antennas	125 (200)	1 (25)	0.1
GRIDPAK® Antennas	125 (200)	1 (25)	0.1
ValuLine® Antennas	125 (200)	1 (25)	0.1

Antenna Specifications and Ordering Information

Antenna Ordering Tables

Our line of terrestrial microwave antennas is presented in the tables on pages 65-116. The tables are arranged by Operating Frequency Band, in ascending order. Within the tables, antennas are grouped by Antenna Type, and by Diameter.

Basic Antenna

The Type Numbers listed in the tables define the basic antenna, less options and accessories. The numbers correspond with those appearing on Radiation Pattern Envelopes published by Andrew (see page 60) and also define the electrical performance parameters of the antennas.

All of the antennas in this section include a feed, reflector and vertical tower mount. Refer to the "Antenna Types" and "Antenna Construction" sections, pages 51-59 for details.

Input Flanges

The primary flange for each antenna, except ValuLine®, is listed in ***bold italics*** in the ordering tables. If a flange type is not specified, the primary flange will be provided. Other flanges are available as options. The optional flanges are listed below the primary flange in the tables. EIA and IEC flanges are available for all ValuLine antennas. Contact Andrew for more details.

Flange types are discussed in detail on pages 136 and 137.

Radomes

All shielded antennas include either a TEGLAR® long-life radome, a Hypalon coated nylon radome or a molded thermoplastic planar radome, as specified in the tables. The TEGLAR long-life radome is optional for antennas which are normally supplied with the Hypalon radome.

Molded radomes are also available as an option for most standard (non-shielded, solid reflector) antennas. Radomes are not applicable for any grid types.

Radomes are discussed in detail on pages 138-141.

Regulatory Information

Any regulatory compliance pertaining to an antenna is noted in its catalog entry.

Antenna Options

Andrew offers a variety of antenna options which allow you to choose additional features or change features from the basic antenna offerings. Options are described in detail on pages 136-146.

- *Input flanges*
- *Antenna colors*
- *Radomes*
- *Radome colors*
- *High wind survival antennas*
- *Corrosive environment antennas*
- *Packing type*
- *Packing quantity*
- *Reflector type*
- *Special purpose mounts*

Accessories

In addition to the above options, Andrew offers the following accessories to enhance your antenna selection. Accessories are described in detail on pages 147-151.

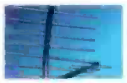
- *Edge protection kits for TEGLAR radome*
- *Port termination loads*
- *Additional side or bottom mounting struts*

Replacement Components

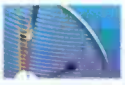
Contact Andrew for information on replacement components.

- *Reflectors*
- *Feeds*
- *Radomes/Radome clip kits (Page 138)*
- *Shield absorber kits*
- *Major hardware kits*
- *Mounts (Page 117)*
- *Universal guy wire kits*
- *Shields*
- *Struts (Page 117)*

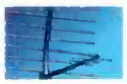
335 - 365 MHz

	Type Number	Diameter ft (m)	Inputs	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Vertical	Beamwidth Horizontal	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KP  **GRIDPAK® Antennas**											
Unpressurized Single Polarized	**KP6F-335B**	6 (2.0)	*Type N Female*	15.0	15.2	15.4	25.0	30.0	23	19	1.3 (17.7)
	KP8F-335	8 (2.4)		15.6	15.7	15.8	19.6	21.4	17	16	1.3 (17.7)
	KP10F-335B	10 (3.0)		18.3	18.4	18.6	16.0	19.0	23	22	1.3 (17.7)
	KP13F-335C	13 (4.0)		20.6	20.7	20.7	12.0	14.5	25	23	1.3 (17.7)
MKP  **Mini-GRIDPAK Antennas**											
Unpressurized Single Polarized	MKP-335A	6.6 x 3.3 (2 x1)	*Type N Female*	11.0	11.0	11.0	28	37	15	9	1.5 (14.0)

365 - 403 MHz

	Type Number	Diameter ft (m)	Inputs	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Vertical	Beamwidth Horizontal	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KP  **GRIDPAK® Antennas**											
Unpressurized Single Polarized	**KP6F-365B**	6 (2.0)	*Type N Female*	15.8	16.3	16.3	22.0	27.0	29	20	1.3 (17.7)
	KP8F-365	8 (2.4)		16.7	17.4	17.8	17.5	22.1	22	18	1.3 (17.7)
	KP10F-365B	10 (3.0)		18.7	19.4	19.6	15.0	18.5	33	23	1.3 (17.7)
	KP13F-365C	13 (4.0)		21.0	21.8	21.9	11.0	14.5	33	24	1.3 (17.7)

403 - 470 MHz

	Type Number	Diameter ft (m)	Inputs	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Vertical	Beamwidth Horizontal	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KP  **GRIDPAK® Antennas**											
Unpressurized Single Polarized	**KP6F-403B**	6 (2.0)	*Type N Female*	16.4	16.3	16.6	19.3	22.9	27	20	1.35 (16.5)
	KP8F-403	8 (2.4)		17.7	17.5	18.0	16.3	19.7	28	20	1.35 (16.5)
	KP10F-403B	10 (3.0)		20.0	19.6	20.4	14.0	14.0	30	22	1.35 (16.5)
	KP13F-403C	13 (4.0)		22.0	22.2	22.6	13.0	13.0	30	24	1.35 (16.5)
MKP  **Mini-GRIDPAK Antennas**											
Unpressurized Single Polarized	MKP-403A	6.6 x 3.3 (2 x1)	*Type N Female*	13.5	13.5	13.5	22	29	17	19	1.35 (16.5)

Microwave Antennas

820 - 960 MHz

	Type Number	Diameter ft (m)	Inputs	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Vertical	Beamwidth Horizontal	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KP  **GRIDPAK® Antennas****											
Unpressurized Single Polarized	**KP4F-820**	4 (1.2)	***Type N***	17.5	18.2	18.8	15.9	17.2	28	24	1.4 (15.5)
	KP6F-820B	6 (2.0)	***Female***	21.8	22.6	23.2	9.5	10.8	30	28	1.4 (15.5)
	KP8F-820	8 (2.4)	or 7-16 DIN	23.4	24.1	24.7	8.0	9.0	34	25	1.35 (16.5)
	KP10F-820B	10 (3.0)	7/8" EIA, "F"	25.2	25.9	26.5	6.7	8.0	30	25	1.35 (16.5)
	KP13F-820C	13 (4.0)	Flange Female	27.3	28.0	28.6	4.9	5.8	36	30	1.35 (16.5)
MKP  **Mini-GRIDPAK Antennas**											
Unpressurized Single Polarized	**MKP-820B**	6.6 x 3.3 (2 x 1)	***Type N Female***	18.0	18.2	18.5	10.0	20.0	20	15	1.5 (14.0)

** Factory assembly available for an additional charge.

890 - 960 MHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance*	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P  **Standard Antennas**											
Air Dielectric Single Polarized	**P4-9C**	4 (1.2)	***7/8" EIA***	B	18.1	18.4	18.7	19.5	8	21	1.3 (17.7)
	P6-9C	6 (1.8)		A	21.6	22.0	22.3	13.0	12	24	1.3 (17.7)
	P8-9C	8 (2.4)		A	24.1	24.4	24.8	9.8	15	27	1.3 (17.7)
	P10-9C	10 (3.0)		A	26.1	26.4	26.7	7.8	15	29	1.3 (17.7)
	P12-9E	12 (3.7)		A	27.7	28.0	28.3	6.5	15	30	1.3 (17.7)
	P15-9D	15 (4.6)		A	29.6	29.9	30.2	5.3	16	32	1.3 (17.7)
Unpressurized Single Polarized	**P6F-9**	6 (1.8)	***"F" Flange Female***	A	21.5	21.9	22.2	13.0	12	24	1.3 (17.7)
	P8F-9	8 (2.4)		A	24.0	24.3	24.7	9.2	15	27	1.3 (17.7)

*U.S. FCC Part 94. Part 101 will replace Part 94 effective June, 1997.

NEW!

1.35 - 1.535 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance*	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
FP  **Focal Plane Antennas**											
Unpressurized Single Polarized	FP4F-13	4 (1.2)	*"F" Flange Female*	*	21.7	22.3	22.5	12.2	30	40	1.3 (17.7)
	FP6F-13	6 (1.8)		*	25.2	25.8	25.9	8.1	30	44	1.3 (17.7)
	FP8F-13	8 (2.4)		*	28.2	29.3	29.4	6.1	30	48	1.3 (17.7)
	FP10F-13	10 (3.0)		*	29.6	30.8	30.9	4.7	30	49	1.3 (17.7)
	FP12F-13	12 (3.7)		*	31.0	31.8	32.1	4.2	30	50	1.3 (17.7)

NEW!

KPR  **GRIDPAK® Antennas – Rural Telephony**											
Air Dielectric Single Polarized	KPR3F-13	3 (0.9)	*Type N Female,* or 7/8" EIA, "F" Flange Female, 7-16 DIN Female	–	20.1	20.1	20.1	13.0V/14.9H	28	23	1.35 (16.5)
	KPR4F-13	4 (1.2)		–	22.4	23.6	23.6	10.1V/10.9H	30	24	1.35 (16.5)
	KPR6F-13	6 (2.0)		–	26.3	26.8	27.3	6.6V/6.6H	30	30	1.35 (16.5)
	KPR8F-13	8 (2.4)		–	28.5	29	29.6	5.4V/5.4H	30	32	1.30 (17.7)
	KPR10F-13	10 (3.0)		–	29.9	30.5	31.0	4.7V/4.7H	30	32	1.30 (17.7)
	KPR13F-13	13 (4.0)		–	32.2	32.8	33.3	3.6V/3.6H	30	35	1.30 (17.7)

* Type Approved to draft ETS300631, Fig 5.

1.427 - 1.535 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance*	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
FP  **Focal Plane Antennas**											
Unpressurized Single Polarized	FP4F-15E	4 (1.2)	*"F" Flange Female*	*	21.4	22.0	22.5	12.1	30	38	1.3 (17.7)
	FP6F-15E	6 (1.8)		*	25.7	25.8	25.9	8.0	30	41	1.3 (17.7)
	FP8F-15E	8 (2.4)		*	28.9	29.1	29.4	6.1	30	46	1.3 (17.7)
	FP10F-15D	10 (3.0)		–	30.2	30.6	30.9	4.7	26	38	1.3 (17.7)
	FP12F-15D	12 (3.7)		–	31.3	31.8	32.2	4.2	26	40	1.3 (17.7)
P  **Standard Antennas**											
Air Dielectric Single Polarized	P4-15C	4 (1.2)	*7/8" EIA*	–	22.6	23.0	23.3	11.6	30	30	1.15 (23.1)
	P6-15C	6 (1.8)		–	26.1	26.5	26.8	7.8	30	32	1.10 (26.4)
	P8-15C	8 (2.4)		–	28.6	29.0	29.3	5.8	30	34	1.10 (26.4)
	P10-15C	10 (3.0)		–	30.6	31.0	31.3	4.7	30	36	1.10 (26.4)
Unpressurized Single Polarized	P4F-15E	4 (1.2)	*"F" Flange Female*	–	22.6	23.0	23.3	11.6	30	30	1.3 (17.7)
	P6F-15D	6 (1.8)		–	26.1	26.5	26.8	7.8	30	32	1.3 (17.7)
	P8F-15D	8 (2.4)		–	28.6	29.0	29.3	5.8	30	34	1.3 (17.7)
	P10F-15D	10 (3.0)		–	30.6	31.0	31.3	4.7	30	36	1.3 (17.7)

*Approved by U.K. Radio Communications Agency to MPT 1404, Annex 3.

1.427 - 1.535 GHz (Continued)

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KP 	**GRIDPAK® Antennas****										
Air Dielectric Single Polarized	**KP4-15A**	4 (1.2)	***7/8" EIA***	–	23.2	23.5	23.8	11.0	31	28	1.3 (17.7)
	KP6-15C	6 (2.0)		–	26.9	27.2	27.5	7.2	32	31	1.2 (20.8)
	KP8-15B	8 (2.4)		–	28.5	28.8	29.1	6.2	30	32	1.2 (20.8)
	KP10-15D	10 (3.0)		–	30.5	30.8	31.1	4.7	34	33	1.15 (23.1)
	KP13-15B	13 (4.0)		–	32.9	33.2	33.5	3.8	30	40	1.15 (23.1)
	GP15-15A*	15 (4.6)		–	33.6	34.0	34.3	3.2	33	40	1.30 (17.7)
Unpressurized Single Polarized	**KP4F-15A**	4 (1.2)	***"F" Flange***	–	23.1	23.4	23.7	11.0	31	28	1.35 (16.5)
	KP6F-15C	6 (2.0)	***Female,***	–	26.8	27.1	27.4	7.2	32	31	1.3 (17.7)
	KP8F-15B	8 (2.4)	7/8" EIA	–	28.4	28.7	29.0	6.2	30	32	1.2 (20.8)
	KP10F-15D	10 (3.0)	or	–	30.4	30.7	31.0	4.7	34	33	1.2 (20.8)
	KP13F-15B	13 (4.0)	Type N Female	–	32.8	33.1	33.4	3.8	30	40	1.2 (20.8)
NEW!	**GP15F-15A***	15 (4.6)		–	33.6	34.0	34.3	3.2	33	40	1.35 (16.5)
KPR 	**GRIDPAK® Antennas – Rural Telephony**										
Unpressurized Single Polarized	**KPR4F-15**	4 (1.2)	***Type N Female,***	–	23.3	23.5	23.8	10.1V/10.9H	30	28	1.35 (16.5)
	KPR6F-15	6 (2.0)	or	–	26.9	27.2	27.5	5.9V/6.9H	31	32	1.35 (16.5)
	KPR8F-15	8 (2.4)	7/8" EIA,	–	29	29.3	29.7	5.0V/5.5H	30	35	1.25 (19.1)
	KPR10F-15	10 (3.0)	"F" Flange	–	30.5	30.8	31.1	4.3V/4.8H	30	34	1.25 (19.1)
	KPR13F-15	13 (4.0)	Female, 7-16 DIN Female	–	32.8	33.1	33.4	3.2V/3.8H	33	37	1.25 (19.1)

* 15 foot antennas are welded construction.
** Factory assembly available for an additional charge.

1.7 - 2.11 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP 	**High Performance Antennas - Hypalon Radome Included**										
Air Dielectric Single Polarized	HP6-17D	6 (1.8)	*7/8" EIA*	B	27.8	28.7	29.6	6.0	25	44	1.10 (26.4)
	HP8-17E	8 (2.4)		A	30.3	31.2	32.1	4.5	30	50	1.10 (26.4)
	HP10-17E	10 (3.0)		A	32.2	33.2	34.1	3.7	34	52	1.10 (26.4)
	HP12-17F	12 (3.7)		A	33.8	34.7	35.6	3.0	30	56	1.10 (26.4)
	HP15-17E	15 (4.6)		A	35.7	36.6	37.5	2.4	30	58	1.10 (26.4)
F-Series Unpressurized Single Polarized	HP6F-17D	6 (1.8)	*"F" Flange Female*	B	27.7	28.6	29.6	6.0	25	44	1.20 (20.8)
	HP8F-17C	8 (2.4)		A	30.2	31.1	32.0	4.5	30	50	1.15 (23.1)
	HP10F-17C	10 (3.0)		A	32.1	33.1	34.1	3.7	34	52	1.15 (23.1)
	HP12F-17C	12 (3.7)		A	33.7	34.6	35.6	3.0	30	56	1.15 (23.1)
FP FPX 	**Focal Plane Antennas**										
Air Dielectric Single Polarized	FP8-17E	8 (2.4)	*7/8" EIA*	–	30.0	30.9	32.0	4.6	30	49	1.10 (26.4)
	FP10-17E	10 (3.0)		–	32.0	32.9	33.9	3.7	30	51	1.10 (26.4)
	FP12-17E	12 (3.7)		–	33.7	34.4	35.4	3.1	30	54	1.10 (26.4)
Air Dielectric Dual Polarized (1.7-1.9 GHz only)	FPX8-17A	8 (2.4)	*7/8" EIA*	–	29.4	30.4	31.2	4.6	28	45	1.10 (26.4)
	FPX10-17A	10 (3.0)		–	31.5	32.3	33.1	3.7	30	50	1.10 (26.4)
	FPX12-17A	12 (3.7)		–	33.3	34.0	34.8	3.2	29	52	1.10 (26.4)
F-Series Unpressurized Single Polarized	FP8F-17D	8 (2.4)	*"F" Flange Female*	–	29.9	30.8	31.9	4.6	30	49	1.20 (20.8)
	FP10F-17D	10 (3.0)		–	31.9	32.8	33.8	3.7	30	51	1.15 (23.1)
	FP12F-17D	12 (3.7)		–	33.6	34.3	35.3	3.1	30	54	1.15 (23.1)
PL P 	**Standard Antennas**										
Low VSWR Air Dielectric Single Polarized	PL6-17C	6 (1.8)	*7/8" EIA*	B	27.8	28.7	29.6	6.0	30	36	1.10 (26.4)
	PL8-17D	8 (2.4)		A	30.3	31.2	32.1	4.5	30	39	1.10 (26.4)
	PL10-17D	10 (3.0)		A	32.2	33.2	34.1	3.7	34	42	1.10 (26.4)
	PL12-17F	12 (3.7)		A	33.8	34.7	35.6	3.0	30	45	1.10 (26.4)
	PL15-17E	15 (4.6)		A	35.7	36.6	37.5	2.4	30	48	1.10 (26.4)
Air Dielectric Single Polarized	P4-17C	4 (1.2)		–	23.9	24.8	25.7	9.0	30	30	1.3 (17.7)
F-Series Unpressurized Single Polarized	P4F-17D	4 (1.2)	*"F" Flange Female*	–	23.9	24.8	25.7	9.0	30	30	1.3 (17.7)
	P6F-17C	6 (1.8)		B	27.7	28.6	29.5	6.0	30	36	1.20 (20.8)
	P8F-17C	8 (2.4)		A	30.2	31.1	32.0	4.5	30	39	1.15 (23.1)
	P10F-17C	10 (3.0)		A	32.1	33.1	34.0	3.7	34	42	1.15 (23.1)
	P12F-17C	12 (3.7)		A	33.7	34.6	35.5	3.0	30	45	1.15 (23.1)
KP 	**GRIDPAK® Antennas****										
Air Dielectric Single Polarized	KP4-17A	4 (1.2)	*7/8" EIA*	–	24.7	25.6	26.5	8.6	31	32	1.20 (20.8)
	KP6-17B	6 (2.0)		B	28.4	29.4	30.3	5.5	33	36	1.10 (26.4)
	KP8-17B	8 (2.4)		B	30.2	31.2	31.8	4.8	32	36	1.08 (28.3)
	KP10-17B	10 (3.0)		A	32.0	32.9	33.8	3.7	38	42	1.08 (28.3)
	KP13-17B	13 (4.0)		A	34.4	35.4	36.3	3.0	30	40	1.08 (28.3)
	GPL15-17B*	15 (4.6)		A	35.5	36.5	3704	2.3	40	46	1.10 (26.4)
F-Series Unpressurized Single Polarized	KP4F-17A	4 (1.2)	*"F" Flange Female, 7/8" EIA* or Type N Female	–	24.6	25.5	26.4	8.6	31	32	1.30 (17.7)
	KP6F-17B	6 (2.0)		B	28.3	29.3	30.2	5.5	33	36	1.20 (20.8)
	KP8F-17B	8 (2.4)		B	30.1	31.1	31.7	4.8	32	36	1.20 (20.8)
	KP10F-17B	10 (3.0)		A	31.9	32.8	33.7	3.7	38	42	1.20 (20.8)
	KP13F-17B	13 (4.0)		A	34.3	35.3	36.2	3.0	30	40	1.20 (20.8)
	GP15F-17*	15 (4.6)		A	35.4	36.4	37.3	2.3	40	46	1.20 (20.8)

† A: U. S. FCC Part 94, Category A. B: U. S. FCC Part 94, Category B.
* 15 foot antennas are welded construction.
** Factory assembly available for an additional charge.

Microwave Antennas

1.85 - 1.99 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHP®  **Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**											
Air Dielectric Single Polarized	**UHP8-18**	8 (2.4)	***7/8" EIA***	A	30.8	31.1	31.4	4.8	33	62	1.08 (28.3)
	UHP10-18	10 (3.0)		A	32.6	33.0	33.3	4.2	32	62	1.08 (28.3)
	UHP12-18	12 (3.7)		A	34.4	34.7	35.0	3.3	32	66	1.08 (28.3)
F-Series Unpressurized Single Polarized	**UHP8F-18**	8 (2.4)	***"F" Flange Female***	A	30.8	31.1	31.4	4.8	33	62	1.10 (26.4)
	UHP10F-18	10 (3.0)		A	32.6	33.0	33.3	4.2	32	62	1.10 (26.4)
	UHP12F-18	12 (3.7)		A	34.4	34.7	35.0	3.3	32	66	1.10 (26.4)
HP  **High Performance Antennas – Hypalon Radome Included**											
Air Dielectric Single Polarized	**HP6-18A**	6 (1.8)	***7/8" EIA***	B	28.5	28.8	29.1	6.0	30	45	1.10 (26.4)
	HP8-18A	8 (2.4)		A	31.0	31.3	31.6	4.5	30	50	1.08 (28.3)
	HP10-18A	10 (3.0)		A	33.0	33.3	33.6	3.7	30	50	1.08 (28.3)
	HP12-18A	12 (3.7)		A	34.5	34.8	35.1	3.2	30	55	1.08 (28.3)
	HP15-18A	15 (4.6)		A	36.4	36.7	37.0	2.3	30	58	1.08 (28.3)
F-Series Unpressurized Single Polarized	**HP6F-18A**	6 (1.8)	***"F" Flange Female***	B	28.4	28.7	29.0	6.0	30	45	1.15 (23.1)
	HP8F-18	8 (2.4)		A	30.9	31.2	31.5	4.5	30	50	1.15 (23.1)
	HP10F-18	10 (3.0)		A	32.9	33.2	33.5	3.7	30	50	1.15 (23.1)
	HP12F-18	12 (3.7)		A	34.4	34.7	35.0	3.2	30	55	1.15 (23.1)
PL PXL P  **Standard Antennas**											
Low VSWR Air Dielectric Single Polarized	**PL6-18**	6 (1.8)	***7/8" EIA***	B	28.5	28.8	29.1	6.0	30	36	1.10 (26.4)
	PL8-18A	8 (2.4)		A	31.0	31.3	31.6	4.5	30	39	1.08 (28.3)
	PL10-18A	10 (3.0)		A	33.0	33.3	33.6	3.7	34	42	1.08 (28.3)
	PL12-18A	12 (3.7)		A	34.5	34.8	35.1	3.0	30	45	1.08 (28.3)
Low VSWR Air Dielectric Dual Polarized	**PXL8-18D**	8 (2.4)	***7/8" EIA***	A	31.0	31.2	31.5	4.6	28	43	1.10 (26.4)
	PXL10-18D	10 (3.0)		A	32.9	33.1	33.6	3.7	28	46	1.10 (26.4)
	PXL12-18D	12 (3.7)		A	34.5	34.7	35.2	3.0	28	48	1.10 (26.4)
F-Series Unpressurized Single Polarized	**P4F-18D**	4 (1.2)	***"F" Flange Female***		24.5	24.8	25.1	9.5	30	30	1.15 (23.1)
	P6F-18C	6 (1.8)		B	28.4	28.7	29.0	6.0	30	36	1.15 (23.1)
	P8F-18C	8 (2.4)		A	30.9	31.2	31.5	4.5	30	39	1.15 (23.1)
	P10F-18C	10 (3.0)		A	32.9	33.2	33.5	3.7	34	42	1.15 (23.1)
KP  **GRIDPAK® Antennas****											
Air Dielectric Single Polarized	**KP4-18**	4 (1.2)	***7/8" EIA***	–	24.7	25.7	26.5	8.6	31	32	1.20 (20.8)
	KP6-18	6 (1.8)		B	28.4	29.4	30.3	5.5	33	36	1.10 (26.4)
	KP8-18	8 (2.4)		A	30.8	31.1	31.4	4.2	35	39	1.08 (28.3)
	KP10-18	10 (3.0)		A	32.7	33.0	33.3	3.4	35	42	1.08 (28.3)
	KP13-18	13(4.0)		A	34.4	35.4	36.3	3.0	30	40	1.08 (28.3)
	GPL15-18A***	15 (4.6)		A	36.3	36.6	36.9	2.3	40	46	1.08 (28.3)
F-Series Unpressurized Single Polarized	**KP4F-18**	4 (1.2)	***"F" Flange***	–	24.6	25.6	26.4	8.6	31	32	1.30 (17.7)
	KP6F-18	6 (1.8)	***Female,***	B	28.3	29.3	30.2	5.5	33	36	1.15 (23.1)
	KP8F-18	8 (2.4)	7/8" EIA or	A	30.7	31.0	31.3	4.2	35	39	1.15 (23.1)
	KP10F-18	10 (3.0)	Type N	A	32.6	32.9	33.2	3.4	35	42	1.15 (23.1)
	KP13F-18	13 (4.0)	Female	A	34.3	35.3	36.2	3.0	30	40	1.15 (23.1)
	GP15F-18***	15 (4.6)		A	36.3	36.6	36.9	2.3	40	46	1.15 (23.1)

† U.S. FCC Part 94.
** Factory assembly available for an additional charge.
*** 15 foot antennas are welded construction

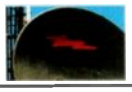
1.9 - 2.3 GHz (see page 73 for 2.1-2.2 GHz)

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHP®	**Ultra High Performance Antennas, Air Dielectric – TEGLAR® Long Life Radome Included**										
Single Polarized	**UHP8-19A**	8 (2.4)	*7/8" EIA*	A	31.1	31.9	32.7	4.2	30	57	1.20 (20.8)
	UHP10-19A	10 (3.0)		A	32.9	33.7	34.5	3.6	30	60	1.20 (20.8)
	UHP12-19A	12 (3.7)		A	34.6	35.4	36.2	2.9	30	64	1.20 (20.8)
F-Series Unpressurized Single Polarized	**UHP8F-19A**	8 (2.4)	*"F" Flange Female*	A	31.1	31.9	32.7	4.2	30	57	1.20 (20.8)
	UHP10F-19A	10 (3.0)		A	32.9	33.7	34.5	3.6	30	60	1.20 (20.8)
	UHP12F-19A	12 (3.7)		A	34.6	35.4	36.2	2.9	30	64	1.20 (20.8)
HP HPX®	**High Performance Antennas – Hypalon Radome Included**										
Air Dielectric Single Polarized	**HP6-19E**	6 (1.8)	*7/8" EIA*	B	28.6	29.5	30.4	5.5	25	46	1.10 (26.4)
	HP8-19E	8 (2.4)		A	31.1	32.0	32.9	4.1	30	50	1.10 (26.4)
	HP10-19E	10 (3.0)		A	33.0	33.9	34.8	3.3	30	53	1.10 (26.4)
	HP12-19F	12 (3.7)		A	34.6	35.5	36.4	2.8	30	57	1.10 (26.4)
	HP15-19E	15 (4.6)		A	36.5	37.4	38.3	2.2	30	59	1.10 (26.4)
Air Dielectric Dual Polarized	**HPX8-19D**	8 (2.4)	*7/8" EIA*	A	31.1	32.0	32.9	4.1	28	48	1.10 (26.4)
	HPX10-19F	10 (3.0)		A	33.0	33.9	34.8	3.3	28	53	1.10 (26.4)
	HPX12-19E	12 (3.7)		A	34.6	35.5	36.4	2.8	30	55	1.10 (26.4)
	HPX15-19F	15 (4.6)		A	36.5	37.4	38.3	2.2	28	56	1.10 (26.4)
F-Series Unpressurized Single Polarized	**HP6F-19D**	6 (1.8)	*"F" Flange Female*	B	28.5	29.4	30.3	5.5	25	46	1.20 (20.8)
	HP8F-19C	8 (2.4)		A	31.0	31.9	32.8	4.1	30	50	1.15 (23.1)
	HP10F-19C	10 (3.0)		A	32.9	33.8	34.7	3.3	30	53	1.15 (23.1)
	HP12F-19C	12 (3.7)		A	34.5	35.4	36.3	2.8	30	57	1.15 (23.1)
F-Series Unpressurized Dual Polarized	**HPX8F-19**	8 (2.4)	*"F" Flange Female*	A	31.1	32.0	32.9	4.1	28	48	1.20 (20.8)
	HPX10F-19	10 (3.0)		A	33.0	33.9	34.8	3.3	28	43	1.20 (20.8)
FP FPX	**Focal Plane Antennas**										
Air Dielectric Single Polarized	**FP8-19E**	8 (2.4)	*7/8" EIA*	–	30.6	31.5	32.3	4.1	30	50	1.10 (26.4)
	FP10-19E	10 (3.0)		–	32.3	33.2	34.1	3.3	30	53	1.10 (26.4)
	FP12-19E	12 (3.7)		–	33.9	34.8	35.7	2.8	30	55	1.10 (26.4)
Air Dielectric Dual Polarized	**FPX8-19A**	8 (2.4)	*7/8" EIA*	–	30.4	31.2	32.0	4.1	25	47	1.10 (26.4)
	FPX10-19A	10 (3.0)		–	32.3	33.1	33.9	3.3	29	52	1.10 (26.4)
	FPX12-19A	12 (3.7)		–	34.0	34.8	34.9	2.8	29	52	1.10 (26.4)
F-Series Unpressurized Single Polarized	**FP8F-19D**	8 (2.4)	*"F" Flange Female*	–	30.5	31.4	32.2	4.1	30	50	1.20 (20.8)
	FP10F-19D	10 (3.0)		–	32.2	33.1	34.0	3.3	30	53	1.15 (23.1)
	FP12F-19D	12 (3.7)		–	33.8	34.7	35.6	2.8	30	55	1.15 (23.1)

† U.S. FCC Part 94. FCC Standards for Common Carrier Service (Part 21).

Continued on next page

1.9 - 2.3 GHz (Continued)

	Type Number	Diameter ft (m)	Input Flanges	Regulatory† Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P PL PXL  **Standard Antennas**											
Low VSWR	**PL4-19C**	4 (1.2)	***7/8" EIA***	–	24.9	25.8	26.7	8.2	30	33	1.30 (17.7)
Air Dielectric	**PL6-19C**	6 (1.8)		B	28.6	29.5	30.4	5.5	30	37	1.10 (26.4)
Single	**PL8-19D**	8 (2.4)		A	31.1	32.0	32.9	4.1	30	40	1.10 (26.4)
Polarized	**PL10-19D**	10 (3.0		A	33.0	33.9	34.8	3.3	30	44	1.10 (26.4)
	PL12-19F	12 (3.7)		A	34.6	35.5	36.4	2.8	30	46	1.10 (26.4)
	PL15-19E	15 (4.6)		A	36.5	37.4	38.3	2.2	30	50	1.10 (26.4)
Low VSWR	**PXL8-19D**	8 (2.4)	***7/8" EIA***	A	31.1	32.0	32.9	4.1	28	43	1.10 (26.4)
Air Dielectric	**PXL10-19D**	10 (3.0)		A	33.0	33.9	34.8	3.3	28	45	1.10 (26.4)
Dual	**PXL12-19D**	12 (3.7)		A	34.6	35.5	36.4	2.8	28	48	1.10 (26.4)
Polarized	**PXL15-19D**	15 (4.6)		A	36.5	37.4	38.3	2.2	28	48	1.10 (26.4)
F-Series	**P4F-19D**	4 (1.2)	***"F"***	–	24.9	25.8	26.7	8.2	30	33	1.30 (17.7)
Unpressurized	**P6F-19C**	6 (1.8)	***Flange***	B	28.5	29.4	30.3	5.5	30	37	1.20 (20.8)
Single	**P8F-19C**	8 (2.4)	***Female***	A	31.0	31.9	32.8	4.1	30	40	1.15 (23.1)
Polarized	**P10F-19C**	10 (3.0)		A	32.9	33.8	34.7	3.3	30	44	1.15 (23.1)
	P12F-19C	12 (3.7)		A	34.5	35.4	36.3	2.8	30	46	1.15 (23.1)
F-Series	**PXL8F-19**	8 (2.4)	***"F"***	A	31.1	32.0	32.9	4.1	28	43	1.20 (20.8)
Unpressurized	**PXL10F-19**	10 (3.0)	***Flange***	A	33.0	33.9	34.8	3.3	28	45	1.20 (20.8)
Dual			***Female***								
Polarized											
KP  **GRIDPAK® Antennas****											
Air Dielectric	**KP4-19A**	4 (1.2)	***7/8" EIA***	–	25.6	26.5	27.3	7.7	29	32	1.20 (20.8)
Single	**KP6-19B**	6 (2.0)		B	29.4	30.3	31.1	5.0	32	36	1.10 (26.4)
Polarized	**KP8-19B**	8 (2.4)		A	31.1	31.9	32.7	4.6	32	39	1.08 (28.3)
	KP10-19B	10 (3.0)		A	32.9	33.8	34.6	3.3	35	41	1.08 (28.3)
	KP13-19B	13 (4.0)		A	35.4	36.3	37.1	2.8	30	40	1.08 (28.3)
	GPL15-19B*	15 (4.6)		A	36.5	37.4	38.2	2.3	40	46	1.10 (26.4)
F-Series	**KP4F-19A**	4 (1.2)	***"F" Flange***	–	25.5	26.4	27.2	7.7	29	32	1.30 (17.7)
Unpressurized	**KP6F-19B**	6 (2.0)	***Female,***	B	29.3	30.2	31.0	5.0	32	36	1.20 (20.8)
Single	**KP8F-19B**	8 (2.4)	7/8" EIA or	A	31.0	31.8	32.6	4.6	32	39	1.20 (20.8)
Polarized	**KP10F-19B**	10 (3.0)	Type N	A	32.8	33.7	34.5	3.3	35	41	1.20 (20.8)
	KP13F-19B	13 (4.0)	Female	A	35.3	36.2	37.0	2.8	30	40	1.20 (20.8)
	GP15F-19*	15 (4.6)		A	36.4	37.3	38.1	2.2	40	46	1.20 (20.8)

† U.S. FCC Part 94. FCC Standards for Common Carrier Service (Part 21).
* 15 foot antennas are welded construction
** Factory assembly available for an additional charge.

2.1 - 2.2 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHP® UHX®  **Ultra High Performance Antenna – TEGLAR® Long Life Radome Included**											
Air Dielectric Single Polarized	**UHP8-21**	8 (2.4)	***7/8" EIA***	A	31.9	32.1	32.3	4.2	32	61	1.08 (28.3)
	UHP10-21	10 (3.0)		A	33.7	33.9	34.0	3.6	33	64	1.08 (28.3)
	UHP12-21	12 (3.7)		A	35.4	35.6	35.8	2.9	32	65	1.08 (28.3)
Air Dielectric Dual Polarized	**UHX8-21**	8 (2.4)	***7/8" EIA***	A	31.9	32.1	32.3	4.2	30	58	1.10 (26.4)
	UHX10-21A	10 (3.0)		A	33.8	34.0	34.2	3.6	32	62	1.10 (26.4)
	UHX12-21A	12 (3.7)		A	35.4	35.6	35.8	2.8	32	67	1.10 (26.4)
F-Series Unpressurized Single Polarized	**UHP8F-21**	8 (2.4)	***"F" Flange Female***	A	31.9	32.1	32.3	4.2	32	61	1.10 (26.4)
	UHP10F-21	10 (3.0)		A	33.7	33.9	34.0	3.6	33	64	1.10 (26.4)
	UHP12F-21	12 (3.7)		A	35.4	35.6	35.8	2.9	32	65	1.10 (26.4)
				A	37.4	37.6	37.8	2.2	30	59	1.08 (28.3)
F-Series Unpressurized Dual Polarized	**UHX8F-21**	8 (2.4)	***"F" Flange Female***	A	31.9	32.1	32.3	4.2	30	58	1.20 (20.8)
	UHX10F-21A	10 (3.0)		A	33.8	34.0	34.2	3.6	32	62	1.20 (20.8)
	UHX12F-21A	12 (3.7)		A	35.4	35.6	35.8	2.8	32	67	1.20 (20.8)
HP  **High Performance Antennas – Hypalon Radome Included**											
Air Dielectric Single Polarized	**HP6-21B**	6 (1.8)	***7/8" EIA***	B	29.5	29.7	29.9	5.5	30	46	1.10 (26.4)
	HP8-21B	8 (2.4)		A	32.0	32.2	32.4	4.1	30	53	1.08 (28.3)
	HP10-21B	10 (3.0)		A	33.9	34.1	34.3	3.4	32	55	1.08 (28.3)
	HP12-21B	12 (3.7)		A	35.5	35.7	35.9	2.9	32	56	1.08 (28.3)
	HP15-21B	15 (4.6)		A	37.4	37.6	37.8	2.2	30	59	1.08 (28.3)
F-Series Unpressurized Single Polarized	**HP6F-21B**	6 (1.8)	***"F" Flange Female***	B	29.4	29.6	29.8	5.5	30	46	1.12 (24.9)
	HP8F-21A	8 (2.4)		A	31.9	32.1	32.3	4.1	30	53	1.12 (24.9)
	HP10F-21A	10 (3.0)		A	33.8	34.0	34.2	3.4	32	55	1.12 (24.9)
	HP12F-21A	12 (3.7)		A	35.4	35.6	35.8	2.9	32	56	1.12 (24.9)
PL P  **Standard Antennas**											
Low VSWR Air Dielectric Single Polarized	**PL4-21C**	4 (1.2)	***7/8" EIA***	B	26.4	26.6	26.8	7.6	30	36	1.15 (23.1)
	PL6-21C	6 (1.8)		A	29.8	30.0	30.2	4.9	30	39	1.10 (26.4)
	PL8-21A	8 (2.4)		A	32.0	32.2	32.4	4.1	30	40	1.08 (28.3)
	PL10-21A	10 (3.0)		A	33.9	34.1	34.3	3.3	30	44	1.08 (28.3)
	PL12-21A	12 (3.7)		A	35.5	35.7	35.9	2.8	30	46	1.08 (28.3)
	PL15-21A	15 (4.6)		A	37.4	37.6	37.8	2.2	30	50	1.08 (28.3)
F-Series Unpressurized Single Polarized	**P4F-21D**	4 (1.2)	***"F" Flange Female***	B	26.4	26.6	26.8	7.6	30	36	1.15 (23.1)
	P6F-21C	6 (1.8)		A	29.8	30.0	30.2	4.9	30	39	1.12 (24.9)
	P6F-21CB	6 (1.8)		B	29.5	29.7	29.9	5.3	30	37	1.12 (24.9)
	P8F-21C	8 (2.4)		A	32.3	32.5	32.7	3.8	30	40	1.12 (24.9)
	P10F-21C	10 (3.0)		A	34.0	34.2	34.4	3.4	30	44	1.12 (24.9)
KP  **GRIDPAK® Antennas****											
Air Dielectric Single Polarized	**KP4-21**	4 (1.2)	***7/8" EIA***	–	26.5	26.7	26.9	7.9	29	32	1.20 (20.8)
	KP6-21	6 (2.0)		A	30.3	30.5	30.7	5.3	32	36	1.10 (26.4)
	KP8-21	8 (2.4)		A	32.0	32.2	32.4	4.0	35	39	1.08 (28.3)
	KP10-21	10 (3.0)		A	33.8	34.0	34.2	3.2	35	41	1.08 (28.3)
	KP13-21	13 (4.0)		A	36.3	36.5	36.7	2.4	30	40	1.08 (28.3)
	GPL15-21A***	15 (4.6)		A	37.4	37.6	37.8	2.2	40	46	1.08 (28.3)
F-Series Unpressurized Single Polarized	**KP4F-21**	4 (1.2)	***"F" Flange***		26.4	26.6	26.8	7.9	29	32	1.30 (17.7)
	KP6F-21	6 (2.0)	***Female,***	A	30.2	30.4	30.6	5.3	32	36	1.15 (23.1)
	KP8F-21	8 (2.4)	7/8" EIA or	A	31.9	32.1	32.3	4.0	35	39	1.15 (23.1)
	KP10F-21	10 (3.0)	Type N	A	33.7	33.9	34.1	3.2	35	41	1.15 (23.1)
	KP13F-21	13 (4.0)	Female	A	36.2	36.4	36.6	2.4	30	40	1.15 (23.1)
	GP15F-21***	15 (4.6)		A	37.4	37.6	37.8	2.2	40	46	1.15 (23.1)

† U.S. FCC Part 94. FCC Standards for Common Carrier Service (Part 21).
** Factory assembly available for an additional charge.
*** 15 foot antennas are welded construction

Microwave Antennas

2.3 - 2.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
FP  **Focal Plane Antennas**											
Air Dielectric Single Polarized	**FP4-23D**	4 (1.2)	*7/8" EIA*	–	26.2	26.5	26.9	7.7	30	40	1.20 (20.8)
	FP6-23D	6 (1.8)		–	29.8	30.4	30.6	5.3	28	41	1.15 (23.1)
	FP8-23D	8 (2.4)		–	32.6	32.7	33.0	4.1	30	52	1.10 (26.4)
	FP10-23D	10 (3.0)		–	34.7	34.8	35.3	3.4	30	53	1.08 (28.3)
	FP12-23D	12 (3.7)		–	35.8	36.4	36.6	2.8	30	57	1.08 (28.3)
Dual Polarized	**FPX6-23C**	6 (1.8)	*7/8" EIA*	–	28.9	29.2	29.6	5.5	27	41	1.15 (23.1)
	FPX8-23C	8 (2.4)		–	31.5	31.8	32.3	4.1	28	52	1.10 (26.4)
	FPX10-23C	10 (3.0)		–	33.8	33.9	34.2	3.3	29	54	1.08 (28.3)
	FPX12-23C	12 (3.7)		–	35.5	35.6	35.9	2.7	30	56	1.08 (28.3)
F-Series Unpressurized Single Polarized	**FP4F-23D**	4 (1.2)	*"F" Flange Female*	–	26.1	26.4	26.8	7.7	30	40	1.30 (17.7)
	FP6F-23D	6 (1.8)		–	29.7	30.3	30.5	5.3	28	41	1.25 (19.0)
	FP8F-23D	8 (2.4)		–	32.5	32.6	32.9	4.1	30	52	1.20 (20.8)
	FP10F-23D	10 (3.0)		–	34.6	34.7	35.2	3.4	30	53	1.15 (23.1)
	FP12F-23D	12 (3.7)		–	35.7	36.3	36.5	2.8	30	57	1.15 (23.1)
PL P  **Standard Antennas**											
Low VSWR Air Dielectric Single Polarized	**PL6-23D**	6 (1.8)	*7/8" EIA*	–	30.5	30.8	31.2	4.8	28	36	1.10 (26.4)
	PL8-23D	8 (2.4)		–	33.0	33.4	33.7	3.5	30	39	1.08 (28.3)
	PL10-23D	10 (3.0)		–	34.9	35.3	35.7	2.8	30	42	1.08 (28.3)
	PL12-23D	12 (3.7)		–	36.5	37.0	37.2	2.5	30	44	1.08 (28.3)
F-Series Unpressurized Single Polarized	**P2F-23A**	2 (0.6)		–	20.1	20.5	20.9	12.8	24	25	1.25 (19.0)
	P4F-23F	4 (1.2)	*"F" Flange Female*	–	26.9	27.3	27.6	6.9	32	36	1.20 (20.8)
	P6F-23E	6 (1.8)		–	30.4	30.8	31.2	4.7	32	36	1.20 (20.8)
	P8F-23E	8 (2.4)		–	33.0	33.4	33.8	3.5	30	39	1.15 (23.1)
	P10F-23E	10 (3.0)		–	34.9	35.3	35.6	3.0	30	44	1.15 (23.1)
	P12F-23E	12 (3.7)		–	36.5	36.9	37.2	2.5	32	47	1.15 (23.1)
KP  **GRIDPAK® Antennas****											
Air Dielectric Single Polarized	**KP4-23A**	4 (1.2)	*7/8" EIA*	–	27.3	27.6	27.9	6.9	30	30	1.20 (20.8)
	KP6-23B	6 (1.8)		–	31.1	31.4	31.7	4.5	30	36	1.10 (26.4)
	KP8-23B	8 (2.4)		A	32.7	33.0	33.2	3.4	30	35	1.08 (28.3)
	KP10-23B	10 (3.0)		A	34.6	34.9	35.2	3.0	30	38	1.08 (28.3)
	KP13-23B	13 (4.0)		–	37.1	37.3	37.6	2.4	30	38	1.08 (28.3)
F-Series Unpressurized Single Polarized	**KP4F-23A**	4 (1.2)	*"F" Flange*	–	27.2	27.5	27.8	6.9	30	30	1.30 (17.7)
	KP6F-23B	6 (1.8)	*Female,* 7/8" EIA	–	31.0	31.3	31.6	4.5	30	36	1.20 (20.8)
	KP8F-23B	8 (2.4)	or	A	32.6	32.9	33.1	3.4	30	35	1.15 (23.1)
	KP10F-23B	10 (3.0)	Type N	A	34.5	34.8	35.1	3.0	30	38	1.15 (23.1)
	KP13F-23B	13 (4.0)	Female	–	37.0	37.2	37.5	2.4	30	38	1.15 (23.1)

† U.S. FCC Part 94, Category A. Also meets Industry Canada SRSP -302.2 Specification

** Factory assembly available for an additional charge.

Continued on next page

2.3 - 2.5 GHz *(Continued)*

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
KPR  **GRIDPAK® Antennas – Rural Telephony**										
Unpressurized Single Polarized	**KPR3F-23**	3 (0.9)	***Type N Female*** or 7/8" EIA, F Flange Female, 7-16 DIN Female	24.2	23.6	23.6	8.7V/7.9H	25	24	1.35 (16.5)
	KPR4F-23	4 (1.2)		27.3	27.8	27.6	6.4V/6.4H	28	30	1.35 (16.5)
	KPR6F-23	6 (1.8)		30.9	31.4	31.3	4.2V/4.2H	30	35	1.35 (16.5)
	KPR8F-23	8 (2.4)		32.6	32.5	32.9	3.4V/3.4H	30	36	1.30 (17.7)
	KPR10F-23	10 (3.0)		34.0	33.8	34.1	2.9V/2.9H	30	38	1.30 (17.7)
	KPR13F-23	13 (4.0)		36.6	37.0	37.1	2.3V/2.3H	30	40	1.30 (17.7)

2.45 - 2.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P  **Standard Antennas**											
F-Series Unpressurized Single Polarized	**P6F-24C**	6 (1.8)	***"F" Flange Female***	B	30.9	31.0	31.1	4.3	28	36	1.30 (17.7)
	P8F-24C	8 (2.4)		A	33.4	33.5	33.6	3.2	28	39	1.30 (17.7)

† U.S. FCC Part 94

2.48 - 2.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP  **High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**											
Air Dielectric Single Polarized	**HP4-25A**	4 (1.2)	***7/8" EIA***		27.0	27.3	27.6	6.7	30	43	1.15 (23.1)
	HP6-25E	6 (1.8)		*	31.2	31.5	31.8	4.6	28	50	1.10 (26.4)
	HP8-25D	8 (2.4)		*	33.7	34.0	34.3	3.1	30	52	1.08 (28.3)
	HP10-25D	10 (3.0)		*	35.7	36.0	36.3	2.7	30	55	1.08 (28.3)
	HP12-25D	12 (3.7)		*	37.2	37.5	37.8	2.3	30	54	1.08 (28.3)
FP FPX  **Focal Plane Antennas**											
Air Dielectric Single Polarized	**FP4-25D**	4 (1.2)	***7/8" EIA***	-	26.9	27.2	27.6	7.2	30	41	1.20 (20.8)
	FP6-25D	6 (1.8)		-	30.6	30.7	31.1	4.9	28	44	1.15 (23.1)
	FP8-25D	8 (2.4)		-	33.0	33.5	33.6	3.9	30	52	1.10 (26.4)
	FP10-25D	10 (3.0)		-	35.3	35.6	35.9	3.2	30	55	1.08 (28.3)
	FP12-25D	12 (3.7)		-	36.6	37.0	37.4	2.6	30	57	1.08 (28.3)
Air Dielectric Dual Polarized	**FPX6-25C**	6 (1.8)	***7/8" EIA***	-	29.6	30.0	30.3	5.0	27	42	1.15 (23.1)
	FPX8-25C	8 (2.4)		-	32.3	32.6	32.7	3.9	27	52	1.10 (26.4)
	FPX10-25C	10 (3.0)		-	34.2	34.6	34.9	3.1	30	54	1.08 (28.3)
	FPX12-25C	12 (3.7)		-	35.9	36.3	36.8	2.6	30	56	1.08 (28.3)
F-Series Unpressurized Single Polarized	**FP4F-25D**	4 (1.2)	***"F" Flange Female***	-	26.8	27.1	27.5	7.2	30	41	1.30 (17.7)
	FP6F-25D	6 (1.8)		-	30.5	30.6	31.0	4.9	28	44	1.25 (19.0)
	FP8F-25D	8 (2.4)		-	32.9	33.4	33.5	3.9	30	52	1.20 (20.8)
	FP10F-25D	10 (3.0)		-	35.2	35.5	35.8	3.2	30	55	1.15 (23.1)
	FP12F-25D	12 (3.7)		-	36.5	36.9	37.3	2.6	30	57	1.15 (23.1)

* Satisfy U.S. FCC requirements on Parts 94 and 74. † Part 94

Continued on next page

2.48 - 2.7 GHz (Continued)

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P PL 	**Standard Antennas**										
Air Dielectric	**PL4-25**	4 (1.2)	***7/8" EIA***		27.6	27.5	28.2	6.3	30	32	1.15 (23.1)
Single	**PL6-25D**	6 (1.8)		*	31.2	31.5	31.8	4.2	28	36	1.10 (26.4)
Polarized	**PL8-25D**	8 (2.4)		*	33.7	34.0	34.3	3.1	30	39	1.08 (28.3)
	PL10-25D	10 (3.0)		*	35.7	36.0	36.3	2.7	30	42	1.08 (28.3)
	PL12-25D	12 (3.7)		*	37.2	37.5	37.8	2.2	30	44	1.08 (28.3)
F-Series	**P4F-25E**	4 (1.2)	***"F"***	*	27.6	27.9	28.2	6.3	30	32	1.20 (20.8)
Unpressurized	**P6F-25D**	6 (1.8)	***Flange***	*	31.1	31.4	31.7	4.2	28	36	1.20 (20.8)
Single	**P8F-25D**	8 (2.4)	***Female***	*	33.6	33.9	34.2	3.1	30	39	1.15 (23.1)
Polarized	**P10F-25D**	10 (3.0)		*	35.6	35.9	36.2	2.7	30	42	1.15 (23.1)
	P12F-25D	12 (3.7)		*	37.1	37.4	37.7	2.2	30	44	1.15 (23.1)
KP 	**GRIDPAK® Antennas****										
Air Dielectric	**KP4-25A**	4 (1.2)	***7/8" EIA***	*	27.9	28.3	28.7	6.1	30	31	1.20 (20.8)
Single	**KP6-25B**	6 (2.0)		*	31.7	32.1	32.5	4.0	30	35	1.10 (26.4)
Polarized	**KP8-25B**	8 (2.4)		*	33.2	33.7	33.9	3.2	30	37	1.08 (28.3)
	KP10-25B	10 (3.0)		*	35.2	35.6	36.0	2.7	31	38	1.08 (28.3)
	KP13-25B	13 (4.0)		*	37.6	37.9	38.1	2.3	30	38	1.08 (28.3)
F-Series	**KP4F-25A**	4 (1.2)	***"F" Flange***	*	27.8	28.2	28.6	6.1	30	31	1.30 (17.7)
Unpressurized	**KP6F-25B**	6 (2.0)	***Female,***	*	31.6	32.0	32.4	4.0	30	35	1.20 (20.8)
Single	**KP8F-25B**	8 (2.4)	7/8" EIA	*	33.1	33.6	33.8	3.2	30	37	1.15 (23.1)
Polarized	**KP10F-25B**	10 (3.0)	or Type N	*	35.1	35.5	35.9	2.7	31	38	1.15 (23.1)
	KP13F-25B	13 (4.0)	Female	*	37.5	37.8	38.0	2.3	30	38	1.15 (23.1)

* Satisfy U.S. FCC requirements on Parts 94 and 74. † Part 94
** Factory assembly available for an additional charge.

Refer to Page 78 for Elliptical Waveguide Ordering Information

3.4 - 3.9 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX®  **Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX8-34D**	8 (2.4)	***CPR229G***	36.2	36.9	37.5	2.4	30	62	1.06 (30.7)
	UHX10-34D	10 (3.0)	or	38.1	38.8	39.4	1.8	30	62	1.06 (30.7)
	UHX12-34D	12 (3.7)	PDR40	39.6	40.4	41.0	1.5	30	65	1.06 (30.7)
	UHX15-34D	15 (4.6)		41.6	42.3	42.9	1.2	30	66	1.06 (30.7)
NEW! **HSX**  **High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX8-34**	8 (2.4)	***CPR229G***	36.1	36.6	37.1	2.4	40	67	1.06 (30.7)
	HSX10-34	10 (3.0)		37.7	38.2	38.7	1.8	40	69	1.06 (30.7)
	HSX12-34	12 (3.7)		39.6	40.1	40.6	1.5	40	70	1.06 (30.7)
	HSX15-34	15 (4.6)		41.6	42.1	42.6	1.2	40	72	1.06 (30.7)
FP  **Focal Plane Antennas**										
Single Polarized	**FP10-34**	10 (3.0)	***PDR40***	37.0	38.3	38.8	1.9	28	60	1.06 (30.7)
	FP12-34	12 (3.7)	or CPR229G	39.3	39.8	40.3	1.6	29	62	1.06 (30.7)

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)	VSWR, max.** (R.L. dB) Up to 300 ft (90 m)
Premium Waveguide Assemblies							
3.4-3.9	**EWP34-34**	CPR229G	**134DET**		**55001-229**	**F229PC0240CS**	1.10 (26.4)
3.54-4.2	**EWP34-35**	CPR229G	**134DET**	**134DEP-2**	**55001-229**	**F229PC0240CA**	1.08 (28.3)
		PDR40	**134DEMT**	**134DEMP-2**	**223306-40**	**F229MH0600HA**	1.08 (28.3)
3.6-4.2	**EWP34-36**	CPR229G	**134DET**		**55001-229**	**F229PC0240CA**	1.08 (28.3)
3.7-4.2	**EWP34-37**	CPR229G	**134DET**	**134DEP-1**	**55001-229**	**F229PC0240CA**	1.08 (28.3)
Standard Waveguide Assemblies			**Non-Tunable**				
3.1-3.6	**EW34**	CPR229G	**134DE**		**55001-229**	**F229PC0240CS**	1.20 (20.8)
3.4-3.9	**EW34**	CPR229G	**134DE**		**55001-229**	**F229PC0240CS**	1.15 (23.1)

* Contact Andrew for information on other frequency bands.
** VSWR, max. (R.L.,dB) Up to 300 ft (90 m). The indicated maximum characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m)*	**42396A-15**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Splice	**134DZ**
Grounding Kit with factory attached, one-hole lug	**204989-5**
Grounding Kit with factory attached, two-hole lug	**241088-5**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-25**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-10**
Grounding Kit with field attachable screw-on lug	**204989-35**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**26985A**
Bending Tool Kit. One each E and H Plane tool	**33586-11**
Connector Reattachment Kit	**33544-43**
Wall-Roof Feed Thru	**35849A-17**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	**204679-34**
5 in (127 mm) dia	**48939-34**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

Refer to Page 80 for Elliptical Waveguide Ordering Information

3.54 - 4.18 GHz Extended Bandwidth Antennas. Meet Canadian DOC Requirements.

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**									
Dual Polarized	**UHX8-35D**	8 (2.4)	***CPR229G***	36.1	36.8	37.5	2.4	30	65	1.06 (30.7)
	UHX10-35C	10 (3.0)	or	38.1	38.8	39.5	1.8	32	65	1.06 (30.7)
	UHX12-35D	12 (3.7)	PDR40	39.6	40.4	41.1	1.5	32	68	1.06 (30.7)
	UHX15-35C	15 (4.6)		41.6	42.3	43.0	1.2	30	65	1.06 (30.7)

3.6 - 4.2 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP 	**High Performance Antennas – Hypalon Radome Included**									
Single Polarized	**HP8-36**	8 (2.4)	***CPR229G***	36.4	37.1	37.7	2.5	30	59	1.10 (26.4)
	HP10-36	10 (3.0)	or	38.1	38.8	39.4	1.9	30	61	1.10 (26.4)
	HP12-36	12 (3.7)	PDR40	39.9	40.6	41.2	1.6	30	62	1.10 (26.4)
NEW!										
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**									
Dual Polarized High XPD	**HSX8-36A**	8 (2.4)	***CPR229G***	36.7	37.3	37.8	2.4	40	65	1.06 (30.7)
	HSX10-36A	10 (3.0)		38.3	38.9	39.4	1.9	40	68	1.06 (30.7)
	HSX12-36A	12 (3.7)		40.3	40.9	41.4	1.6	40	71	1.06 (30.7)
	HSX15-36A	15 (4.6)		42.1	42.7	43.2	1.2	40	71	1.06 (30.7)
FP FPX 	**Focal Plane Antennas**									
Single Polarized	**FP10-36**	10 (3.0)	***PDR40***	38.6	39.1	39.6	1.7	29	62	1.06 (30.7)
	FP12-36	12 (3.7)	or CPR229G	40.3	40.9	41.2	1.4	31	64	1.06 (30.7)
Dual Polarized	**FPX10-36**	10 (3.0)	***PDR40***	38.6	39.1	39.6	1.7	26	62	1.06 (30.7)
	FPX12-36	12 (3.7)	or CPR229G	40.3	40.9	41.2	1.4	27	64	1.06 (30.7)

3.7 - 4.2 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX8-37H**	8 (2.4)	***CPR229G***	A	36.8	37.4	37.6	2.4	33	66	1.06 (30.7)
	UHX10-37H	10 (3.0)	or	A	38.5	39.1	39.5	1.8	33	67	1.06 (30.7)
	UHX12-37H	12 (3.7)	PDR40	A	40.4	41.0	41.2	1.5	33	73	1.06 (30.7)
	UHX15-37H	15 (4.6)		A	42.1	42.7	43.1	1.2	33	73	1.06 (30.7)
PL PXL 	**Standard Antennas**										
Low VSWR Single Polarized	**PL6-37E**	6 (1.8)	***CPR229G***	–	34.5	35.0	35.5	3.0	30	40	1.07 (29.4)
	PL8-37D	8 (2.4)	or	–	36.7	37.3	37.8	2.4	30	42	1.06 (30.7)‡
	PL10-37D	10 (3.0)	PDR40	B	38.7	39.3	39.8	1.8	30	47	1.06 (30.7)‡
	PL12-37F	12 (3.7)		B	40.4	41.0	41.5	1.5	30	50	1.06 (30.7)‡
	PL15-37D	15 (4.6)		B	42.1	42.7	43.2	1.2	30	52	1.06 (30.7)‡
Low VSWR Dual Polarized	**PXL10-37D**	10 (3.0)	***CPR229G***	B	38.7	39.3	39.8	1.8	30	45	1.06 (30.7)
	PXL12-37E	12 (3.7)	or	B	40.4	41.0	41.1	1.5	30	48	1.06 (30.7)
	PXL15-37D	15 (4.6)	PDR40	B	42.1	42.7	43.0	1.2	30	52	1.06 (30.7)

† U.S. FCC Part 21. ‡ 1.05 (32.3) available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies						**VSWR 1.06 (30.7)****
3.7–4.2	**EWP37S**	CPR229G	**137DET**		**55001-229**	**F229PC0240CA**
Premium Waveguide Assemblies						**VSWR 1.08 (28.3)****
3.4–3.9	**EWP37-34*****	CPR229G	**137DET**		**55001-229**	**F229PC0240CS**
3.4-3.9	**EWP37-34**	PDR40	–	**137DEMP-3**	**223306-40**	**F229MH0600HS**
3.54–4.2	**EWP37-35**	CPR229G	**137DET**	**137DEP-2**	**55001-229**	**F229PC0240CA**
		PDR40		**137DEMP-2**	**223306-40**	**F229MH0600HA**
3.6–4.2	**EWP37-36**	CPR229G	**137DET**		**55001-229**	**F229PC0240CA**
3.7–4.2	**EWP37-37**	CPR229G	**137DET**	**137DEP-1**	**55001-229**	**F229PC0240CA**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
3.6–4.2	**EWP37**	CPR229G	**137DE**		**55001-229**	**F229PC0240CS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237
*** VSWR 1.10 (26.4)

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m)*	**42396A-4**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Round Member Adapter Kit of 10. Stainless stee	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	**205869**
Splice	**137DZ**
Grounding Kit with factory attached, one-hole lug	**204989-5**
Grounding Kit with factory attached, two-hole lug	**241088-5**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-25**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-10**
Grounding Kit with field attachable screw-on lug	**204989-35**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**31535**
Bending Tool Kit. One each E and H Plane tool	**33586-3**
Connector Reattachment Kit	**33544-24**
Wall-Roof Feed Thru Assembly	**35849A-8**
Waveguide Boot for Plates (below), 4 in (102 mm) dia.	**204679-37**
5 in (127 mm) dia	**48939-37**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 82 for Elliptical Waveguide Ordering Information

4.4 - 5.0 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**									
Single Polarized	**HP4-44A**	4 (1.2)	***UG-148C/U,***	30.0	32.6	33.1	3.8	30	56	1.10 (26.4)
	HP6-44F	6 (1.8)	CPR187G	36.0	36.6	37.1	2.5	30	62	1.06 (30.7)‡
	HP8-44E	8 (2.4)	or	38.7	39.3	39.8	1.8	30	65	1.06 (30.7)‡
	HP10-44E	10 (3.0)	PDR48	40.4	41.0	41.5	1.5	30	67	1.06 (30.7)‡
	HP12-44F	12 (3.7)		42.1	42.7	43.2	1.2	30	67	1.06 (30.7)‡
	HP15-44E	15 (4.6)		44.0	44.5	45.0	1.0	30	68	1.06 (30.7)‡
Dual Polarized	**HPX6-44E**	6 (1.8)	***UG-148C/U,***	35.8	36.3	36.8	2.5	30	60	1.06 (30.7)
	HPX8-44D	8 (2.4)	CPR187G	38.6	39.1	39.7	1.8	30	64	1.06 (30.7)
	HPX10-44D	10 (3.0)	or	39.8	40.3	40.9	1.5	30	66	1.06 (30.7)
	HPX12-44D	12 (3.7)	PDR48	41.9	42.5	43.0	1.2	30	67	1.06 (30.7)
NEW! **HSX** 	**High Performance Antennas – Super High Cross Polarization Discrimination**									
Dual Polarized High XPD	**HSX6-44B**	6 (1.8)	***CPR187G***	35.7	36.3	36.8	2.6	40	68	1.06 (30.7)
	HSX8-44B	8 (2.4)		38.2	38.8	39.3	1.9	40	70	1.06 (30.7)
	HSX10-44B	10 (3.0)		40.0	40.6	41.1	1.5	40	71	1.06 (30.7)
	HSX12-44B	12 (3.7)		41.7	42.2	42.8	1.2	40	74	1.06 (30.7)
	HSX15-44B	15 (4.6)		43.7	44.3	44.8	1.0	40	75	1.06 (30.7)
PL PXL 	**Standard Antennas**									
Low VSWR Single Polarized	**PL4-44E**	4 (1.2)	***UG-148C/U,***	32.4	33.0	33.5	3.7	30	40	1.08 (28.3)
	PL6-44E	6 (1.8)	CPR187G	36.0	36.6	37.1	2.5	30	44	1.06 (30.7)‡
	PL8-44E	8 (2.4)	or	38.7	39.3	39.8	1.8	30	45	1.06 (30.7)‡
	PL10-44E	10 (3.0)	PDR48	40.4	41.0	41.5	1.5	30	49	1.06 (30.7)‡
	PL12-44G	12 (3.7)		42.1	42.7	43.2	1.2	30	50	1.06 (30.7)‡
	PL15-44F	15 (4.6)		44.0	44.5	45.0	1.0	29	51	1.06 (30.7)‡
Dual Polarized	**PXL4-44**	4 (1.2)	***UG-148C/U,***	32.3	32.7	33.1	3.7	30	40	1.08 (28.3)
	PXL6-44	6 (1.8)	CPR187G	35.9	36.4	36.9	2.5	30	43	1.06 (30.7)
	PXL8-44	8 (2.4)	or	38.6	39.2	39.7	1.8	30	45	1.06 (30.7)
	PXL10-44	10 (3.0)	PDR48	40.3	40.9	41.2	1.5	30	50	1.06 (30.7)
	PXL12-44	12 (3.7)		42.0	42.6	43.1	1.2	30	51	1.06 (30.7)

‡ 1.05 (32.3) available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Fixed Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.07 (29.4)****
4.4–5.0	**EWP43**	UG-149/U†††	**143DCT**		**55000A-187**	**F187PA0240BA**
		CPR187G	**143DET**	**143SE**	**55001-187**	**F187PA0240CA**
		PDR48		**143SEM**	**223306-48**	**F187MH0600HA**
Standard Waveguide Assemblies						**VSWR 1.15 (23.1)****
4.4–5.0	**EW43**	PDR48		**143SEM**	**223306-48**	**F187MH0600HS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4 ft (1.22 m)*	**42396A-16**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for connector attachment	**EWFTK-43**
Splice	**143DZ**
Grounding Kit with factory attached, one-hole lug	**204989-10**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-28**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**31535**
Bending Tool Kit. One each E and H Plane tool	**33586-3**
Connector Reattachment Kit	**33544-45**
Wall-Roof Feed Thru	**35849A-7**
Waveguide Boot for Plates (below), 4 in (102 mm) dia.	**204679-43**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots
1	**204673-1**
1	**204673-2**
4	**204673-4**
8	**204673-8**

Refer to Page 85 for Elliptical Waveguide Ordering Information

5.6 - 6.2 GHz

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX®  **Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX10-56C**	10 (3.0)	***CPR137G*** or PDR70	42.5	42.9	43.3	1.1	36	72	1.06 (30.7)
	UHX12-56C	12 (3.7)		44.0	44.5	44.9	0.9	36	73	1.06 (30.7)
HPX  **High Performance Antennas – Hypalon Radome Included**										
Dual Polarized	**HPX8-56**	8 (2.4)	***CPR137G*** or PDR70	40.5	41.0	41.4	1.6	30	68	1.06 (30.7)
	HPX10-56	10 (3.0)		42.0	42.5	42.9	1.4	30	69	1.06 (30.7)
	HPX12-56	12 (3.7)		43.8	44.2	44.7	1.0	30	71	1.06 (30.7)

5.725 - 6.425 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
NEW! **HP**  **High Performance Antennas – Hypalon Radome Included**											
Single Polarized	**HP4-57W**	4 (1.2)	***CPR137G*** or PDR70	*	34.6	35.0	35.4	2.9	30	52	1.10 (26.4)
	HP6-57W	6 (1.8)		**	38.0	38.5	39.0	2.0	30	60	1.06 (30.7)
	HP8-57W	8 (2.4)		**	40.7	41.2	41.7	1.6	30	64	1.06 (30.7)
	HP10-57W	10 (3.0)		**	42.5	42.9	43.4	1.3	30	65	1.06 (30.7)
	HP12-57W	12 (3.7)		**	44.2	44.6	45.0	1.0	30	70	1.06 (30.7)
NEW! **P**  **Standard Antennas**											
Single Polarized	**P2-57W**	2 (0.6)	***CPR137G*** or PDR70	*	29.2	29.3	29.9	5.8	30	40	1.10 (26.4)
	P4-57W	4 (1.2)		*	34.6	35.0	35.4	2.9	30	40	1.10 (26.4)
	P6-57W	6 (1.8)		**	38.0	38.5	39.0	2.0	30	45	1.06 (30.7)
	P8-57W	8 (2.4)		**	40.7	41.2	41.7	1.6	30	47	1.06 (30.7)
	P10-57W	10 (3.0)		**	42.5	42.9	43.4	1.3	30	50	1.06 (30.7)
	P12-57W	12 (3.7)		**	44.2	44.6	45.0	1.0	30	51	1.06 (30.7)

* FCC Part 15 ** FCC Part 15 and Part 21, Category B

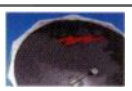
5.925 - 6.425 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HDX  **High Performance, Dual Beam Antennas – TEGLAR® Long Life Radome Included**											
Dual Polarized	**HDX8-59***	8 (2.4)	***CPR137G***	A	41.2	41.5	41.8	1.4	26 Main 18 Div.	73	1.06 (30.7)
	HDX10-59A*	10 (3.0)	***CPR137G***	A	42.9	43.2	43.4	1.1	26 Main 20 Div.	74	1.06 (30.7)
	HDX12-59*	12 (3.7)	***CPR137G***	A	44.6	45.0	45.4	1.0	26 Main 18 Div.	75	1.06 (30.7)

† U.S. FCC Part 21. * For unused waveguide port use termination load Type no. 62901-137 (see page 242).

Refer to Page 85 for Elliptical Waveguide Ordering Information

5.925 - 6.425 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX6-59J**	6 (1.8)	***CPR137G***	A	38.4	38.8	39.1	1.8	33	75	1.06 (30.7)
	UHX8-59H	8 (2.4)	or	A	40.9	41.3	41.6	1.4	33	77	1.06 (30.7)
	UHX10-59J	10 (3.0)	PDR70	A	42.9	43.2	43.6	1.1	34	80	1.06 (30.7)
	UHX12-59J	12 (3.7)		A	44.4	44.8	45.2	0.9	35	80	1.06 (30.7)
	UHX15-59H	15 (4.6)		A	46.1	46.4	46.8	0.8	34	80	1.06 (30.7)
HP HPX 	**High Performance Antennas – Hypalon Radome Included**										
Single Polarized	**HP6-59H**	6 (1.8)	***CPR137G***	A	38.7	38.9	39.4	1.8	30	62	1.06 (30.7)
	HP8-59E	8 (2.4)	or	A	41.1	41.5	41.9	1.4	30	66	1.06 (30.7)‡
	HP10-59E	10 (3.0)	PDR70	A	42.9	43.3	43.6	1.1	30	69	1.06 (30.7)‡
	HP12-59E	12 (3.7)		A	44.7	45.0	45.2	0.9	30	71	1.06 (30.7)‡
	HP15-59D	15 (4.6)		A	46.1	46.4	46.8	0.8	30	71	1.06 (30.7)‡
Dual Polarized	**HPX6-59G**	6 (1.8)	***CPR137G***	A	38.4	38.8	39.1	1.8	30	65	1.07 (29.4)
	HPX8-59E	8 (2.4)	or	A	40.9	41.3	41.6	1.4	30	69	1.06 (30.7)
	HPX10-59E	10 (3.0)	PDR70	A	42.7	43.1	43.5	1.1	30	71	1.06 (30.7)
	HPX12-59F	12 (3.7)		A	44.4	44.8	45.2	0.9	30	71	1.06 (30.7)
NEW!	**HPX15-59E**	15 (4.6)		A	46.1	46.4	46.8	0.8	30	71	1.06 (30.7)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX6-59A**	6 (1.8)	***CPR137G***	A	38.4	38.8	39.1	1.8	40	72	1.07 (29.4)
	HSX8-59A	8 (2.4)		A	40.9	41.3	41.6	1.4	40	74	1.06 (30.7)
	HSX10-59A	10 (3.0)		A	42.5	42.9	43.2	1.1	40	76	1.06 (30.7)
	HSX12-59A	12 (3.7)		A	44.4	44.7	45.0	0.9	40	78	1.06 (30.7)
	HSX15-59A	15 (4.6)		A	46.3	46.6	46.9	0.8	40	79	1.06 (30.7)
FP FPX 	**Focal Plane Antennas**										
Single Polarized	**FP8-59**	8 (2.4)	***PDR70***	–	40.3	40.6	40.8	1.4	28	64	1.06 (30.7)
	FP10-59	10 (3.0)		–	42.5	42.8	42.9	1.1	28	66	1.04 (34.2)
	FP12-59	12 (3.7)		–	44.2	44.6	44.7	0.9	28	68	1.04 (34.2)
Dual Polarized	**FPX8-59**	8 (2.4)	***PDR70***	–	40.1	40.4	40.6	1.4	27	64	1.07 (29.4)
	FPX10-59	10 (3.0)		–	42.3	42.6	42.7	1.1	28	66	1.06 (30.7)
NEW!	**FPX12-59**	12 (3.7)		–	44.0	44.4	44.5	0.9	28	68	1.06 (30.7)
PAR 	**Standard Antennas – Similar to PL ( ) -59 Series, Except Meet Category A**										
Single Polarized	**PAR6-59**	6 (1.8)	***CPR137G***	A	38.0	38.2	38.4	1.9	30	55	1.06 (30.7)
	PAR8-59	8 (2.4)	or	A	40.3	40.6	40.8	1.4	30	58	1.06 (30.7)
	PAR10-59A	10 (3.0)	PDR70	A	43.0	43.2	43.4	1.1	30	62	1.06 (30.7)
	PAR12-59A	12 (3.7)		A	44.2	44.6	44.9	0.9	30	63	1.06 (30.7)
PL PXL 	**Standard Antennas**										
Low VSWR Single Polarized	**PL4-59D**	4 (1.2)	***CPR137G,***	–	35.0	35.4	35.7	2.7	30	41	1.08 (28.3)
	PL6-59D	6 (1.8)	UG-343B/U	B	38.4	38.9	39.4	1.8	30	46	1.06 (30.7)
	PL8-59D	8 (2.4)	or PDR70	B	41.1	41.5	41.9	1.4	30	48	1.06 (30.7)‡
	PL10-59D	10 (3.0)		B	42.9	43.3	43.6	1.1	30	51	1.06 (30.7)‡
	PL12-59E	12 (3.7)		B	44.7	45.0	45.2	0.9	30	52	1.06 (30.7)‡
	PL15-59D	15 (4.6)		B	46.1	46.4	46.8	0.8	30	53	1.06 (30.7)‡
Low VSWR Dual Polarized	**PXL6-59E**	6 (1.8)	***CPR137G,***	B	38.4	38.7	39.1	1.8	30	46	1.07 (29.4)
	PXL8-59D	8 (2.4)	UG-343B/U	B	40.9	41.3	41.6	1.4	30	48	1.06 (30.7)
	PXL10-59D	10 (3.0)	or PDR70	B	42.7	43.1	43.5	1.1	30	49	1.06 (30.7)
	PXL12-59F	12 (3.7)		B	44.4	44.8	45.2	0.9	30	53	1.06 (30.7)
	PXL15-59E	15 (4.6)		B	46.1	46.4	46.8	0.8	30	54	1.06 (30.7)

† U.S. FCC Part 21. Part 101 will replace Part 21 effective June, 1997. †† Isolation is 50 dB minimum. ‡ 1.04 (34.2) available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies						VSWR 1.05 (32.3)**†
5.925–6.425	EWP52S	CPR159G	152DET		55001-159	F159PC0240CA
		UG-344/U†††	252DCT		55000A-137	F137PA0240BA
		CPR137G	252DET		55001-137	F137PC0240CA
		PDR70	252DEMT		223306-70	F137MH0600HA
Premium Waveguide Assemblies						VSWR 1.06 (30.7)**†
5.6–6.2	EWP52-56	CPR159G	152DET		55001-159	F159PC0240CG
		UG-344/U†††	252DCT		55000A-137	F137PA0240BG
		CPR137G	252DET	252DEP-3	55001-137	F137PC0240CG
		PDR70	252DEMT	252DEMP-3	223306-70	F137MH0600HG
5.85–6.425	EWP52-58	CPR159G	152DET		55001-159	F159PC0240CA
		UG-344/U†††	252DCT		55000A-137	F137PA0240BA
		CPR137G	252DET	252DEP-2	55001-137	F137PC0240CA
		PDR70	252DEMT	252DEMP-2	223306-70	F137MH0600HA
5.925–6.425	EWP52-59	CPR159G	152DET	152DEP-1	55001-159	F159PC0240CA
		UG-344/U†††	252DCT		55000A-137	F137PA0240BA
		CPR137G	252DET	252DEP-1	55001-137	F137PC0240CA
		PDR70	252DEMT	252DEMP-1	223306-70	F137MH0600HA
Standard Waveguide Assemblies			Non-Tunable			VSWR 1.15 (23.1)**†
5.85–6.425	EW52	CPR159G	152DE		55001-159	F159PC0240CS
		UG-344/U†††	252DC		55000A-137	F137PA0240BS
		CPR137G	252DE		55001-137	F137PC0240CS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
** 1.036 (35.0 dB) for lengths 150 ft (46 m) and shorter.
† "Tunable" connectors ordered with factory assemblies are factory tuned. "Pre-tuned" connectors are for field attachment only.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3.5 ft (1.07 m)*	42396A-8
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	EWFTK-52
Splice	152DZ
Grounding Kit with factory attached, one-hole lug	204989-4
Grounding Kit with factory attached, two-hole lug	241088-4
Grounding Kit with field attachable crimp-on, one-hole lug	204989-24
Grounding Kit with field attachable crimp-on, two-hole lug	241088-9
Grounding Kit with field attachable screw-on lug	204989-34
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	24312A
Bending Tool Kit. One each E and H Plane tool	33586-7
Connector Reattachment Kit	33544-38
Wall-Roof Feed Thru	35849A-14
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	204679-52
5 in (127 mm) dia	48939-52

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 89 for Elliptical Waveguide Ordering Information

5.925 - 7.125 GHz

NEW!

Polarization	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHP® UHX®	**Ultra High Performance/Wide Band Antennas – TEGLAR® Long Life Radome Included**										
Single Polarized	**UHP6-59W**	6 (1.8)	***CPR137G***	A/B*	38.4	39.3	39.9	1.8	35	75	1.06 (30.7)
	UHP8-59W	8 (2.4)	or	A	40.9	41.9	42.2	1.5	35	78	1.06 (30.7)
	UHP10-59W	10 (3.0)	PDR70	A	42.4	43.3	43.7	1.3	35	78	1.06 (30.7)
	UHP12-59W	12 (3.7)		A	44.3	45.2	45.5	1.0	35	80	1.06 (30.7)
Dual Polarized	**UHX6-59W**	6 (1.8)	***CPR137G***	A/B*	38.2	39.0	39.6	1.8	36	67	1.08 (28.3)
	UHX8-59W	8 (2.4)	or	A	41.0	41.7	42.3	1.4	36	68	1.08 (28.3)
	UHX10-59W	10 (3.0)	PDR70	A	42.5	43.2	43.8	1.2	36	71	1.08 (28.3)
	UHX12-59W	12 (3.7)		A	44.1	44.8	45.4	1.0	36	74	1.08 (28.3)

† U.S. FCC Part 21 and Part 94. Part 101 will replace Part 21 and 94 effective June, 1997.
* These antennas meet Category A under Part 94 and Part 101, and Category B under Part 21.

6.425 - 7.125 GHz, Dual Beam Antennas

Polarization	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HDH HDV	**High Performance, Dual-Beam (Angle Diversity) Antennas – Hypalon Radome Included**										
Horizontal	**HDH6-65**	6 (1.8)	***CPR137G***	B	39.4	39.7	40.0	1.9	Main 30 Div. 25	60	1.08 (28.3)
Vertical	**HDV6-65**	6 (1.8)	***CPR137G***	B	39.4	39.7	40.0	1.9	Main 29 Div. 23	65	1.08 (28.3)
Horizontal	**HDH8-65**	8 (2.4)	***CPR137G***	A	42.1	42.4	42.7	1.5	Main 30 Div. 24	65	1.06 (30.7)
Vertical	**HDV8-65**	8 (2.4)	***CPR137G***	A	42.1	42.4	42.7	1.5	Main 30 Div. 21	62	1.06 (30.7)
Horizontal	**HDH10-65**	10 (3.0)	***CPR137G***	A	43.6	43.9	44.2	1.2	Main 26 Div. 23	66	1.06 (30.7)
Vertical	**HDV10-65**	10 (3.0)	***CPR137G***	A	43.6	43.9	44.2	1.2	Main 30 Div. 20	66	1.06 (30.7)
Horizontal	**HDH12-65**	12 (3.7)	***CPR137G***	A	45.0	45.3	45.6	0.9	Main 30 Div. 24	70	1.06 (30.7)
Vertical	**HDV12-65**	12 (3.7)	***CPR137G***	A	45.0	45.3	45.6	0.9	Main 30 Div. 20	67	1.06 (30.7)

Polarization	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
PDH PDV	**P Standard, Dual-Beam (Angle Diversity) Antennas**										
Horizontal	**PDH6-65**	6 (1.8)	***CPR137G***	–	39.4	39.7	40.0	1.9	Main 30 Div. 24	46	1.08 (28.3)
Vertical	**PDV6-65**	6 (1.8)	***CPR137G***	–	39.4	39.7	40.0	1.9	Main 29 Div. 21	54	1.08 (28.3)
Horizontal	**PDH8-65**	8 (2.4)	***CPR137G***	B	42.1	42.4	42.7	1.5	Main 30 Div. 24	55	1.06 (30.7)
Vertical	**PDV8-65**	8 (2.4)	***CPR137G***	A	42.1	42.4	42.7	1.5	Main 30 Div. 20	55	1.06 (30.7)
Horizontal	**PDH10-65**	10 (3.0)	***CPR137G***	A	43.6	43.9	44.2	1.2	Main 30 Div. 23	60	1.06 (30.7)
Vertical	**PDV10-65**	10 (3.0)	***CPR137G***	A	43.6	43.9	44.2	1.2	Main 30 Div. 20	60	1.06 (30.7)
Horizontal	**PDH12-65**	12 (3.7)	***CPR137G***	A	45.0	45.3	45.6	0.9	Main 30 Div. 24	53	1.06 (30.7)
Vertical	**PDV12-65**	12 (3.7)	***CPR137G***	A	45.0	45.3	45.6	0.9	Main 30 Div. 20	60	1.06 (30.7)

† U.S. FCC Part 94. Part 101 will replace Part 94 effective June, 1997.

Refer to Page 89 for Elliptical Waveguide Ordering Information

6.425 - 7.125 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX6-65E**	6 (1.8)	***CPR137G***	B/A*	39.1	39.5	40.0	1.7	30	70	1.06 (30.7)
	UHX8-65E	8 (2.4)	or	A	41.6	42.0	42.4	1.3	30	76	1.06 (30.7)
	UHX10-65E	10 (3.0)	PDR70	A	43.6	44.0	44.4	1.0	32	80	1.06 (30.7)
	UHX12-65J	12 (3.7)		A	45.2	45.7	46.1	0.9	38	78	1.06 (30.7)
	UHX15-65E	15 (4.6)		A	46.6	46.9	47.3	0.7	30	75	1.06 (30.7)
HP HPX 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR) Radome Included**										
Single Polarized	**HP4-65A**	4 (1.2)	***CPR137G***	–	35.5	36.0	36.4	2.7	30	58	1.08 (28.3)
	HP6-65F	6 (1.8)	or	B/A*	39.4	39.8	40.2	1.7	30	64	1.06 (30.7)
	HP8-65E	8 (2.4)	PDR70	A	41.9	42.3	42.8	1.3	30	66	1.06 (30.7)‡
	HP10-65E	10 (3.0)		A	43.6	43.9	44.3	1.0	27	70	1.06 (30.7)‡
	HP12-65E	12 (3.7)		A	45.2	45.6	46.1	0.8	30	71	1.06 (30.7)‡
	HP15-65D	15 (4.6)		A	46.8	47.1	47.6	0.7	30	71	1.06 (30.7)‡
Dual Polarized	**HPX4-65A**	4 (1.2)	***CPR137G***	–	35.4	35.9	36.3	2.7	30	58	1.08 (28.3)
	HPX6-65E	6 (1.8)	or	B/A*	39.1	39.5	39.9	1.7	30	64	1.07 (29.4)
	HPX8-65D	8 (2.4)	PDR70	A	41.6	42.0	42.4	1.3	34	68	1.06 (30.7)
	HPX10-65D	10 (3.0)		A	43.6	44.0	44.4	1.0	34	70	1.06 (30.7)
	HPX12-65D	12 (3.7)		A	45.0	45.4	45.9	0.8	30	71	1.06 (30.7)
NEW!	**HPX15-65D**	15 (4.6)		A	46.6	46.9	47.3	0.7	30	71	1.06 (30.7)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX6-64A**	6 (1.8)	***CPR137G***	B/A*	39.1	39.6	40.0	1.7	40	70	1.07 (29.4)
	HSX8-64A	8 (2.4)		A	41.6	42.0	42.4	1.3	40	75	1.06 (30.7)
	HSX10-64A	10 (3.0)		A	43.2	43.6	44.0	1.0	40	77	1.06 (30.7)
	HSX12-64A	12 (3.7)		A	45.2	45.7	46.1	0.8	40	78	1.06 (30.7)
	HSX15-64A	15 (4.6)		A	46.9	47.4	47.8	0.7	40	79	1.06 (30.7)
FP FPX 	**Focal Plane Antennas**										
Single Polarized	**FP6-64**	6 (1.8)	***PDR70***	–	38.2	38.6	38.8	1.8	28	57	1.07 (29.4)
	FP8-64	8 (2.4)		–	41.1	41.5	41.8	1.3	30	64	1.06 (30.7)
	FP10-64	10 (3.0)		–	43.2	43.3	43.8	1.0	27	66	1.04 (34.2)
	FP12-64	12 (3.7)		–	44.9	45.3	45.5	0.8	30	68	1.04 (34.2)
Dual Polarized	**FPX6-64**	6 (1.8)	***PDR70***	–	38.0	38.4	38.6	1.8	28	57	1.08 (28.3)
	FPX8-64	8 (2.4)		–	40.8	41.2	41.4	1.3	30	64	1.07 (29.4)
	FPX10-64	10 (3.0)		–	43.0	43.4	43.6	1.0	30	66	1.06 (30.7)
	FPX12-64	12 (3.7)		–	44.8	45.2	45.4	0.8	30	68	1.06 (30.7)

† U. S. FCC Parts 94 and 74. Part 101 will replace Part 94 effective June,1997.

* These antennas meet Category B under FCC Part 94 and Category A under Part 101.

** Isolation is 50 dB.

‡ 1.04 (34.2) available on request.

Continued on next page

Refer to Page 89 for Elliptical Waveguide Ordering Information

6.425 - 7.125 GHz (Continued)

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
PL PXL  **Standard Antennas**											
Low VSWR Single Polarized	**PL4-65D**	4 (1.2)	***CPR137G,***	–	35.8	36.3	36.7	2.5	30	43	1.08 (28.3)
	PL6-65D	6 (1.8)	UG-343B/U	B	39.3	39.8	40.2	1.7	30	47	1.06 (30.7)
	PL8-65D	8 (2.4)	or PDR70	A/B*	41.9	42.3	42.8	1.3	30	49	1.06 (30.7)‡
	PL10-65D	10 (3.0)		A/B*	43.6	43.9	44.3	1.0	30	52	1.06 (30.7)‡
	PL12-65E	12 (3.7)		A/B*	45.2	45.6	46.1	0.8	30	53	1.06 (30.7)‡
	PL15-65D	15 (4.6)		A/B*	46.8	47.1	47.6	0.7	30	54	1.06 (30.7)‡
Low VSWR Dual Polarized	**PXL6-65D**	6 (1.8)	***CPR137G,***	B	39.1	39.4	39.9	1.7	30	47	1.07 (29.4)
	PXL8-65D	8 (2.4)	UG-343B/U	A/B*	41.6	42.0	42.4	1.3	34	52	1.06 (30.7)
	PXL10-65D	10 (3.0)	or PDR70	A/B*	43.6	44.0	44.4	1.0	34	58	1.06 (30.7)
	PXL12-65E	12 (3.7)		A/B*	45.0	45.4	45.9	0.8	30	62	1.06 (30.7)
NEW!	**PXL15-65E**	15 (4.6)		A/B*	46.6	46.9	47.3	0.7	30	59	1.06 (30.7)
PAR  **Standard Antennas**											
Low VSWR Single Polarized	**PAR6-65A**	6 (1.8)	***CPR137G***	B/A**	38.7	38.8	39.0	1.8	30	59	1.06 (30.7)
	PAR8-65A	8 (2.4)	or PDR70	A	41.1	41.5	41.8	1.3	30	60	1.06 (30.7)
	PAR10-65	10 (3.0)		A	43.4	43.6	43.8	1.0	30	63	1.06 (30.7)
	PAR12-65	12 (3.7)		A	44.9	45.3	45.5	0.8	30	64	1.06 (30.7)

* These antennas meet Category A under Part 94 and Category B under Part 101
** This antenna meets Category B under Part 94 and Category A under Part 101
† U. S. FCC Parts 94 and 74. Part 101 will replace Part 94 effective June, 1997.
‡ 1.04 (34.2) available on request.

6.875 - 7.125 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P  **Standard Antennas**											
Single Polarized	**P6A-68**	6 (1.8)	***CPR137G***	A	39.3	39.5	39.7	1.5	30	51	1.10 (26.4)

† U. S. FCC Part 74.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies							**VSWR 1.05 (32.3)****
6.425–7.125	**EWP63S**	UG-344/U†††	**163DCT**	**163DCP-2**		**55000A-137**	**F137PA0240BS**
		CPR137G	**163DET**	**163DEP-2**		**55001-137**	**F137PC0240CB**
		PDR70			**163SEM**	**223306-70**	**F137MH0600HS**
Premium Waveguide Assemblies							**VSWR 1.06 (30.7)****
5.925–6.575	**EWP63-59**	UG-344/U†††	**163DCT**			**55000A-137**	**F137PA0240BA*****
		CPR137G	**163DET**			**55001-137**	**F137PC0240CA*****
		PDR70			**163SEM**	**223306-70**	**F137MH0600HA*****
5.925–7.125	**EWP63-59W**	UG-344/U†††	**163DCT**			**55000A-137**	**F137PA0240BA*****
		CPR137G	**163DET**			**55001-137**	**F137PC0240CA*****
		PDR70			**163SEM**	**223306-70**	**F137MH0600HA*****
							VSWR 1.05 (32.3)*
6.525–6.875	**EWP63-65N**	UG-344/U†††	**163DCT**	**163DCP-1**		**55000A-137**	**F137PA0240BS**
		CPR137G	**163DET**	**163DEP-1**		**55001-137**	**F137PC0240CA**
		PDR70			**163SEM**	**223306-70**	**F137MH0600HS**
							VSWR 1.06 (30.7)**
6.425–7.125	**EWP63-65**	UG-344/U†††	**163DCT**	**163DCP-2**		**55000A-137**	**F137PA0240BS**
		CPR137G	**163DET**	**163DEP-2**		**55001-137**	**F137PC0240CB**
		PDR70			**163SEM**	**223306-70**	**F137MH0600HS**
Standard Waveguide Assemblies			**Non-Tunable**				**VSWR 1.15 (23.1)****
6.425–7.125	**EW63**	UG-344/U†††	**163DC**			**55000A-137**	**F137PA0240BS**
		CPR137G	**163DE**			**55001-137**	**F137PC0240CB**
		PDR70			**163SEM**	**223306-70**	**F137MH0600HS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Low VSWR guaranteed for 5.925 to 6.425 GHz, nominal for 5.925 to 6.575 GHz.
† "Tunable" connectors ordered with factory assemblies are factory tuned. "Pre-tuned" connectors are for field attachment only.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-7**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	**EWFTK-63**
Splice	**163DZ**
Grounding Kit with factory attached, one-hole lug	**204989-4**
Grounding Kit with factory attached, two-hole lug	**241088-4**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-24**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-9**
Grounding Kit with field attachable screw-on lug	**204989-34**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**24312A**
Bending Tool Kit. One each E and H Plane tool	**33586-8**
Connector Reattachment Kit	**33544-33**
Wall-Roof Feed Thru	**35849A-6**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	**204679-63**
5 in (127 mm) dia	**48939-63**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 92 for Elliptical Waveguide Ordering Information

7.125 - 7.725 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
FP FPX 	**Focal Plane Antennas**									
Single Polarized	**FP4-71**	4 (1.2)	***PDR70***	34.9	35.2	35.4	2.2	25	52	1.10 (26.4)
	FP6-71	6 (1.8)		38.8	39.2	39.5	1.5	25	58	1.07 (29.4)
	FP8-71	8 (2.4)		42.0	42.3	42.4	1.1	26	65	1.06 (30.7)
	FP10-71	10 (3.0)		44.1	44.4	44.5	0.9	26	67	1.04 (34.2)
	FP12-71	12 (3.7)		45.7	46.1	46.2	0.7	28	69	1.04 (34.2)
Dual Polarized	**FPX6-71**	6 (1.8)	***PDR70***	38.8	39.2	39.5	1.5	25	58	1.08 (28.3)
	FPX8-71	8 (2.4)		41.8	42.1	42.3	1.1	26	65	1.07 (29.4)
	FPX10-71	10 (3.0)		43.9	44.2	44.3	0.9	26	67	1.06 (30.7)
	FPX12-71	12 (3.7)		45.5	45.9	46.0	0.7	28	69	1.06 (30.7)

*7.125 - 7.750 GHz**

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**									
Single Polarized	**HP6-71E**	6 (1.8)	***CPR137G***	40.1	40.5	40.9	1.5	28	65	1.06 (30.7)
	HP8-71D	8 (2.4)	or	42.6	43.0	43.3	1.1	30	67	1.06 (30.7)‡
	HP10-71D	10 (3.0)	PDR70	44.3	44.7	45.0	0.9	30	70	1.06 (30.7)‡
	HP12-71E	12 (3.7)		46.3	46.7	47.1	0.7	30	71	1.06 (30.7)‡
	HP15-71D	15 (4.6)		47.4	48.1	48.4	0.6	30	71	1.06 (30.7)‡
Single Polarized	**HP4-71G**	4 (1.2)	***CPR112G***	35.8	36.2	36.5	2.4	28	62	1.08 (28.3)
	HP6-71GF	6 (1.8)	or	39.7	40.0	40.3	1.5	30	66	1.06 (30.7)
	HP8-71GE	8 (2.4)	PDR84	42.3	42.5	42.9	1.1	30	68	1.06 (30.7)‡
	HP10-71GE	10 (3.0)		44.1	44.5	44.8	0.9	28	70	1.06 (30.7)‡
	HP12-71GF	12 (3.7)		45.6	46.0	46.3	0.7	30	71	1.06 (30.7)‡
	HP15-71GE	15 (4.6)		47.5	47.8	48.2	0.6	30	71	1.06 (30.7)‡
Dual Polarized	**HPX4-71A**	4 (1.2)	***CPR137G***	36.0	36.4	36.7	2.3	26	61	1.08 (28.3)
	HPX6-71F	6 (1.8)	or	40.0	40.4	40.7	1.5	25	65	1.07 (29.4)
	HPX8-71E	8 (2.4)	PDR70	42.4	42.9	43.2	1.1	30	67	1.06 (30.7)
	HPX10-71E	10 (3.0)		44.5	44.8	45.0	0.9	30	70	1.06 (30.7)
	HPX12-71E	12 (3.7)		45.7	46.1	46.4	0.8	28	71	1.06 (30.7)
	HPX15-71D	15 (4.6)		47.3	47.7	48.0	0.7	32	72	1.06 (30.7)
Dual Polarized	**HPX6-71GE**	6 (1.8)	***CPR112G***	39.5	39.9	40.2	1.6	30	66	1.06 (30.7)
	HPX8-71GD	8 (2.4)	or	42.1	42.5	42.8	0.9	30	67	1.06 (30.7)
			PDR84							

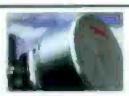
NEW!

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**									
Dual Polarized High XPD	**HSX4-71**	4 (1.2)	***CPR112G***	36.4	36.7	37.0	2.3	40	64	1.08 (28.3)
	HSX6-71	6 (1.8)		40.0	40.3	40.6	1.5	40	72	1.08 (28.3)
	HSX8-71	8 (2.4)		42.3	42.6	42.9	1.2	40	73	1.06 (30.7)
	HSX10-71	10 (3.0)		43.9	44.2	44.4	1.0	40	75	1.06 (30.7)
	HSX12-71	12 (3.7)		46.1	46.5	46.9	0.8	40	78	1.06 (30.7)
	HSX15-71	15 (4.6)		47.7	48.1	48.5	0.6	40	78	1.06 (30.7)

* 7.110-7.725 available on request.
‡ 1.04 (34.2) available on request.

Refer to Page 92 for Elliptical Waveguide Ordering Information

*7.125 - 7.750 GHz**

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
P,PL PX PXL  **Standard Antennas**										
Low VSWR Single Polarized	**PL4-71D**	4 (1.2)	***CPR137G,*** UG-343B/U or PDR70	36.7	37.0	37.3	2.2	30	46	1.08 (28.3)
	PL6-71E	6 (1.8)		40.1	40.5	40.9	1.5	30	48	1.06 (30.7)
	PL8-71E	8 (2.4)		42.6	43.0	43.3	1.1	30	50	1.06 (30.7)‡
	PL10-71F	10 (3.0)		44.3	44.7	45.0	0.9	30	52	1.06 (30.7)‡
	PL12-71H	12 (3.7)		46.3	46.7	47.1	0.7	30	54	1.06 (30.7)‡
	PL15-71E	15 (4.6)		47.7	48.1	48.4	0.6	30	55	1.06 (30.7)‡
Low VSWR Single Polarized	**PL4-71GD**	4 (1.2)	***CPR112G,*** UG-52B/U or PDR84	36.2	36.5	36.8	2.2	30	45	1.06 (30.7)
	PL6-71GD	6 (1.8)		39.7	40.0	40.3	1.5	30	48	1.06 (30.7)
	PL8-71GE	8 (2.4)		42.3	42.5	42.9	1.1	30	50	1.06 (30.7)‡
	PL10-71GE	10 (3.0)		44.1	44.5	44.8	0.9	30	52	1.06 (30.7)‡
	PL12-71GF	12 (3.7)		45.6	46.0	46.3	0.7	30	54	1.06 (30.7)‡
	PL15-71GD	15 (4.6)		47.5	47.8	48.2	0.6	30	57	1.06 (30.7)‡
Low VSWR Dual Polarized	**PXL6-71E**	6 (1.8)	***CPR137G,*** UG-343B/U or PDR70	40.0	40.4	40.7	1.5	30	48	1.07 (29.4)
	PXL8-71E	8 (2.4)		42.4	42.9	43.2	1.1	30	50	1.06 (30.7)
	PXL10-71F	10 (3.0)		44.5	44.8	45.0	0.9	30	52	1.06 (30.7)
	PXL12-71E	12 (3.7)		45.7	46.1	46.4	0.7	30	54	1.06 (30.7)
VHP  **ValuLine® Antennas – High Performance**										
Single Polarized	**VHP2-71**	2 (0.6)	†	29.8	30.1	30.4	4.9	30	53	1.15 (23.1)**
	VHP4-71	4 (1.2)		36.0	36.4	36.7	2.4	32	60	1.15 (23.1)**
Dual Polarized	**VHPX2-71**	2 (0.6	†	29.5	29.8	30.1	4.9	30	53	1.15 (23.1)**
	VHPX4-71	4 (1.2)		35.5	35.8	36.1	2.4	32	60	1.15 (23.1)**
VP  **ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-71**	2 (0.6)	†	30.6	31.0	31.4	4.9	30	40	1.15 (23.1)**
	VP4-71	4 (1.2)		36.8	37.2	37.5	2.4	32	45	1.15 (23.1)**

* 7.110-7.725 available on request.
** 1.10 (26.4) available on request.
‡ 1.04 (34.2) available on request.
† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.

Microwave Antennas

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Tunable	Connector† Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies							VSWR 1.06 (30.7)**
7.125–7.750	EWP64-71	UG-344/U†††	164DCT	164DCP-1		55000A-137	F137PA0240BC
		CPR137G	164DET	164DEP-1		55001-137	F137PA0240CC
		CPR112G	264DET	264DEP-1		55001-112	F137PA0240CA
		PDR70			164SEM	223306-70	F137MH0600HC
Standard Waveguide Assemblies			Non-Tunable				VSWR 1.15 (23.1)**
7.125–7.750	EW64	UG-344/U†††	164DC			55000A-137	F137PA0240BC
		CPR137G	164DE			55001-137	F137PA0240CC
		CPR112G	264DE			55001-112	F137PA0240CA
		PDR70			164SEM	223306-70	F137MH0600HC

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	42396A-1
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	202358
Splice	164DZ
Grounding Kit with factory attached, one-hole lug	204989-3
Grounding Kit with factory attached, two-hole lug	241088-3
Grounding Kit with field attachable crimp-on, one-hole lug	204989-23
Grounding Kit with field attachable crimp-on, two-hole lug	241088-8
Grounding Kit with field attachable screw-on lug	204989-33
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	29961
Bending Tool Kit. One each E and H Plane tool	33586-2
Connector Reattachment Kit	33544-35
Wall-Roof Feed Thru	35849A-12
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	204679-64
5 in (127 mm) dia	48939-64

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

Refer to Page 96 for Elliptical Waveguide Ordering Information

7.125 - 8.4 GHz

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon Radome Included**									
Single Polarized	**HP6-71WA**	6 (1.8)	***CPR112G***	39.7	40.3	41.1	1.5	30	66	1.06 (30.7)
	HP8-71W	8 (2.4)	or	42.3	42.9	43.6	1.1	30	68	1.06 (30.7)
	HP10-71W	10 (3.0)	PDR84	44.0	44.8	45.5	0.9	30	70	1.06 (30.7)
	HP12-71W	12 (3.7)		45.6	46.3	47.1	0.7	30	71	1.06 (30.7)
Dual Polarized	**HPX8-71W**	8 (2.4)	***CPR112G*** or PDR84	42.1	42.9	43.5	1.2	30	67	1.10 (26.4)
P 	**Standard Antennas**									
Single Polarized	**P4-71GD**	4 (1.2)	***UG-52B/U,***	36.2	36.8	37.5	2.2	30	45	1.10 (26.4)
	P6-71GD	6 (1.8)	CPR112G	39.7	40.3	41.1	1.5	30	48	1.10 (26.4)
	P8-71GF	8 (2.4)	or	42.3	42.9	43.6	1.1	30	52	1.10 (26.4)
	P10-71GF	10 (3.0)	PDR84	44.0	44.8	45.5	0.9	30	55	1.10 (26.4)
	P12-71GH	12 (3.7)		45.6	46.3	47.1	0.7	30	58	1.10 (26.4)
	P15-71GD	15 (4.6)		47.5	48.2	48.9	0.6	30	57	1.10 (26.4)

7.425 - 7.900 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**										
Single Polarized	**HP4-74GA**	4 (1.2)	***CPR112G***	*	36.5	36.7	37.0	2.3	32	61	1.06 (30.7)
	HP6-74GA	6 (1.8)	or	*	40.1	40.4	40.6	1.5	32	64	1.06 (30.7)
	HP8-74G	8 (2.4)	PDR84	*	42.5	42.8	43.0	1.2	32	70	1.04 (34.2)
	HP10-74G	10 (3.0)		*	43.8	44.0	44.2	1.0	32	70	1.04 (34.2)
Dual Polarized	**HPX4-74GA**	4 (1.2)	***CPR112G***	*	37.1	37.4	37.6	2.5	32	63	1.10 (26.4)
	HPX6-74GA	6 (1.8)	or	*	40.5	40.8	41.1	1.5	32	67	1.06 (30.7)
	HPX8-74G	8 (2.4)	PDR84	*	42.9	43.1	43.4	1.2	32	70	1.06 (30.7)
	HPX10-74G	10 (3.0)		*	44.3	44.7	45.0	1.1	30	68	1.06 (30.7)
NEW! **HSX** 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX4-74**	4 (1.2)	***CPR112G***	†	36.7	37.0	37.3	2.3	40	64	1.08 (28.3)
	HSX6-74	6 (1.8)		†	40.3	40.6	40.9	1.5	40	67	1.08 (28.3)
	HSX8-74	8 (2.4)		†	42.6	42.9	43.2	1.1	40	74	1.06 (30.7)
	HSX10-74	10 (3.0)		†	44.0	44.3	44.6	0.9	40	75	1.06 (30.7)
	HSX12-74	12 (3.7)		†	46.5	46.8	47.0	0.8	40	78	1.06 (30.7)
	HSX15-74	15 (4.6)		†	48.0	48.3	48.6	0.6	40	78	1.06 (30.7)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP2-74**	2 (0.6)	††	–	30.1	30.4	30.6	4.8	30	54	1.15 (23.1)‡
	VHP4A-74	4 (1.2)		–	36.4	36.6	36.9	2.3	32	62	1.15 (23.1)‡
	VHP4-74	4 (1.2)		†	36.2	36.4	36.7	2.3	32	62	1.15 (23.1)‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-74**	2 (0.6)	††	–	31.0	31.2	31.5	4.8	30	40	1.15 (23.1)‡
	VP4A-74	4 (1.2)		–	37.2	37.4	37.7	2.3	32	45	1.15 (23.1)‡

* MPT 1407, Part 3, Fig. 3.1.
‡ 1.10 (26.4) available on request.
† MPT 1407, Part 3, Fig 3.2
†† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.

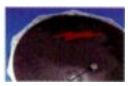
Refer to Page 96 for Elliptical Waveguide Ordering Information

7.725 - 8.275 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX®  **Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**											
Dual Polarized	**UHX6-77GE**	6 (1.8)	***CPR112G***	*	40.5	41.0	41.2	1.5	30	67	1.06 (30.7)
	UHX8-77GD	8 (2.4)	or	*	43.1	43.5	43.7	1.1	30	68	1.06 (30.7)
	UHX10-77GD	10 (3.0)	PDR84	*	44.9	45.2	45.4	0.9	30	70	1.06 (30.7)
	UHX12-77GD	12 (3.7)		*	46.4	46.7	46.9	0.7	30	75	1.06 (30.7)
NEW!	**UHX15-77GD**	15 (4.6)		*	48.4	48.7	48.9	0.6	30	70	1.06 (30.7)
HSX  **High Performance Antennas – Super High Cross Polarization Discrimination**											
Dual Polarized High XPD	**HSX6-77**	6 (1.8)	***CPR112G***	–	40.5	40.7	41.0	1.5	40	67	1.06 (30.7)
	HSX8-77	8 (2.4)		–	43.2	43.5	43.8	1.1	40	77	1.06 (30.7)
	HSX10-77	10 (3.0)		–	44.8	45.2	45.6	0.9	40	79	1.06 (30.7)
	HSX12-77	12 (3.7)		–	46.4	46.7	47.0	0.7	40	79	1.06 (30.7)
	HSX15-77	15 (4.6)		–	48.3	48.6	48.8	0.6	40	76	1.06 (30.7)

* Meets Canadian DOC Standard SRSP306, 7.725-8.5 GHz on request.

7.725 - 8.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
FP FPX  **Focal Plane Antennas**										
Single Polarized	**FP6-77G**	6 (1.8)	***PDR84***	40.2	40.6	40.8	1.5	30	60	1.07 (29.4)
	FP8-77G	8 (2.4)		42.9	43.3	43.5	1.1	26	64	1.06 (30.7)
	FP10-77G	10 (3.0)		44.9	45.3	45.4	0.9	30	66	1.04 (34.2)
	FP12-77G	12 (3.7)		46.5	46.9	47.0	0.7	28	68	1.04 (34.2)
Dual Polarized	**FPX6-77G**	6 (1.8)	***PDR84***	40.2	40.4	40.6	1.5	30	58	1.08 (28.3)

‡ 1.10 (26.4) available on request.

7.750 - 8.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP  **ValuLine® Antennas – High Performance**										
Single Polarized	**VHP2-77**	2 (0.6)	†	30.4	30.8	31.1	4.6	30	54	1.15 (23.1)‡
	VHP4-77	4 (1.2)		36.7	37.1	37.5	2.2	32	62	1.15 (23.1)‡
Dual Polarized	**VHPX2-77**	2 (0.6)	†	30.1	30.5	30.8	4.6	30	56	1.15 (23.1)‡
	VHPX4-77	4 (1.2)		36.1	36.5	36.8	2.2	32	62	1.15 (23.1)‡
VP  **ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-77**	2 (0.6)	†	31.3	31.7	32.1	4.6	30	40	1.15 (23.1)‡
	VP4-77	4 (1.2)		37.5	37.9	38.3	2.2	32	45	1.15 (23.1)‡

‡ 1.10 (26.4) available on request.
† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.

Refer to Page 96 for Elliptical Waveguide Ordering Information

*7.750 - 8.4 GHz**

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**									
Single Polarized	**HP4-77GA**	4 (1.2)	***CPR112G***	36.8	37.2	37.5	2.2	30	63	1.06 (30.7)
	HP6-77GF	6 (1.8)	or	40.3	40.8	41.1	1.5	30	68	1.06 (30.7)
	HP8-77GE	8 (2.4)	PDR84	42.9	43.3	43.6	1.1	30	68	1.06 (30.7)‡
	HP10-77GF	10 (3.0)		44.8	45.2	45.5	0.9	30	70	1.06 (30.7)‡
	HP12-77GF	12 (3.7)		46.3	46.7	47.1	0.7	30	71	1.06 (30.7)‡
	HP15-77GE	15 (4.6)		48.2	48.5	48.9	0.6	30	71	1.06 (30.7)‡
PL 	**Standard Antennas**									
Low VSWR Single Polarized	**PL4-77GD**	4 (1.2)	***CPR112G***	36.8	37.2	37.5	2.2	30	45	1.06 (30.7)
	PL6-77GE	6 (1.8)	or	40.3	40.8	41.1	1.5	30	48	1.06 (30.7)
	PL8-77GE	8 (2.4)	PDR84	42.9	43.3	43.6	1.1	30	50	1.06 (30.7)‡
	PL10-77GD	10 (3.0)		44.8	45.2	45.5	0.9	30	58	1.06 (30.7)‡
	PL12-77GF	12 (3.7)		46.3	46.7	47.1	0.7	30	54	1.06 (30.7)‡
	PL15-77GD	15 (4.6)		48.2	48.5	48.9	0.6	30	57	1.06 (30.7)‡

*7.725-8.275 or 7.725-8.5 GHz available on request ‡ 1.04 (34.2) available on request.

8.2 - 8.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon Radome Included**									
Single Polarized	**HP6-82D**	6 (1.8)	***CPR112G***	40.6	40.8	41.0	1.5	30	68	1.06 (30.7)‡
	HP8-82C	8 (2.4)	or	43.4	43.5	43.7	1.1	30	68	1.06 (30.7)‡
	HP10-82C	10 (3.0)	PDR84	45.3	45.5	45.7	0.9	30	70	1.06 (30.7)‡
	HP12-82C	12 (3.7)		46.8	47.0	47.1	0.7	30	71	1.06 (30.7)‡
	HP15-82C	15 (4.6)		48.6	48.8	48.9	0.6	30	71	1.06 (30.7)‡
Dual Polarized	**HPX6-82D**	6 (1.8)	***CPR112G***	41.0	41.1	41.2	1.3	30	58	1.06 (30.7)
	HPX8-82C	8 (2.4)	or	43.5	43.6	43.7	1.0	30	67	1.06 (30.7)
	HPX10-82C	10 (3.0)	PDR84	45.5	45.6	45.7	0.8	30	70	1.06 (30.7)
	HPX12-82C	12 (3.7)		47.1	47.2	47.3	0.7	30	70	1.06 (30.7)
NEW!	**HPX15-82C**	15 (4.6)		48.7	48.8	48.9	0.6	30	70	1.06 (30.7)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**									
Dual Polarized High XPD	**HSX6-82**	6 (1.8)	***CPR112G***	41.0	41.1	41.2	1.4	40	67	1.06 (30.7)
	HSX8-82	8 (2.4)		43.7	43.8	43.9	1.0	40	78	1.06 (30.7)
	HSX10-82	10 (3.0)		45.3	45.4	45.5	0.8	40	78	1.06 (30.7)
	HSX12-82	12 (3.7)		47.1	47.2	47.3	0.7	40	79	1.06 (30.7)
	HSX15-82	15 (4.6)		48.7	48.8	48.9	0.6	40	76	1.06 (30.7)
PL PXL 	**Standard Antennas**									
Low VSWR Single Polarized	**PL6-82C**	6 (1.8)	***CPR112G***	40.6	40.8	41.0	1.5	30	48	1.06 (30.7)
	PL8-82C	8 (2.4)	or	43.4	43.5	43.7	1.1	30	50	1.06 (30.7)‡
	PL10-82C	10 (3.0)	PDR84	45.3	45.5	45.7	0.9	30	58	1.06 (30.7)‡
	PL12-82C	12 (3.7)		46.8	47.0	47.1	0.7	30	54	1.06 (30.7)‡
	PL15-82C	15 (4.6)		48.6	48.8	48.9	0.6	30	57	1.06 (30.7)‡
Low VSWR Dual Polarized	**PXL6-82C**	6 (1.8)	***CPR112G***	41.0	41.1	41.2	1.3	30	48	1.06 (30.7)
	PXL8-82C	8 (2.4)	or	43.7	43.8	43.9	1.0	30	55	1.06 (30.7)
	PXL10-82C	10 (3.0)	PDR84	45.7	45.8	45.9	0.8	30	57	1.06 (30.7)
	PXL12-82C	12 (3.7)		47.3	47.4	47.5	0.7	30	63	1.06 (30.7)
	PXL15-82C	15 (4.6)		48.5	48.6	48.7	0.6	30	65	1.06 (30.7)

‡ 1.04 (34.2) available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned†	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.06 (30.7)****
7.125–7.750	**EWP77-71**	UG-51/U†††	**177DCT**	**177DCP-1**	**55000A-112**	**F112PA0240BA**
		CPR112G	**177DET**	**177DEP-1**	**55001-112**	**F112PC0240CA**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KA**
		PDR84	**177DEMT**	**177DEMP-1**	**223306-84**	**F112MH0600HA**
		PDR70	**277DEMT**	**277DEMP-1**	**223306-70**	**F137MH0600HC**
7.725–8.500	**EWP77-77**	UG-51/U†††	**177DCT**	**177DCP-2**	**55000A-112**	**F112PA0240BB**
		CPR112G	**177DET**	**177DEP-2**	**55001-112**	**F112PC0240CB**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KB**
		PDR84	**177DEMT**	**177DEMP-2**	**223306-84**	**F112MH0600HB**
		PDR70	**277DEMT**	**277DEMP-2**	**223306-70**	**F137MH0600HF‡**
7.125–8.500	**EWP77-71W**	UG-51/U†††	**177DCT**		**55000A-112**	**F112PA0240BC**
		CPR112G	**177DET**	**177DEP-3**	**55001-112**	**F112PC0240CC**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KC**
		PDR84	**177DEMT**	**177DEMP-3**	**223306-84**	**F112MH0600HC**
***		PDR70	**277DEMT**	**277DEMP-4**	**223306-70**	**F137MH0600HE**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
7.125–8.500	**EW77**	UG-51/U†††	**177DC**		**55000A-112**	**F112PA0240BC**
		PBR84	**177DCM**		**243495-84**	**F112MK0600KC**
		CPR112G	**177DE**		**55001-112**	**F112PC0240CC**
		PDR84	**177DEM**		**223306-84**	**F112MH0600HC**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.
*** 7.425 - 7.925 GHz
‡ 7.725 - 8.3 GHz ONLY

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-11**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	**202421**
Splice	**177DZ**
Grounding Kit with factory attached, one-hole lug	**204989-3**
Grounding Kit with factory attached, two-hole lug	**241088-3**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-23**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-8**
Grounding Kit with field attachable screw-on lug	**204989-33**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**19256B**
Bending Tool Kit. One each E and H Plane tool	**33586-9**
Connector Reattachment Kit	**33544-34**
Wall-Roof Feed Thru	**35849A-16**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	**204679-77**
5 in (127 mm) dia	**48939-77**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 100 for Elliptical Waveguide Ordering Information

10.2 - 10.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**									
Dual Polarized	**UHX4-102**	4 (1.2)	***CPR90G***	39.3	39.5	39.7	1.8	33	68	1.10 (26.4)
	UHX6-102A	6 (1.8)	or	42.5	42.7	42.9	1.2	33	79	1.10 (26.4)
	UHX8-102	8 (2.4)	PDR100	45.0	45.1	45.2	0.9	33	78	1.10 (26.4)
	UHX10-102	10 (3.0)		46.7	46.8	46.9	0.8	33	80	1.10 (26.4)
HP HPX 	**High Performance Antennas – Hypalon (Except 2 and 4 ft are TEGLAR®) Radome Included**									
Single Polarized	**HP2-102**	2 (0.6)	***CPR90G***	33.2	33.3	33.4	3.6	30	50	1.15 (23.1)
	HP4-102	4 (1.2)	or	39.6	39.8	40.0	1.8	30	58	1.10 (26.4)
	HP6-102	6 (1.8)	PDR100	42.9	43.1	43.3	1.2	30	68	1.10 (26.4)
	HP8-102	8 (2.4)		45.3	45.4	45.5	0.9	30	68	1.10 (26.4)
	HP10-102	10 (3.0)		47.0	47.1	47.2	0.7	30	68	1.10 (26.4)
Dual Polarized	**HPX4-102**	4 (1.2)	***CPR90G***	39.6	39.8	40.0	1.8	30	58	1.15 (23.1)
	HPX6-102	6 (1.8)	or	42.9	43.1	43.3	1.2	30	68	1.10 (26.4)
	HPX8-102	8 (2.4)	PDR100	45.3	45.4	45.5	0.9	30	68	1.10 (26.4)
	HPX10-102	10 (3.0)		47.0	47.1	47.2	0.7	30	68	1.10 (26.4)
P PX 	**Standard Antennas**									
Single Polarized	**P4-102**	4 (1.2)	***CPR90G***	39.7	39.9	40.1	1.8	30	45	1.10 (26.4)
	P6-102A	6 (1.8)	or	43.1	43.2	43.3	1.2	30	50	1.10 (26.4)
	P8-102	8 (2.4)	PDR100	45.4	45.5	45.6	0.9	30	52	1.10 (26.4)
	P10-102	10 (3.0)		47.1	47.2	47.3	0.7	30	58	1.10 (26.4)
Dual Polarized	**PX4-102**	4 (1.2)	***CPR90G***	39.7	39.9	40.1	1.8	30	45	1.10 (26.4)
	PX6-102	6 (1.8)	or	43.1	43.2	43.3	1.2	30	50	1.10 (26.4)
	PX8-102	8 (2.4)	PDR100	45.4	45.5	45.6	0.9	30	52	1.10 (26.4)
	PX10-102A	10 (3.0)		47.1	47.2	47.3	0.7	30	58	1.10 (26.4)

Refer to Page 100 for Elliptical Waveguide Ordering Information

10.5 - 10.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance †	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX4-105A**	4 (1.2)	***CPR90G***	A	39.8	39.9	40.0	1.7	33	70	1.08 (28.3)
	UHX6-105A	6 (1.8)	or	A	43.4	43.5	43.6	1.2	33	81	1.06 (30.7)
	UHX8-105	8 (2.4)	PDR100	A	45.8	45.9	46.0	1.0	33	80	1.06 (30.7)
	UHX10-105	10 (3.0)		A	47.8	47.9	48.0	0.8	33	83	1.06 (30.7)
	UHX12-105	12 (3.7)		A	49.2	49.3	49.4	0.65	33	80	1.06 (30.7)
HP HPX 	**High Performance Antennas – Hypalon (Except 2 and 4 ft are TEGLAR®) Radome Included**										
Single Polarized	**HP4-105C**	4 (1.2)	***CPR90G***	A	39.8	39.9	40.0	1.8	30	60	1.08 (28.3)
	HP6-105C	6 (1.8)	or	A	43.4	43.5	43.6	1.2	30	66	1.06 (30.7)
	HP8-105C	8 (2.4)	PDR100	A	45.8	45.9	46.0	0.9	30	68	1.06 (30.7)
	HP10-105C	10 (3.0)		A	47.7	47.8	47.9	0.8	30	70	1.06 (30.7)
	HP12-105C	12 (3.7)		A	49.2	49.3	49.4	0.7	30	71	1.06 (30.7)
Dual Polarized	**HPX4-105B**	4 (1.2)	***CPR90G***	A	39.8	39.9	40.0	1.8	30	60	1.10 (26.4)
	HPX6-105A	6 (1.8)	or	A	43.4	43.5	43.6	1.2	30	64	1.08 (28.3)
	HPX8-105A	8 (2.4)	PDR100	A	45.8	45.9	46.0	0.9	30	68	1.06 (30.7)
	HPX10-105A	10 (3.0)		A	47.7	47.8	47.9	0.8	30	70	1.06 (30.7)
NEW!	**HPX12-105A**	12 (3.7)		A	49.2	49.3	49.4	0.7	30	71	1.06 (30.7)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX4-105**	4 (1.2)	***CPR90G***	A	39.6	39.7	39.8	1.7	40	64	1.10 (26.4)
	HSX6-105	6 (1.8)		A	43.2	43.4	43.5	1.1	40	72	1.08 (28.3)
	HSX8-105	8 (2.4)		A	45.8	45.9	46.0	0.8	40	75	1.06 (30.7)
	HSX10-105	10 (3.0)		A	47.6	47.7	47.8	0.7	40	75	1.06 (30.7)
	HSX12-105	12 (3.7)		A	49.5	49.3	49.2	0.6	40	80	1.06 (30.7)
P PX 	**Standard Antennas**										
Single Polarized	**P4-105A**	4 (1.2)	***CPR90G***	B	39.8	39.9	40.0	1.8	30	45	1.15 (23.1)
	P6-105B	6 (1.8)	or	B	43.4	43.5	43.6	1.2	30	51	1.10 (26.4)
	P8-105B	8 (2.4)	PDR100	B	45.8	45.9	46.0	0.9	30	53	1.10 (26.4)
	P10-105B	10 (3.0)		A	47.8	47.9	48.0	0.8	30	53	1.10 (26.4)
	P12-105B	12 (3.7)		B	49.2	49.3	49.4	0.7	30	55	1.10 (26.4)
Dual Polarized	**PX6-105B**	6 (1.8)	***CPR90G***	B	43.4	43.5	43.6	1.2	30	49	1.15 (23.1)
	PX8-105B	8 (2.4)	or	B	45.8	45.9	46.0	0.9	30	50	1.10 (26.4)
	PX10-105B	10 (3.0)	PDR100	B	47.7	47.8	47.9	0.8	30	52	1.10 (26.4)
NEW!	**PX12-105B**	12 (3.7)		B	49.2	49.3	49.4	0.7	30	55	1.10 (26.4)
PAR 	**Standard Antennas – Similar to P ( ) - 105 Series, except meet Category A**										
Single Polarized	**PAR6-105**	6 (1.8)	***CPR90G***	A	43.0	43.1	43.2	1.2	30	60	1.06 (30.7)
	PAR8-105	8 (2.4)		A	45.6	45.7	45.8	0.9	30	63	1.06 (30.7)
	PAR12-105	12 (3.7)		A	49.2	49.3	49.4	0.7	30	65	1.06 (30.7)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP2-105**	2 (0.6)	*	A	34.0	34.1	34.2	3.4	32	55	1.20 (20.8)‡
	VHP4-105	4 (1.2)		A	39.8	39.9	40.0	1.8	32	60	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† U.S. FCC Parts 21 and 94. Part 101 will replace Parts 21 and 94 effective June, 1997.
‡ 1.15 (23.1) available on request.

Refer to Page 100 for Elliptical Waveguide Ordering Information

10.7 - 11.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance †	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX4-107A**	4 (1.2)	***CPR90G***	A	40.0	40.4	40.8	1.6	33	70	1.08 (28.3)
	UHX6-107J	6 (1.8)	or	A	43.6	44.0	44.4	1.1	33	80	1.06 (30.7)
	UHX8-107J	8 (2.4)	PDR100	A	46.0	46.5	46.8	0.8	33	80	1.06 (30.7)
	UHX10-107J	10 (3.0)		A	47.6	48.0	48.3	0.7	33	82	1.06 (30.7)
	UHX12-107J	12 (3.7)		A	49.4	49.8	50.2	0.5	33	80	1.06 (30.7)
HP HPX 	**High Performance Antennas – Hypalon (Except 4 ft is TEGLAR®) Radome Included**										
Single Polarized	**HP4-107A**	4 (1.2)	***CPR90G***	A	40.0	40.4	40.8	1.6	30	61	1.08 (28.3)
	HP6-107G	6 (1.8)	or	A	43.6	44.0	44.4	1.0	30	70	1.06 (30.7)
	HP8-107F	8 (2.4)	PDR100	A	46.0	46.4	46.8	0.8	30	71	1.06 (30.7)
	HP10-107F	10 (3.0)		A	47.9	48.3	48.6	0.7	30	70	1.06 (30.7)
	HP12-107G	12 (3.7)		A	49.4	49.8	50.2	0.5	30	70	1.06 (30.7)
Dual Polarized	**HPX4-107A**	4 (1.2)	***CPR90G***	A	40.0	40.3	40.6	1.6	30	6.2	1.10 (26.4)
	HPX6-107E	6 (1.8)	or	A	43.6	44.0	44.4	1.0	30	70	1.08 (28.3)
	HPX8-107C	8 (2.4)	PDR100	A	46.0	46.4	46.8	0.8	30	70	1.06 (30.7)
	HPX10-107C	10 (3.0)		A	47.9	48.3	48.6	0.7	30	70	1.06 (30.7)
NEW!	**HPX12-107D**	12 (3.7)		A	49.4	49.8	50.2	0.5	30	72	1.06 (30.7)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX4-107**	4 (1.2)	***CPR90G***	A	39.8	40.2	40.6	1.6	40	64	1.10 (26.4)
	HSX6-107	6 (1.8)	or	A	43.5	43.9	44.3	1.1	40	72	1.08 (28.3)
	HSX8-107	8 (2.4)	PDR100	A	46.0	46.5	46.8	0.8	40	75	1.06 (30.7)
	HSX10-107	10 (3.0)		A	47.8	48.2	48.6	0.7	40	75	1.06 (30.7)
	HSX12-107	12 (3.7)		A	49.2	49.6	50.3	0.5	40	80	1.06 (30.7)
HDX 	**High Performance, Dual Beam Antennas**										
Dual Polarized	**HDX8-107**	8 (2.4)	***CPR90G***	A	47.6	47.9	48.1	0.8	26	78	1.10 (26.4)
	HDX10-107	10 (3.0)		A	47.6	47.9	48.1	0.8	22	78	1.10 (26.4)
PAR 	**Standard Antennas – Similar to P ( ) - 105 Series, except meet Category A**										
Single Polarized	**PAR6-107**	6 (1.8)	***CPR90G***	A	43.2	43.6	44.0	1.1	30	60	1.06 (30.7)
	PAR8-107	8 (2.4)		A	45.8	46.2	46.6	0.8	30	63	1.06 (30.7)
	PAR12-107	12 (3.7)		A	49.4	49.8	50.2	0.5	30	62	1.06 (30.7)
PL PXL 	**Standard Antennas**										
Low VSWR Single Polarized	**PL4-107E**	4 (1.2)	***CPR90G***	B	40.1	40.5	40.9	1.6	30	46	1.08 (28.3)
	PL6-107E	6 (1.8)	or	B	43.6	44.0	44.4	1.0	30	51	1.06 (30.7)
	PL8-107F	8 (2.4)	PDR100	B	46.0	46.4	46.8	0.8	30	53	1.06 (30.7)
	PL10-107F	10 (3.0)		A	47.8	48.2	48.5	0.7	30	54	1.06 (30.7)
	PL12-107G	12 (3.7)		B	49.4	49.8	50.2	0.5	30	60	1.06 (30.7)
Dual Polarized	**PXL6-107C**	6 (1.8)	***CPR90G***	B	43.6	44.0	44.4	1.0	30	49	1.08 (28.3)
	PXL8-107C	8 (2.4)	or	B	46.0	46.4	46.8	0.8	30	50	1.06 (30.7)
	PXL10-107C	10 (3.0)	PDR100	B	47.9	48.3	48.6	0.7	30	52	1.06 (30.7)
	PXL12-107D	12 (3.7)		B	49.4	49.8	50.2	0.5	30	53	1.06 (30.7)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP4-107A**	4 (1.2)	*	A	40.1	40.5	40.9	1.8	32	60	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† U.S. FCC Parts 21 and 94. Part 101 will replace Parts 21 and 94 effective June, 1997.
‡ 1.15 (23.1) available on request

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Tunable	Connector† Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies							**VSWR 1.05 (32.3)****
10.7-11.7	**EWP90S**	CPR90G	**190DET**			**55001-90**	**F090PC0240CB**
		PDR100	**190DEMT**			**223306-100**	**F090MH0600HB**
Premium Waveguide Assemblies							**VSWR 1.06 (30.7)****
10.5-10.7	**EWP90-105**	CPR90G	**190DET**	**190DEP-2**		**55001-90**	**F090PC0240CA**
		PDR100	**190DEMT**	**190DEMP-2**		**223306-100**	**F090MH0600HA**
10.7-11.7	**EWP90-107**	CPR90G	**190DET**	**190DEP-1**		**55001-90**	**F090PC0240CB**
		PDR100	**190DEMT**	**190DEMP-1**		**223306-100**	**F090MH0600HB**
							VSWR 1.09 (27.3)**
10.7-11.7		WR75†††			**290SC**	**55000A-75**	**F075PA0240BB**
Standard Waveguide Assemblies			**Non-Tunable**				**VSWR 1.15 (23.1)****
10.5-11.7	**EW90**	CPR90G	**190DE**			**55001-90**	**F090PC0240CS**
		PDR100	**190DEM**			**223306-100**	**F090MH0600HS**
		WR75†††			**290SC**	**55000A-75**	**F075PA0240BA**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable cover flange.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**204919**
Splice	**190DZ**
Grounding Kit with factory attached, one-hole lug	**204989-2**
Grounding Kit with factory attached, two-hole lug	**241088-2**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-22**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-7**
Grounding Kit with field attachable screw-on lug	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**29958**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-37**
Wall-Roof Feed Thru	**35849A-15**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-90**
5 in (127) mm) dia	**48939-90**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 103 for Elliptical Waveguide Ordering Information

12.2 - 12.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance †	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HPX 	**High Performance Antennas – Hypalon Radome Included**										
Dual Polarized	**HPX6-122E**	6 (1.8)	***WR75***	A	44.6	44.8	45.0	0.9	30	68	1.10 (26.4)
	HPX8-122D	8 (2.4)	***cover/gasket***	A	47.1	47.3	47.5	0.7	30	70	1.10 (26.4)
	HPX10-122C	10 (3.0)	or	A	48.4	48.5	48.7	0.6	25	71	1.10 (26.4)
	HPX12-122C	12 (3.7)	PDR120	A	50.5	50.6	50.8	0.5	25	71	1.10 (26.4)
PX 	**Standard Antennas**										
Dual Polarized	**PX4-122C**	4 (1.2)	***WR75***	B	40.5	40.7	40.9	1.4	25	52	1.10 (26.4)
	PX6-122C	6 (1.8)	***cover/gasket***	A	44.6	44.8	45.0	0.9	25	51	1.10 (26.4)
	PX8-122C	8 (2.4)	or	A	47.1	47.3	47.5	0.7	30	54	1.10 (26.4)
	PX10-122C	10 (3.0)	PDR120	A	48.4	48.5	48.7	0.6	30	57	1.10 (26.4)
	PX12-122C	12 (3.7)		A	50.5	50.6	50.8	0.5	25	58	1.10 (26.4)

12.2 - 13.25 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance †	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP 	**High Performance Antennas – Hypalon Radome Included**										
Single Polarized	**HP6-122E**	6 (1.8)	***WR75***	A	44.7	45.1	45.4	0.9	30	70	1.08 (28.3)
	HP8-122D	8 (2.4)	***cover/gasket***	A	47.2	47.6	47.9	0.7	30	70	1.08 (28.3)
	HP10-122D	10 (3.0)	or	A	48.4	48.8	49.1	0.6	28	71	1.08 (28.3)
	HP12-122E	12 (3.7)	PDR120	A	50.6	50.9	51.2	0.5	30	71	1.08 (28.3)
P 	**Standard Antennas**										
Single Polarized	**P2-122E**	2 (0.7)	***WR75***	–	35.1	35.5	35.8	2.8	25	42	1.10 (26.4)
	P4-122D	4 (1.2)	***cover/gasket***	B	41.2	41.5	41.9	1.4	30	49	1.10 (26.4)
	P6-122F	6 (1.8)	or	**	44.7	45.1	45.4	0.9	30	55	1.08 (28.3)
	P8-122E	8 (2.4)	PDR120	**	47.2	47.6	47.9	0.7	30	59	1.08 (28.3)
	P10-122F	10 (3.0)		A	48.4	48.8	49.1	0.6	26	60	1.08 (28.3)
	P12-122E	12 (3.7)		A	50.6	50.9	51.2	0.5	30	58	1.08 (28.3)

12.7 - 13.25 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance †	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
UHX® 	**Ultra High Performance Antennas – TEGLAR® Long Life Radome Included**										
Dual Polarized	**UHX8-127H**	8 (2.4)	***WR75***	A	47.5	47.6	47.8	0.7	32	80	1.10 (26.4)
	UHX10-127H	10 (3.0)	***cover/gasket*** or PDR120	A	48.7	48.8	49.0	0.6	30	82	1.10 (26.4)
HPX 	**High Performance Antennas – Hypalon Radome Included**										
Dual Polarized	**HPX6-127E**	6 (1.8)	***WR75***	A	45.0	45.1	45.3	0.9	30	68	1.10 (26.4)
	HPX8-127D	8 (2.4)	***cover/gasket***	A	47.5	47.6	47.8	0.7	30	70	1.10 (26.4)
	HPX10-127C	10 (3.0)	or PDR120	A	48.7	48.8	49.0	0.6	25	71	1.10 (26.4)
	HPX12-127C	12 (3.7)		A	50.8	50.9	51.1	0.5	25	72	1.10 (26.4)
PX 	**Standard Antennas**										
Dual Polarized	**PX4-127C**	4 (1.2)	***WR75***	B	40.9	41.0	41.2	1.4	25	52	1.10 (26.4)
	PX6-127C	6 (1.8)	***cover/gasket***	**	45.0	45.1	45.3	0.9	25	52	1.10 (26.4)
	PX8-127C	8 (2.4)	or PDR120	**	47.5	47.6	47.8	0.7	30	54	1.10 (26.4)
	PX10-127C	10 (3.0)		A	48.7	48.8	49.0	0.6	30	57	1.10 (26.4)
	PX12-127C	12 (3.7)		A	50.8	50.9	51.1	0.5	25	58	1.10 (26.4)

† U.S. FCC Parts 74, 78, 12.7-13.25 GHz. Part 94, 12.2-12.7 GHz. Part 21, 13.2-13.25 GHz. Part 101 will replace Parts 21 and 94 effective June, 1997.
**A for parts 74, 78 and 94; B for part 21

Refer to Page 103 for Elliptical Waveguide Ordering Information

12.75 - 13.25 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP HPX 	**High Performance Antennas – Hypalon (4 ft is TEGLAR®) Radome Included**										
Single Polarized	**HP4-130**	4 (1.2)	***PDR120***	*	40.9	41.0	41.1	1.3	28	68	1.10 (26.4)
	HP6-130A	6 (1.8)	or WR75	*	45.1	45.2	45.3	0.9	28	70	1.08 (28.3)
	HP8-130	8 (2.4)	cover/gasket	*	47.6	47.7	47.8	0.7	28	71	1.08 (28.3)
Dual Polarized	**HPX4-130**	4 (1.2)	***PDR120***	*	40.9	41.0	41.1	1.3	28	66	1.10 (26.4)
	HPX6-130A	6 (1.8)	or WR75	*	45.0	45.1	45.2	0.9	28	68	1.10 (26.4)
	HPX8-130	8 (2.4)	cover/gasket	*	47.6	47.7	47.8	0.7	32	74	1.10 (26.4)
HSX 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX4-130**	4 (1.2)	***PDR120***	*	41.4	41.6	41.8	1.6	40	68	1.10 (26.4)
	HSX6-130	6 (1.8)		*	44.9	45.1	45.3	0.9	40	75	1.10 (26.4)
	HSX8-130	8 (2.4)		*	47.4	47.6	47.8	0.7	40	76	1.10 (26.4)
	HSX10-130	10 (3.0)		*	48.7	48.8	49.0	0.6	40	76	1.10 (26.4)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP2-130**	2 (0.6)	†††	*	35.1	35.3	35.5	2.8	32	61	1.20 (20.8)‡
	VHP2.5-130	2.5 (0.8)		††	37.7	37.9	38.1	2.1	32	63	1.20 (20.8)‡
	VHP4-130	4 (1.2)		††	41.2	41.4	41.6	1.3	32	67	1.20 (20.8)‡
	VHP6-130	6 (1.8)		††	44.8	45.0	45.1	0.9	32	70	1.20 (20.8)‡
Single Polarized	**VHP4A-130**	4 (1.2)		**	41.2	41.4	41.6	1.3	32	63	1.20 (20.8)‡
	VHP6A-130	6 (1.8)		†	44.8	45.0	45.1	0.9	32	66	1.20 (20.8)‡
Dual Polarized	**VHPX2-130**	2 (0.6)		*	34.5	34.7	34.9	2.8	32	61	1.25 (19.2)‡‡
	VHPX2.5-130	2.5 (0.8)		††	37.2	37.5	37.7	2.1	32	63	1.25 (19.2)‡‡
	VHPX4-130	4 (1.2)		††	41.0	41.2	41.3	1.3	32	67	1.25 (19.2)‡‡
	VHPX6-130	6 (1.8)		††	44.6	44.8	44.9	0.9	32	70	1.25 (19.2)‡‡
Dual Polarized	**VHPX4A-130**	4 (1.2)		†	41.0	41.2	41.3	1.3	32	63	1.25 (19.2)‡‡
	VHPX6A-130	6 (1.8)		†	44.6	44.8	44.9	0.9	32	66	1.25 (19.2)‡‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2A-130**	2 (0.6)	†††	–	35.3	35.5	35.7	2.8	32	45	1.20 (20.8)‡
	VP4A-130	4 (1.2)		**	41.4	41.6	41.8	1.3	32	52	1.20 (20.8)‡
	VP6A-130	6 (1.8)		†	45.0	45.2	45.3	0.9	32	58	1.20 (20.8)‡

NEW!

* MPT 1403, Part 3, Figure 3.2.
** FCC Parts 74, 78 and 94 Category B
† FCC Parts 74,78 and 94 Category A
†† FCC Parts 74,78 and 94 Category A, RA MPT 1403, Part 3, HP
††† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
‡ 1.15 (23.1) available on request
‡‡ 1.2 (20.8) available on request

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.08 (28.3)****
11.7-12.2	**EWP127A-117**	WR75†††	**1127DCT**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**		**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	1127DKT		***	***
12.2-12.7	**EWP127A-122**	WR75†††	**1127DCT**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**		**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**		**223306-120**	**F075MH0600HS**
12.7-13.25	**EWP127A-127**	WR75†††	**1127DCT**	**1127DCP-3**	**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**	**1127DCMP-3**	**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**	**1127DEMP-3**	**223306-120**	**F075MH0600HS**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
11.7-13.25	**EW127A**	WR75†††	**1127DC**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCM**		**110088**	**F075MK0600KS**
		PDR120	**1127DEM**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	1127DK		***	***

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Not Available
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable Cover Flange

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-9**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**204960**
Splice	**1127DZ**
Grounding Kit with factory attached, one-hole lug	**204989-2**
Grounding Kit with factory attached, two-hole lug	**241088-2**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-22**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-7**
Grounding Kit with field attachable screw-on lug	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**29958**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-41**
Wall-Roof Feed Thru	**35849A-1**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-122**
5 in (127) mm) dia	**48939-122**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

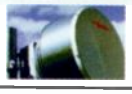
* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 105 for Elliptical Waveguide Ordering Information

14.25 - 14.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
NEW! **HSX** 	**High Performance Antennas – Super High Cross Polarization Discrimination**										
Dual Polarized High XPD	**HSX4-142**	4 (1.2)	***PDR140***	*	42.5	42.6	42.7	1.2	40	68	1.10 (26.4)
	HSX6-142	6 (1.8)		*	45.9	46.0	46.1	0.8	40	75	1.10 (26.4)
	HSX8-142	8 (2.4)		*	48.4	48.5	48.6	0.6	40	76	1.10 (26.4)
	HSX10-142	10 (3.0)		*	50.1	50.2	50.3	0.5	40	76	1.10 (26.4)

14.25 - 15.35 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-142**	1 (0.3)	†	–	30.8	31.1	31.4	4.5	30	50	1.20 (20.8)‡
	VHP2-142	2 (0.6)		*	36.2	36.5	36.8	2.4	32	62	1.20 (20.8)‡
	VHP2.5-142	2.5 (0.8)		*	38.8	39.1	39.4	1.8	32	64	1.20 (20.8)‡
	VHP4-142	4 (1.2)		*	42.2	42.5	42.8	1.2	32	68	1.20 (20.8)‡
	VHP6-142	6 (1.8)		*	45.7	46.0	46.3	0.8	32	71	1.20 (20.8)‡
Single Polarized	**VHP4A-142**	4 (1.2)		–	42.2	42.5	42.8	1.2	32	64	1.20 (20.8)‡
	VHP6A-142	6 (1.8)		–	45.7	46.0	46.3	0.8	32	67	1.20 (20.8)‡
Dual Polarized	**VHPX2-142**	2 (0.6)		*	36.0	36.3	36.6	2.4	32	62	1.25 (19.2)‡‡
	VHPX2.5-142	2.5 (0.8)		*	38.6	38.9	39.2	1.8	32	64	1.25 (19.2)‡‡
	VHPX4-142	4 (1.2)		*	42.0	42.3	42.6	1.2	32	68	1.25 (19.2)‡‡
	VHPX6-142	6 (1.8)		*	45.5	45.8	46.1	0.8	32	71	1.25 (19.2)‡‡
Dual Polarized	**VHPX4A-142**	4 (1.2)		–	42.0	42.3	42.6	1.2	32	64	1.25 (19.2)‡‡
	VHPX6A-142	6 (1.8)		–	45.5	45.8	46.1	0.8	32	67	1.25 (19.2)‡‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2A-142**	2 (0.6)	†	–	36.4	36.7	37.0	2.4	32	45	1.20 (20.8)
	VP4A-142	4 (1.2)		–	42.4	42.7	43.0	1.2	32	53	1.20 (20.8)

* MPT 1403, Part 3, Figure 3.2.
† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
‡ 1.15 (23.1) available on request. ‡‡ 1.2 (20.8) available on request.

14.4 - 15.35 GHz

	Type Number	Diameter ft (m)	Input Flanges	Bottom	Gain, dBi Mid-Band	Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
NEW! **HSX** 	**High Performance Antennas – Super High Cross Polarization Discrimination**									
Dual Polarized High XPD	**HSX4-144**	4 (1.2)	***UG-541A/U***	42.5	42.7	43.0	1.2	40	68	1.10 (26.4)
	HSX6-144	6 (1.8)		46.0	46.3	46.5	0.8	40	75	1.10 (26.4)
	HSX8-144	8 (2.4)		48.5	48.8	49.1	0.6	40	76	1.10 (26.4)
	HSX10-144	10 (3.0)		50.2	50.5	50.8	0.5	40	76	1.10 (26.4)
P PX 	**Standard Antennas**									
Single Polarized	**P8-144E**	8 (2.4)	***UG-541A/U***	48.3	48.6	48.9	0.6	30	57	1.10 (26.4)*
	P10-144E	10 (3.0)	or PDR140	50.2	50.5	50.8	0.5	30	58	1.10 (26.4)*
Dual Polarized	**PX4-144C**	4 (1.2)	***UG-541A/U***	42.3	42.5	42.8	1.2	30	48	1.10 (26.4)*
	PX6-144C	6 (1.8)	or PDR140	45.8	46.1	46.3	0.8	30	55	1.10 (26.4)*
	PX8-144D	8 (2.4)		48.3	48.6	48.9	0.6	30	57	1.10 (26.4)*
	PX10-144D	10 (3.0)		50.2	50.5	50.8	0.5	30	58	1.10 (26.4)*

*Lower VSWR available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.08 (28.3)****
14.0-14.5	**EWP132-140**	WR75†††	**2132DCT**	**2132DCP-1**	**55000A-75**	**F075PA0240BS**
		PBR120	**2132DCMT**	**2132DCMP-1**	**110088**	**F075MK0600KS**
		PBR140	**1132DCMT**		**110089**	**F062MK0600KS**
		PDR120	**2132DEMT**	**2132DEMP-1**	**223306-120**	**F075MH0600HS**
		PDR140	**1132DEMT**	**1132DEMP-1**	**223306-140**	**F062MH0600HS**
		Pressurizable Contact Flange	**2132DKT**		***	***
14.4-15.35	**EWP132-144**	UG-541/U††††	**1132DCT**		**55000-62**	**F062PA0240BS**
		PBR140	**1132DCMT**		**110089**	**F062MK0600KS**
		PDR140	**1132DEMT**	**1132DEMP-1**	**223306-140**	**F062MH0600HS**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
14.0-14.5	**EW132-140**	WR75†††	**2132DC**		**55000A-75**	**F075PA0240YS**
		PBR140	**1132DCM**		**110089**	**F062MK0600KS**
		PDR140	**1132DEM**		**223306-140**	**F062MH0600HS**
		PBR120	**2132DCM**		**110088**	**F075MK0600KS**
		PDR120	**2132DEM**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	**2132DK**		***	***
14.4-15.35	**EW132-144**	UG-541/U††††	**1132DC**		**55000A-75**	**F075PA0240BS**
		PBR140	**1132DCM**		**110089**	**F062MK0600KS**
		PDR140	**1132DEM**		**223306-140**	**F062MH0600HS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Not Available
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable Cover Flange
†††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-9**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**203809**
Splice	**1132DZ**
Grounding Kit with factory attached, one-hole lug	**204989-2**
Grounding Kit with factory attached, two-hole lug	**241088-2**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-22**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-7**
Grounding Kit with field attachable screw-on lug	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**29958**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-39**
Wall-Roof Feed Thru	**35849A-11**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-132**
5 in (127 mm) dia	**48939-132**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 107 for Elliptical Waveguide Ordering Information

17.3 - 17.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-173**	1 (0.3)	†	–	32.4	32.5	32.6	3.8	30	58	1.20 (20.8)‡
	VHP2-173	2 (0.6)		‡‡	38.0	38.1	38.2	2.3	32	64	1.20 (20.8)‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP4-173**	4 (1.2)	†	‡‡	44.1	44.2	44.3	1.0	32	55	1.20 (20.8)‡
	VP6-173	6 (1.8)		‡‡	47.5	47.6	47.7	0.8	32	58	1.20 (20.8)‡

† IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
‡ 1.15 (23.1) available on request. ‡‡ RA MPT 1419, Part 3, Fig 3.2

17.7 - 19.7 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance†	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
HP 	**High Performance Antennas - TEGLAR® Long Life Radome Included**										
Single Polarized	**HP8-180A**	8 (2.4)	***UG-595/U cover/gasket**** or PBR220	A	50.2	50.7	51.2	0.5	30	72	1.15 (23.1)
HSX 	**High Performance – Super High Cross Polarization Discrimination Polarization-Molded Planar Radome Included (Except 6 ft is TEGLAR® Long Life Radome)**										
Dual Polarized High XPD	**HSX1-180**	1 (0.3)	***PBR220***	–	32.4	33.0	33.5	3.6	34	60	1.135 (24.0)
	HSX2-180	2 (0.6)	*or*	A	38.0	38.4	38.8	1.9	36	64	1.135 (24.0)
	HSX4-180	4 (1.2)	UG-595/U	A	44.0	44.4	44.8	1.0	36	67	1.135 (24.0)
	HSX6-180	6 (1.8)	cover/gasket**	A	47.5	48.0	48.4	0.7	36	72	1.135 (24.0)
P 	**Standard Antennas**										
Single Polarized	**P8-180**	8 (2.4)	***UG-595/U cover/gasket**** or PBR220	B	50.2	50.7	51.2	0.5	30	59	1.15 (23.1)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-180**	1 (0.3)	*	–	32.6	33.1	33.5	3.6	30	58	1.20 (20.8)‡
	VHP2-180A	2 (0.6)		††	38.2	38.7	39.1	1.9	32	60	1.20 (20.8)‡
Single Polarized	**VHP2.5-180**	2.5 (0.8)		††	40.7	41.2	41.6	1.5	32	66	1.20 (20.8)‡
	VHP4-180A	4 (1.2)		††	44.1	44.6	45.1	0.9	32	65	1.20 (20.8)‡
	VHP6-180A	6 (1.8)		††	47.5	48.0	48.5	0.7	32	70	1.20 (20.8)‡
Dual Polarized	**VHPX1-180**	1 (0.3)		–	32.4	32.9	33.3	3.6	30	58	1.25 (19.2)‡‡
Dual Polarized	**VHPX2-180A**	2 (0.6)		††	37.9	38.4	38.8	1.9	32	60	1.25 (19.2)‡‡
	VHPX2.5-180	2.5 (0.8)		††	40.5	41.0	41.4	1.5	32	66	1.25 (19.2)‡‡
	VHPX4-180A	4 (1.2)		††	44.0	44.5	45.0	0.9	32	65	1.25 (19.2)‡‡
	VHPX6-180A	6 (1.8)		††	47.4	47.9	48.4	0.7	32	70	1.25 (19.2)‡‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-180A**	2 (0.6)	*	†††	38.4	38.9	39.3	1.9	32	52	1.20 (20.8)‡
	VP4-180A	4 (1.2)		†††	44.3	44.8	45.3	0.9	32	53	1.20 (20.8)‡
	VP6-180A	6 (1.8)		†††	47.7	48.2	48.7	0.7	32	57	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information. ** Modified UG-595/U mates with choke or cover.
† U.S. FCC Parts 21 and 94. Part 101 will replace Parts 21 and 94 effective June, 1997. ††FCC Parts 21, 74, 78 and 94 Category A.
††† FCC Parts 21, 74, 78 and 94 Category B. ‡ 1.15 (23.1) available on request. ‡‡ 1.2 (20.8) available on request .

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Tunable	Connector† Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies							VSWR 1.09 (27.3)**
17.7-19.7	EWP180-180	UG-595/U†††	1180DCT	1180DCP-1		55000A-42	F042PA0240BS
		PBR220	1180DCMT	1180DCMP-1		112588	F042MK0600KS
		PDR180			2180SEM	223306-180	F051MH0600HS
Standard Waveguide Assemblies							VSWR 1.15 (23.1)**
17.7-19.7	EW180-180	UG-595/U†††	1180DCT	1180DCP-1		55000A-42	F042PA0240BS
		PBR220	1180DCMT	1180DCMP-1		112588	F042MK0600KS
		PDR180			2180SEM	223306-180	F051MH0600HS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	201439
Splice	1180DZ
Grounding Kit with factory attached, one-hole lug	204989-1
Grounding Kit with factory attached, two-hole lug	241088-1
Grounding Kit with field attachable crimp-on, one-hole lug	204989-21
Grounding Kit with field attachable crimp-on, two-hole lug	241088-6
Grounding Kit with field attachable screw-on lug	204989-31
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	43094
Bending Tool Kit. One each E and H Plane tool	33586-1
Connector Reattachment Kit	33544-42
Wall-Roof Feed Thru	35849A-18
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	204679-180
5 in (127) mm) dia	48939-180

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	—
2	—	48940-2
3	—	48940-3
4	204673-4	48940-4
6	—	48940-6
8	204673-8	—

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Refer to Page 109 for Elliptical Waveguide Ordering Information

21.2 - 23.6 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-220**	1 (0.3)	‡‡‡	†	34.3	34.8	35.2	2.8	30	60	1.20 (20.8)‡
	VHP2-220A	2 (0.6)		††	39.6	40.1	40.5	1.6	32	66	1.20 (20.8)‡
Single Polarized	**VHP2.5-220**	2.5 (0.8)		†††	42.1	42.6	43.1	1.4	32	68	1.20 (20.8)‡
	VHP4-220A	4 (1.2)		††	45.6	46.1	46.6	0.8	32	72	1.20 (20.8)‡
	VHP6-220A	6 (1.8)		†††	48.9	49.4	49.9	0.5	32	75	1.20 (20.8)‡
Single Polarized	**VHP4A-220A**	4 (1.2)		*	45.6	46.1	46.6	0.8	32	67	1.20 (20.8)‡
	VHP6A-220A	6 (1.8)		*	48.9	49.4	49.9	0.5	32	72	1.20 (20.8)‡
Dual Polarized	**VHPX1-220**	1 (0.3)		††††	33.7	34.2	34.6	2.8	30	60	1.25 (19.2)‡‡
	VHPX2-220A	2 (0.6)		†††	39.4	39.9	40.3	1.6	32	66	1.25 (19.2)‡‡
Dual Polarized	**VHPX2.5-220**	2.5 (0.8)		††††	41.9	42.4	42.9	1.4	32	68	1.25 (19.2)‡‡
	VHPX4-220A	4 (1.2)		†††	45.5	46.0	46.5	0.8	32	72	1.25 (19.2)‡‡
	VHPX6-220A	6 (1.8)		†††	48.8	49.3	49.8	0.5	32	75	1.25 (19.2)‡‡
Dual Polarized	**VHPX4A-220A**	4 (1.2)		†††††	45.5	46.0	46.5	0.8	32	67	1.25 (19.2)‡‡
	VHPX6A-220A	6 (1.8)		*	48.8	49.3	49.8	0.5	32	72	1.25 (19.2)‡‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-220**	2 (0.6)	‡‡‡	**	39.8	40.3	40.7	1.6	32	54	1.20 (20.8)‡
	VP4-220A	4 (1.2)		**	45.8	46.3	46.8	0.8	32	58	1.20 (20.8)‡
	VP4A-220A	4 (1.2)		***	45.8	46.3	46.8	0.8	32	58	1.20 (20.8)‡

‡ 1.15 (23.1) available on request.
‡‡ 1.2 (20.8) available on request.
‡‡‡ IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† RA MPT 1409, Part 3, Fig. 3.2; ETSI ETS 300198, Fig 4; BAPT 211 ZV 02/23, August 93, Class B.
†† FCC Parts 21 & 94, Cat A; RA MPT 1409, Part 3, Fig. 3.2; ETS 300198, Fig 4; BAPT 211 ZV 02/23, August 93, Class B.
††† FCC Parts 21 & 94, Cat A; RA MPT 1409, Part 3, Fig. 3.2; ETS 300198, Fig 4.
†††† RA MPT 1409, Part 3, Fig. 3.2; ETSI ETS 300198, Fig 4.
††††† FCC Parts 21 & 94, Cat A; RA MPT 1409, Part 3, Fig. 3.2.
* FCC Parts 21 & 94, Cat A.
** FCC Parts 21 & 94, Cat B; RA MPT 1409, Part 3, 3.1.
*** FCC Parts 21 & 94, Cat B.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Standard Waveguide Assemblies					**VSWR 1.15 (23.1)****
21.2-23.6	**EW220**	UG-595/U††† PBR220	**1220ASC 1220ASCM**	**55000A-42 112588**	**F042PA0240BS F042MK0600KS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**205127**
Splice	**1220DZ**
Grounding Kit with factory attached, one-hole lug	**204989-1**
Grounding Kit with factory attached, two-hole lug	**241088-1**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-21**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-6**
Grounding Kit with field attachable screw-on lug	**204989-31**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**43094**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-44A**
Wall-Roof Feed Thru	**35849A-19**
Waveguide Boot for Plates (below), 4 in (102 mm) dia	**204679-220**
5 in (127 mm) dia	**48939-220**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

Refer to Page 111 for Elliptical Waveguide Ordering Information

24.25 - 26.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-240A**	1 (0.3)	*	†	35.5	35.9	36.3	2.5	30	61	1.20 (20.8)‡
	VHP2-240A	2 (0.6)	*	†	40.6	41.0	41.4	1.4	32	67	1.20 (20.8)‡
	VHP2.5-240	2.5 (0.8)	*	†	43.2	43.6	44.0	1.1	32	69	1.20 (20.8)‡
	VHP4-240	4 (1.2)	*	†	46.5	46.9	47.2	0.7	32	73	1.20 (20.8)‡
Dual Polarized	**VHPX1-240A**	1 (0.3)	*	†	35.3	35.7	36.1	2.5	30	61	1.25 (19.2)‡‡
	VHPX2-240A	2 (0.6)	*	†	40.4	40.8	41.2	1.4	32	67	1.25 (19.2)‡‡
	VHPX2.5-240	2.5 (0.8)	*	†	43.0	43.4	43.8	1.1	32	69	1.25 (19.2)‡
	VHPX4-240	4 (1.2)	*	†	46.3	46.7	47.0	0.7	32	73	1.25 (19.2)‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single Polarized	**VP2-240**	2 (0.6)	*	††	40.8	41.2	41.6	1.5	32	52	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† RA MPT 1420, Part 3; Fig. 3; Meets ETSI ETS300431, Fig 3.
†† RA MPT 1420, Part 3; ETSI ETS300431, Fig 2.
‡ 1.15 (23.1) available on request.
‡‡ 1.2 (20.8) available on request.

Ordering Information for HELIAX® Elliptical Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Standard Waveguide Assemblies					**VSWR 1.15 (23.1)****
24.0-26.5	**EW240**	PBR220	**1240SCM**	**112588**	**F042MK0600KS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**242774**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**205127**
Splice	**1240DZ**
Grounding Kit with factory attached, one-hole lug	**223158**
Hoisting Grip	**43094**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-47**
Wall-Roof Feed Thru	**35849A-21**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-240**
5 in (127 mm) dia	**48939-240**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

27.5 - 29.5 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single	**VHP1-275**	1 (0.3)	*	†	36.3	36.6	36.9	2.2	30	62	1.20 (20.8)‡
Polarized	**VHP2-275**	2 (0.6)		†	41.2	41.5	41.8	1.2	32	68	1.20 (20.8)‡
VP 	**ValuLine® Antennas – Standard Performance**										
Single	**VP2-275**	2 (0.6)	*	††	42.0	42.3	42.6	1.2	32	53	1.20 (20.8)‡
Polarized	**VP2A-275**	2 (0.6)		††	42.0	42.3	42.6	1.2	32	53	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† FCC Part 94, Cat A; RA MPT 1420, Part 3; Fig. 3.
†† FCC Part 94, Cat B; RA MPT 1420, Part 3; STD
‡ 1.15 (23.1) available on request

31.0 - 31.8 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single	**VHP1-310**	1 (0.3)	*	–	36.8	36.9	37.0	2.3	30	62	1.20 (20.8)‡
Polarized	**VHP2-310**	2 (0.6)		–	42.0	42.2	42.4	1.4	32	68	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
‡ 1.15 (23.1) available on request

37.0 - 40.0 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single	**VHP1-370A**	1 (0.3)	*	†	39.2	39.5	39.8	1.7	30	60	1.20 (20.8)‡
Polarized	**VHP2-370A**	2 (0.6)		†	44.0	44.3	44.6	1.0	32	63	1.20 (20.8)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† MPT 1414, Part 3, Figure 3.1; BAPT 211 ZV 12/38 GHz, Class C; FCC Part 21, 78 and 94, Category A.
‡ 1.15 (23.1) available on request.

54.25 - 57.25 GHz

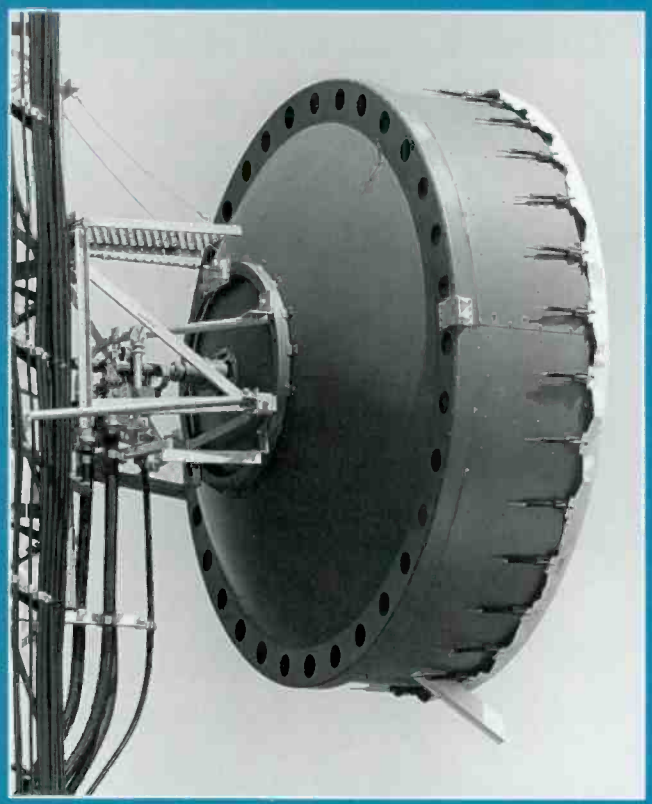
	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-540**	1 (0.3)	*	†	42.2	42.4	42.6	1.2	30	61	1.30 (17.7)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† MPT 1416, Part 3, Figure 3; FCC Part 21, Category B.
‡ 1.15 (23.1) available on request

57.2 - 58.2 GHz

	Type Number	Diameter ft (m)	Input Flanges	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi Mid-Band	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B Ratio dB	VSWR max. (R.L., dB)
VHP 	**ValuLine® Antennas – High Performance**										
Single Polarized	**VHP1-570**	1 (0.3)	*	†	42.6	42.7	42.8	1.1	30	62	1.30 (17.7)‡

* IEC and EIA flanges are available for all ValuLine antennas. Contact Andrew for more information.
† MPT 1415, Part 2, Figure 2.1; FCC Part 21, Category B.
‡ 1.15 (23.1) available on request



Multiband Antennas

Multiband antennas offer very high route capacity at minimum antenna/tower system cost. They also offer great system planning flexibility, especially for upgrades of existing frequency congested routes. Multiband antennas provide a second frequency band of operation using one antenna. Maximum channel expansion, with minimum increase in tower wind load, saves system installation time and cost.

Size, weight, wind load characteristics and tower interface requirements are similar to other Andrew antennas of equivalent size. Our line of multiband antennas can, in general, be used as direct replacements for your existing single band antennas.

Andrew also offers the combining networks and circulators you need to complete your multiband antenna system.

The multiband antennas listed in this Catalog are a small sampling of our total capabilities. We understand that your upgrade or expansion needs may be unique and we would like the opportunity to discuss your requirements with you. Contact Andrew for further information and help in designing your system.

Input Flange Information

Band, GHz	Antenna Input
0.9, 1.7, 1.9, 2, 2.3	7/8" EIA
4	CPR229G
4.7	CPR187G
6	CPR137G
6.5 (UMX and 3-port)	CPR137G
6.5 (HPX12-6511C)	PAR70
7 and 8	CPR112G
11	CPR90G
12	WR75 cover/gasket

Pressurization

Antenna	Pressure Rating Max. lb/in² (kPa)
UMX-459	0.5 (3.5)
UMX-465	5 (35)
UMX-611	5 (35)
HPX12-6511C	5 (35)
P-186	2 (14)
All Others	10 (70)

See pages 250-285 for pressurization equipment to complement your antennas.

MultiBand Antennas

Frequency GHz	Type Number	Diameter Feet (m)	Band	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi MidiBand	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B dB	VSWR, max (R.L., dB)
UMX® 	**Ultra High Performance Multi-band 4-Port Antennas**										
3.4-3.9 GHz and 4.4-5.0 GHz	**UMX10-3444**	10 (3.0)	4	–	37.4	38.0	38.6	2.0	35	68	1.10 (26.4)
			5	–	39.7	40.2	40.7	1.6	35	71	1.15 (23.1)
	UMX12-3444	12 (3.7)	4	–	39.0	39.6	40.2	1.7	35	71	1.10 (26.4)
			5	–	41.4	41.9	42.5	1.3	35	78	1.15 (23.1)
4.4-5.0 GHz and 5.6-6.2 GHz	**UMX10-4456**	10 (3.0)	5	–	39.7	40.2	40.8	1.6	35	75	1.15 (23.1)
			6	–	41.8	42.2	42.6	1.2	35	76	1.10 (26.4)
	UMX12-4456	12 (3.7)	5	–	41.4	41.8	42.5	1.3	35	74	1.15 (23.1)
			6	–	43.4	43.8	44.2	1.0	35	77	1.10 (26.4)
3.4-3.9 GHz and 5.6-6.2 GHz	**UMX10-3456**	10 (3.0)	4	–	36.6	37.2	37.8	2.1	35	70	1.15 (23.1)
			6	–	40.7	41.2	41.3	1.2	35	73	1.15 (23.1)
	UMX12-3456	12 (3.7)	4	–	38.5	39.1	39.7	1.8	35	71	1.15 (23.1)
			6	–	42.6	43.1	43.2	1.0	35	76	1.15 (23.1)
3.7-4.2 GHz and 5.925-6.425 GHz	**UMX10-459B†**	10 (3.0)	4	A*	38.4	39.0	39.4	1.8	30	75	1.06 (30.7)
			6	A*	42.8	43.1	43.5	1.1	30	80	1.06 (30.7)
	UMX12-459A†	12 (3.7)	4	A*	40.7	41.3	41.5	1.5	30	74	1.06 (30.7)
			6	A*	44.9	45.3	45.7	0.9	30	80	1.06 (30.7)
3.58-4.2 GHz and 6.425-7.125 GHz	**UMX12-A465**	12 (3.7)	4	A*	40.3	40.9	41.5	1.7	30	73	1.12 (24.9)
			6	A**	44.5	45.0	45.4	0.95	30	78	1.12 (24.9)
5.925-6.425 GHz and 10.7-11.7 GHz	**UMX10-611A**	10 (3.0)	6	A*	42.0	42.2	42.5	1.4	30	73	1.13 (24.3)
			11	A*	47.0	47.4	47.3	0.8	30	82	1.13 (24.3)
4.40-5.00 GHz and 6.425-7.125 GHz	**UMX8-4464**	8 (2.4)	5	–	37.3	37.8	38.3	1.9	35	68	1.15 (23.1)
			6.5		40.5	41.0	41.4	1.3	35	70	1.15 (23.1)
4.40-5.00 GHz and 6.425-7.125 GHz	**UMX10-4464**	10 (3)	5	–	39.2	39.7	40.2	1.6	35	72	1.15 (23.1)
			6.5		42.5	42.9	43.4	1.1	35	74	1.15 (23.1)
4.40-5.00 GHz and 6.425-7.125 GHz	**UMX12-4464**	12 (3.7)	5	–	41.1	41.6	42.2	1.3	35	73	1.15 (23.1)
			6.5		44.4	44.8	45.3	0.9	35	75	1.15 (23.1)
4.40-5.00 GHz and 6.425-7.125 GHz	**UMX15-4464**	15 (4.6)	5	–	43.0	43.6	44.1	1.0	35	74	1.15 (23.1)
			6.5		46.3	46.7	47.2	0.7	35	76	1.15 (23.1)
6.425-7.125 GHz and 7.725-8.275 GHz	**UMX8-6477**	8 (2.4)	6.5	–	41.0	41.5	41.9	1.3	35	70	1.15 (23.1)
			8		42.6	42.8	42.9	1.1	35	73	1.15 (23.1)
6.425-7.125 GHz and 7.725-8.275 GHz	**UMX10-6477**	10 (3)	6.5	–	43.0	43.4	43.8	1.0	35	74	1.15 (23.1)
			8		44.6	44.8	45.0	0.9	35	76	1.15 (23.1)
6.425-7.125 GHz and 7.725-8.275 GHz	**UMX12-6477**	12 (3.7)	6.5	–	44.6	45.0	45.4	0.9	35	75	1.15 (23.1)
			8		46.2	46.4	46.6	0.7	35	77	1.15 (23.1)
6.425-7.125 GHz and 7.725-8.275 GHz	**UMX15-6477**	15 (4.6)	6.5	–	46.5	46.9	47.4	0.7	35	76	1.15 (23.1)
			8		48.1	48.3	48.5	0.6	35	78	1.15 (23.1)

* U.S. FCC Part 21
** U.S. FCC Part 94
† Requires 4-port combiner Type 200816A (order separately).
Note: Part 101 will replace Parts 21 and 94 effective June, 1997.

MultiBand Antennas

Frequency GHz	Type Number	Diameter Feet (m)	Band	Regulatory Compliance	Gain, dBi Bottom	Gain, dBi MidiBand	Gain, dBi Top	Beamwidth Degrees	Cross Pol. Disc., dB	F/B dB	VSWR, max (R.L., dB)
UMX®	**High Performance Multi-Band 4-Port Antennas**										
6.425-7.125 GHz and 10.7-11.7 GHz	HPX12-6511C	12 (3.7)	6	B**	43.5	44.0	44.5	0.9	33	70	1.12 (24.9)
			11	A*	47.0	48.0	47.0	0.6	33	72	1.22 (20.1)
HP	**High Performance Multi-Band 2 Port Antennas** (Single Polarized Each Band, Orthogonal Polarized)										
1.85-1.99 GHz and 6.425-7.125 GHz	HP8-186	8 (2.4)	2	A**	30.4	30.7	31.0	4.3	28	51	1.15 (23.1)
			6.5	A**	41.5	41.9	42.4	1.3	30	69	1.10 (26.4)
1.85-1.99 GHz and 6.425-7.125 GHz	HP10-186	10 (3.0)	2	A**	32.4	32.7	33.0	3.7	28	54	1.15 (23.1)
			6.5	A**	42.7	43.0	43.4	1.0	30	71	1.10 (26.4)
6.425-7.125 GHz and 10.7-11.7 GHz	HP8-6511	8 (2.4)	6	A**	41.6	41.9	42.3	1.3	32	65	1.06 (30.7)
			11	A*	44.3	44.7	45.1	0.8	25	70	1.10 (26.4)
5.925-6.425 GHz and 10.7-11.7 GHz	HP8-611D	8 (2.4)	6	A*	40.9	41.3	41.6	1.4	35	65	1.06 (30.7)
			11	A*	44.3	44.7	45.1	0.8	25	70	1.10 (26.4)
	HP10-611E	10 (3.0)	6	A*	42.7	43.0	43.2	1.1	30	72	1.06 (30.7)
			11	A*	46.1	45.8	46.2	0.7	25	72	1.10 (26.4)
	HP12-611F	12 (3.7)	6	A*	44.3	44.7	45.0	0.9	28	72	1.06 (30.7)
			11	A*	46.9	47.3	47.7	0.5	25	72	1.10 (26.4)
P	**Standard Antennas Multi-band 3-port Antennas** (2 GHz Single Polarized, 6 GHz Dual-Polarized)										
1.85-1.99 GHz and 6.425-7.125 GHz	P8-186	8(2.4)	2	A**	30.9	31.2	31.5	4.3	18	39	1.15 (23.1)
			6.5	A**	41.6	42.0	42.5	1.3	30	49	1.10 (26.4)
	P10-186	10 (3.0)	2	A**	32.5	32.8	33.1	3.7	20	42	1.15 (23.1)
			6.5	A**	43.7	44.0	44.4	1.0	30	52	1.10 (26.4)
P	**Standard Antennas Multi-band 2-port Antennas** (Both Bands Single Polarized, Orthogonal Polarization)										
6.875-7.125 GHz and 12.7-13.25 GHz	P8-6812	8(2.4)	7	A***	42.2	42.4	42.5	1.3	30	53	1.10 (26.4)
			12	B***	44.6	43.1	42.2	1.1	15	54	1.15 (23.1)
	P10-6812	10 (3.0)	7	A***	42.8	43.0	43.1	1.2	30	59	1.10 (26.4)
			12	B***	44.7	43.1	40.7	1.1	10	60	1.15 (23.1)

* U.S. FCC Part 21
** U.S. FCC Part 94
*** U.S. FCC Part 74
Note: Part 101 will replace Parts 21 and 94 effective June, 1997.

Antenna Mechanical Specifications

Mounting Information

All microwave antennas listed on pages 65-116, except UMX-459 series, include a vertical tower mount. Standard mounting information is summarized in the table on page 118. Special purpose mounts are described on page 146. Dimensional information and illustrations for installation planning are presented on pages 119-132.

Mounting Pipe. Vertical tower mounts attached to a tower supported vertical pipe of the diameter specified on page 118. The mounting pipe is not included with the antenna. It is normally purchased as part of the tower.

Mount Construction. Structural members are hot-dip galvanized steel or aluminum.

Hardware. Fixed hardware is hot-dip galvanized steel. Adjusting hardware, including adjusting rods, is stainless steel.

Azimuth and Elevation Adjustments. The adjustment ranges are indicated in the table. Some mounts, as noted in the table, use a swivel clamp for azimuth adjustment. Adjustment range for these is 360 degrees. All mounts have threaded fine elevation adjustment, except those for the 4 ft (1.2 m) GRIDPAK® and the mini-GRIDPAK® antennas.

Side Struts. Some antennas include one or two side struts. The number supplied with each antenna is indicated in the table on pg 118. Where one side strut is supplied, it includes a stainless steel threaded rod fine azimuth adjustment. Where two side struts are supplied, one is adjustable (has fine azimuth adjustment) and the other is fixed (adjustable but without fine azimuth adjustment). Refer to page 119 for information on side strut positioning.

Pressurization Requirements

Most air-dielectric antenna feeds are pressurizable to 10 lb/in² (70 kPa). Exceptions are:

Antenna Types	Pressure Rating
Dual Polarized, 1.7 - 2.7 GHz	3 lb/in² (20 kPa)
Dual Polarized, 3.4 - 3.7 GHz	5 lb/in² (35 kPa)
UMX( )-465, UMX( )-611 and HPX12-6511C	5 lb/in² (35 kPa)
UMX( )-459	0.5 lb/in² (3.5 kPa)
P( )-186	2 lb/in² (14 kPa)

Note: For other multiband antennas–refer to feed installation instructions for pressurization instructions.

The vertical tower mounts listed below are included as part of all new antennas. Mount Type Numbers are shown for ordering replacement mounts.

Vertical Tower Mounts

Antenna Size, ft (m)	Replacement Mount Type Number Metric Standard Hardware	Mounting Pipe Dia. in (mm)	Center Offset* in (mm)	Fine Azimuth Adjustment Degrees	Fine Elevation Adjustment Degrees	Side Struts Included
Shielded Antennas						
4 (1.2)‡	T6MSB	4.5 (115)	5.4 (137)**	±5	±5	–
6 (1.8)‡‡	T6MSC	4.5 (115)	5.4 (137)**	±5	±5	1
8 (2.4)	T10MSB	4.5 (115)	8 (200) left*	±5	±5	2
10 (3.0)	T10MSB	4.5 (115)	8 (200) left*	±5	±5	2
12 (3.7)	T12MSA††	4.5 (115)	8.5 (215) left*	±5	±5	2
15 (4.6)	Integral	4.5 (115)	8 (200) right*	±5	±3.6	1
Standard and Focal Plane Antennas						
4 (1.2)‡	T6MSB	4.5 (115)	5.4 (137)**	±5	±5	–
4 (1.2)‡‡	46770A-2	4.5 (115)	5.4 (137)**	***	±5	–
6 (1.8)‡	T6MSB	4.5 (115)	5.4 (137)**	±5	±5	–
6 (1.8)‡‡	46770A-2	4.5 (115)	5.4 (137)**	***	±5	–
8 (2.4)	T10MSB	4.5 (115)	8 (200) left*	±5	±5	1
10 (3.0)	T10MSB	4.5 (115)	8 (200) left*	±5	±5	1
12 (3.7)	T12MSA	4.5 (115)	8.5 (215) left*	±5	±5	2
15 (4.6)	Integral	4.5 (115)	8 (200) right*	±5	±3.6	1
GRIDPAK® Antennas						
4 (1.3)	Integral	4.5 (115)	6.88 (175)	***	±15	–
6 (2)	140854	4.5 (115)	6.88 (175)	***	±5	–
8 (2.4)	140855	4.5 (115)	6.88 (175)	±5	±5	1
10 (3)	140856	4.5 (115)	6.88 (175)	±5	±5	1
13 (4)	140857	4.5 (115)	6.88 (175)	±5	±5	2
ValuLine® Antennas						
1 (0.3)	Integral	2.0 to 4.5 (50 to 115)	9.4 (239)	± 15°	± 22°	–
2 (0.6)	Integral	2.5 to 4.5 (65 to 115)	12.4 (315)	± 15°	± 50°	–
2.5 (0.8)	Integral	2.5 to 4.5 (65 to 115)	12.4 (315)	± 15°	± 50°	–
4 (1.2)	Integral	4.5 (115)	10.4 (264)	± 15°	± 20°	1
6 (1.8)	T6MSC	4.5 (115)	5.4 (137)	± 15°	± 5°	1

* With respect to the mounting pipe viewed from the rear of the antenna. Can be reversed by inverting the mount or antenna.

** Can be offset right or left without inverting the mount or antenna.

*** 360° azimuth capability, no fine adjustment.

†† UHX12-59J includes a bottom strut and requires a 10 ft (3 m) long mounting pipe.

‡ Applies to antennas 3.5 GHz and higher.

‡‡ Applies to antennas 2.7 GHz and lower, except for FP antennas which use the T6MSB mount.

Note: Integral mounts consist of multiple part numbers. Contact Andrew for part numbers.

Antenna/Tower Interface

Dimensional information and illustrations for installation planning are presented on the following pages.

Side Strut Positioning

For maximum wind load capacity, side struts should be installed straight back to the tower. When this is not possible, the following guidelines apply:

When only one side strut is supplied, its angle should not exceed ±25° in the horizontal plane and ±5° in the vertical plane. See illustration for "adjustable strut".

For antennas with two side struts, the adjustable strut can be lowered or raised 5° from horizontal. The fixed side strut can be lowered or raised 25°. In the horizontal plane, both struts can be positioned at an angle up to 25°. See illustration at right. Further, the strut closest to the mounting pipe may be positioned at an angle up to 35°, provided the sum of the angles for both struts does not exceed 50°.

Feed Orientation

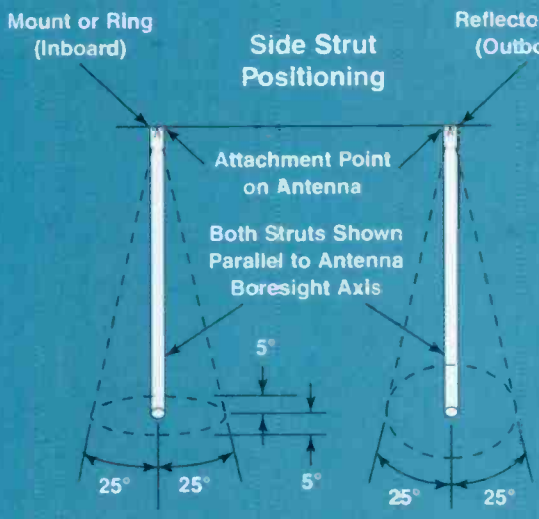
All Andrew solid parabolic antennas are fed from the center of the reflector and include polarization adjustment. The polarizations are clearly marked with arrows on the feed mounting hub. For single polarized antennas, the arrow is positioned up or down for vertical polarization and right or left for horizontal polarization. See illustrations.

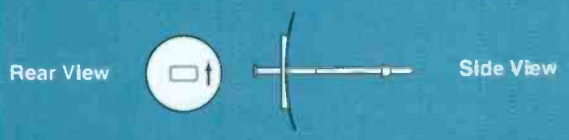
Dual Polarized, waveguide fed antennas have both input flanges in the same plane to ease the attachment of waveguide. One input signal is rotated 90° inside the feed horn to provide cross polarization.

UHX® ultra high performance antennas have asymmetrical patterns with lower side lobe levels on one side. For these antennas, RPEs are prepared for the full 360°. The frequency coordinator can use the better half of the radiation pattern on either the right or the left side of the antenna to reduce potential interference. UHX feed hubs use red to identify the better side. This side can be placed either right or left or boresight. Therefore, it is necessary for the frequency coordinator to specify "red right" or "red left" feed position.

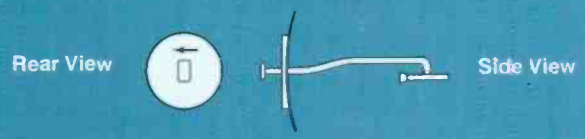
The installer must be advised of the proper feed orientation on all ultra high performance antennas and the proper polarization for single-polarized antennas.

Microwave Antennas

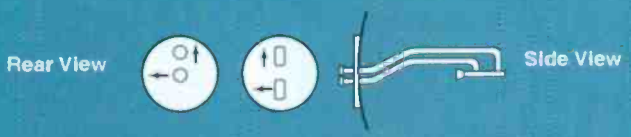




Vertically Polarized Antenna

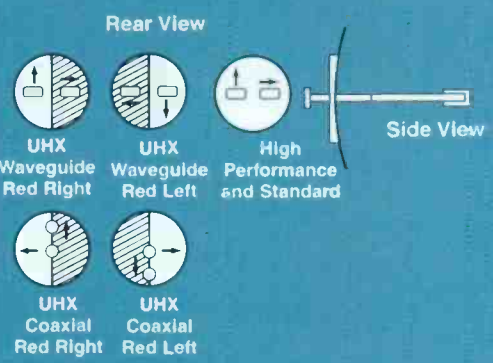


Horizontally Polarized Antenna



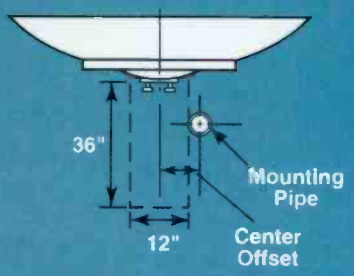
Applies to: PXL-17 and -19 series, PX6 (except -107 -22 and -127), PXL6 (except -107, -122 and -127) PXL10-37, PXL8-37

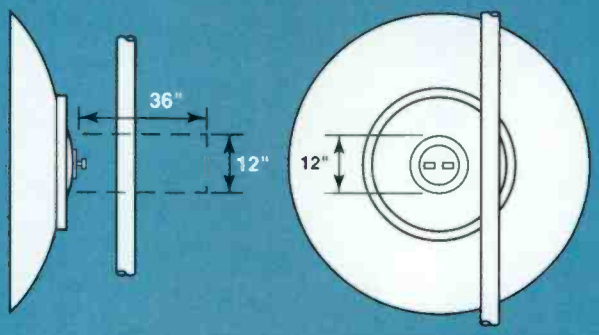
Dual Polarized Antennas. Applies to Specified Types



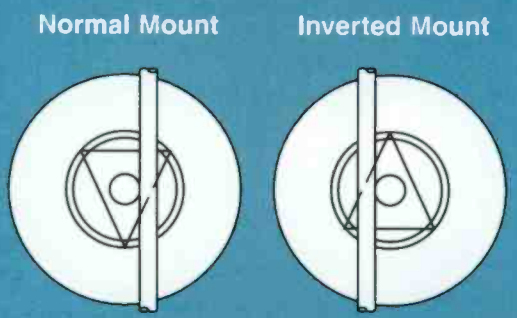
Dual Polarized Antennas. Except Those Specified Above.

Microwave Antennas





Clear space required behind reflector for routing and attachment of transmission line.



Normal and Inverted Mounts. Applies to all 8, 10 and 12 ft antennas.

Feed Installation

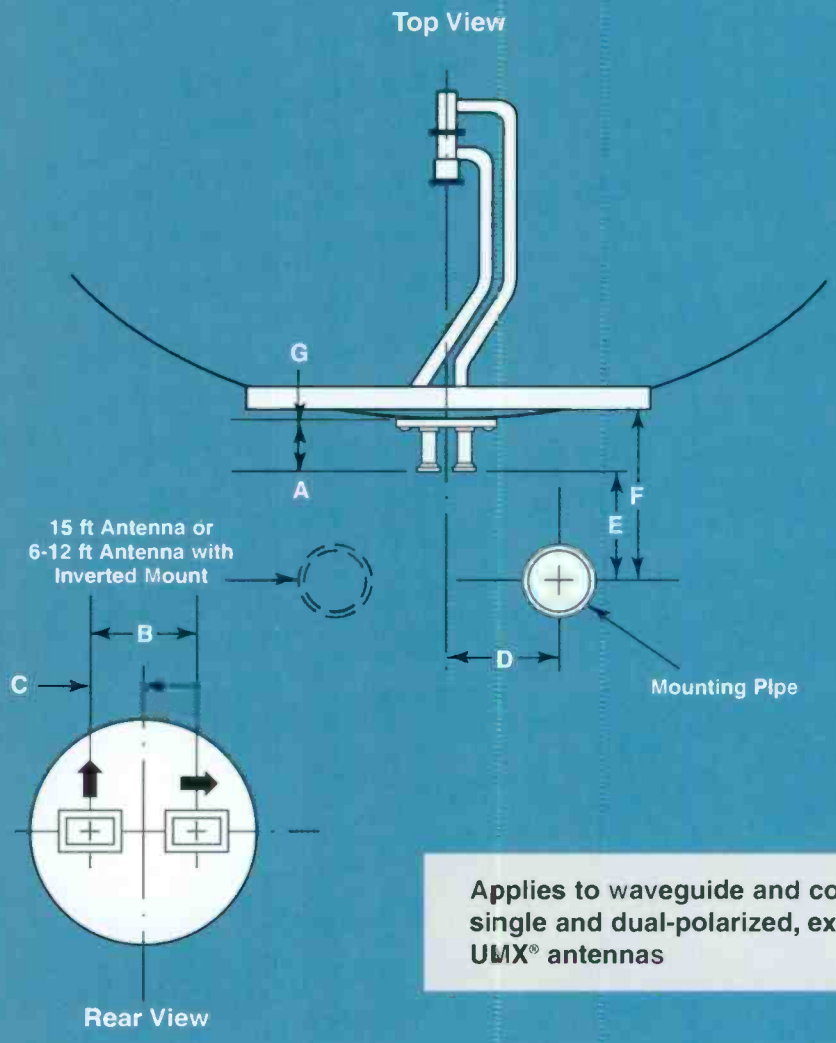
Most feeds are designed to be originally installed from the front of the antenna. However, single-polarized feeds (except -34, -35, -37 series) and most dual polarized -105, -107, -122, -127, -130, -144, -180, -220 series feeds [except HPX()-105A, UHX()-107 and UHX()-127H] can be replaced from the back of the antenna. All other feeds, including dual band feeds, must be inserted from the front of the antenna before the radome is attached.

Reversing the Feed Offset

It is recommended that a cylindrical clear space of 12 in (305 mm) diameter by 36 in (915 mm) long be provided behind the center of the antenna to permit proper routing and attachment of the transmission line. Tower members directly behind the feed will interfere with the routing of the HELIAX® elliptical waveguide or coaxial cable to the feed. If there are interfering members behind the center of the antenna when mounted normally, it is possible to reverse the feed offset to position the feed on the other side of the mounting pipe.

The antenna mount can be inverted to change the offset of the feed for all 8, 10 and 12-ft antennas. Reflectors used on these antennas are designed to accommodate both standard and inverted mounting. To shift the offset of 1-ft, 2-ft and 15-ft antennas, the entire antenna is inverted. The offset for 4-ft and 6-ft antennas can be shifted without inverting the mount or antenna.

The installer should be advised which antennas require inverted mounting prior to assembly and the antennas should be clearly identified prior to lifting.



Applies to waveguide and coaxial, single and dual-polarized, except UMX® antennas

Feed Dimensions

The dimensions presented below are for use in planning transmission line routing for waveguide, coaxial, single polarized and dual polarized feeds.

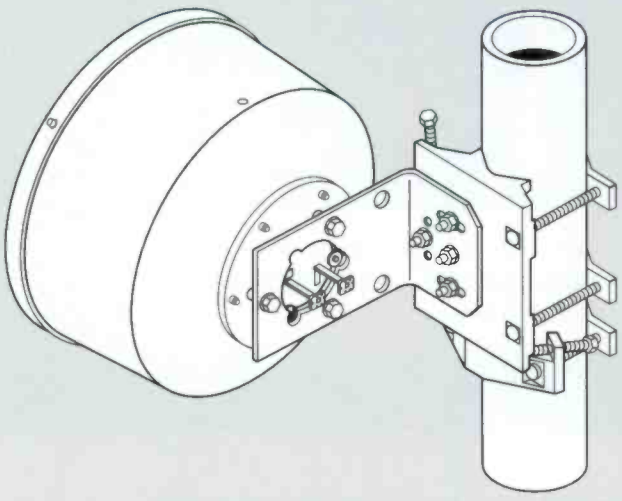
Dimensions A, B, C and E

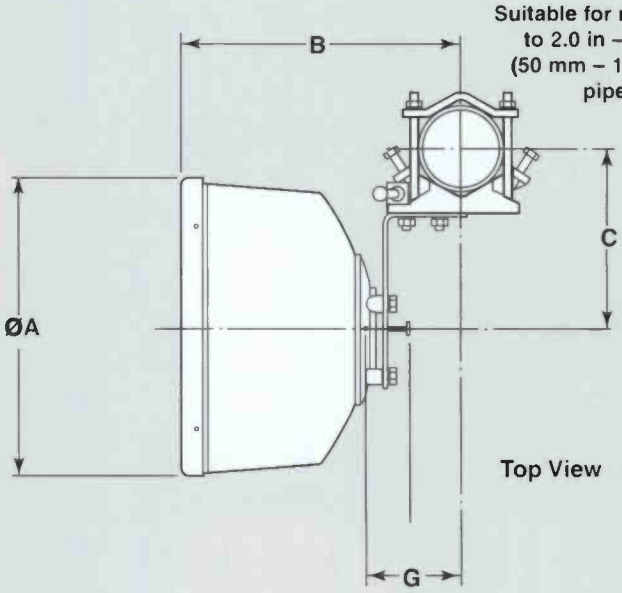
A = 4.5 in (115 mm)
B = 3 in (76 mm)
C = 1.5 in (38 mm)
E = F - (G + A)

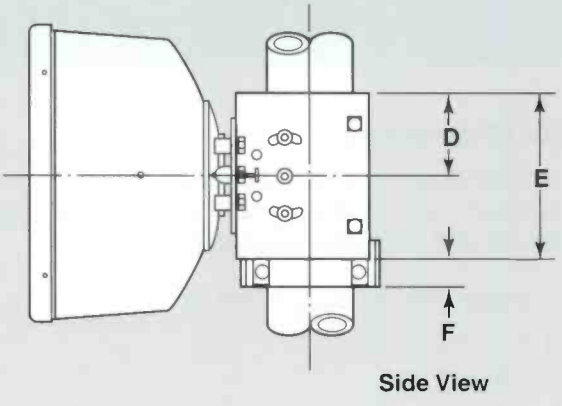
Dimensions D, F and G, in (mm)

Antenna Type and Size, ft (m)	D	F	G
Shielded Antennas			
4 (1.2)	5.4 (140)	14.5 (370)	0.75 (19)
6 (1.8)	5.4 (140)	11.75 (298)	-0.6 (-15)
8 and 10 (2.4 and 3.0)	8 (205)	13 (330)	1.1 (28)
12 (3.7)	8.5 (215)	13 (330)	0.5 (13)
15 (4.6)	- 8 (-205)	15.25 (387)	8.1 (206)
Standard Antennas			
4 (1.2)	5.4 (135)	11.75 (298)	0.75 (19)
6 (1.8)	5.4 (135)	11.75 (298)	-0.6 (-15)
8 and 10 (2.4 and 3.0)	8 (205)	13 (330)	1.1 (28)
12 (3.7)	8.5 (215)	13 (330)	0.5 (-13)
15 (4.6)	-8 (-205)	15.25 (387)	8.1 (206)

1 ft ValuLine®





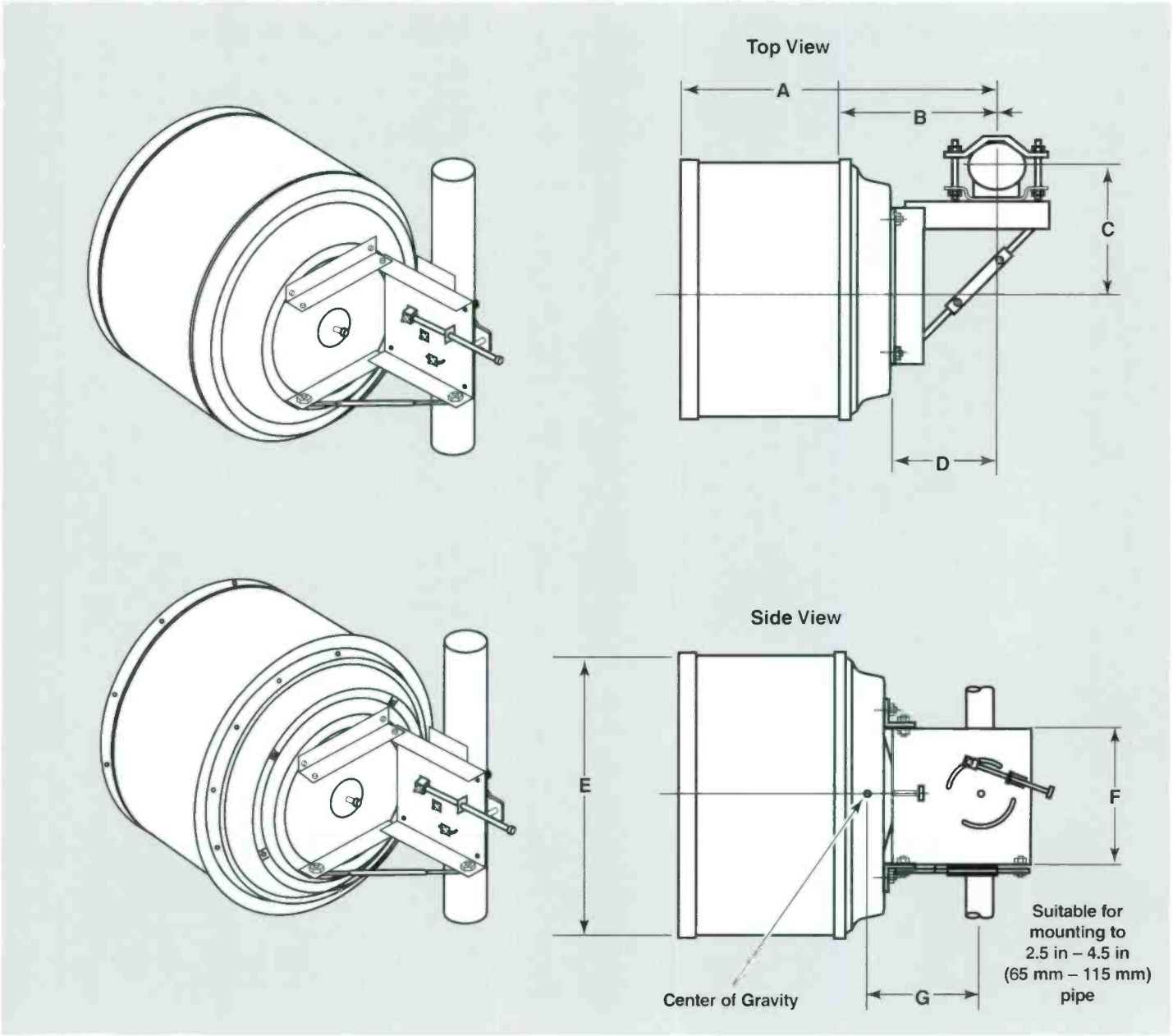


Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F	G
1 (0.3)	15.6 (398)	14.9 (379)	9.4 (239)	4.3 (110)	8.7 (220)	1.6 (40)	5.1 (130)

All dimensions based on 4.5 in (115 mm) pipe.

2 ft Shielded ValuLine®
2 ft Standard ValuLine®
2.5 ft Shielded ValuLine®
2.5 ft Standard ValuLine®



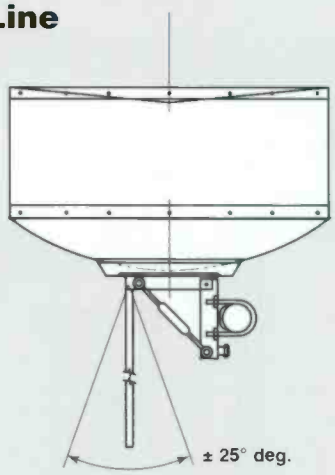
Dimensions in inches (mm)

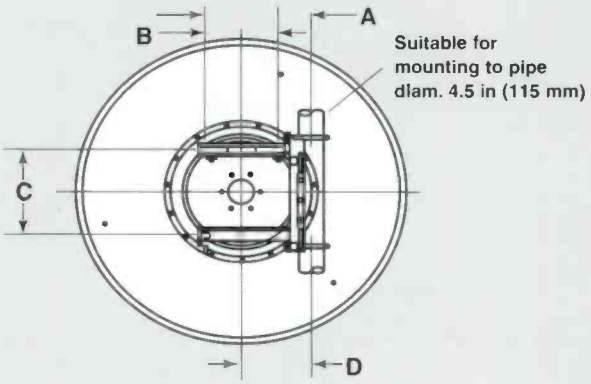
Antenna Size, ft (m)	A	B	C	D	E	F	G
2 (0.6) Shielded	25.4 (645)	12.4 (315)	11.9 (301)	8.3 (210)	25.6 (675)	12.0 (306)	6.9 (175)
2 (0.6) Standard	–	12.4 (315)	11.9 (301)	8.3 (210)	25.1 (637)	12.0 (306)	3.5 (88)
2.5 (0.8) Shielded	29.5 (749)	15.0 (382)	11.9 (301)	8.3 (210)	33.7 (855)	12.0 (306)	8.0 (205)
2.5 (0.8) Standard	–	15.0 (382)	11.9 (301)	8.3 (210)	33.2 (843)	12.0 (306)	–

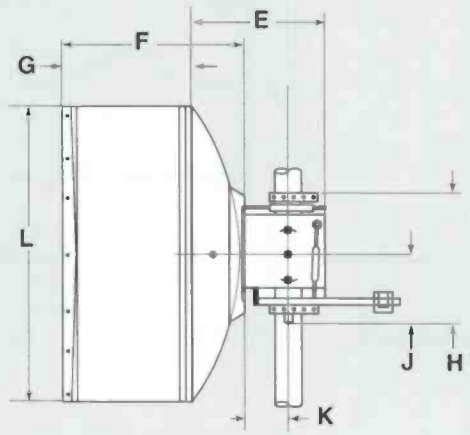
All dimensions based on 4.5 in (115 mm) pipe.

4 and 6 ft ValuLine®

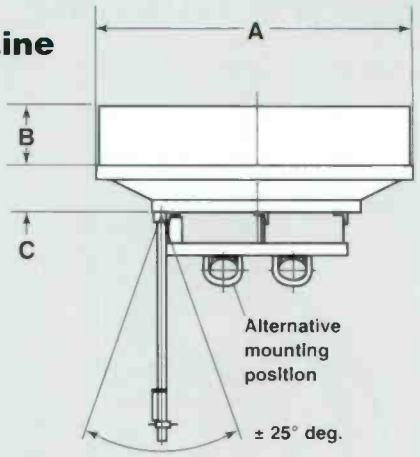
4 ft ValuLine

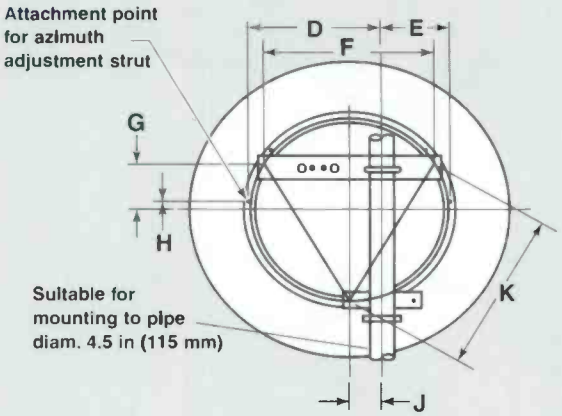


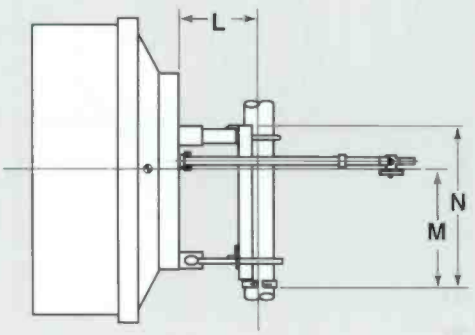




6 ft ValuLine





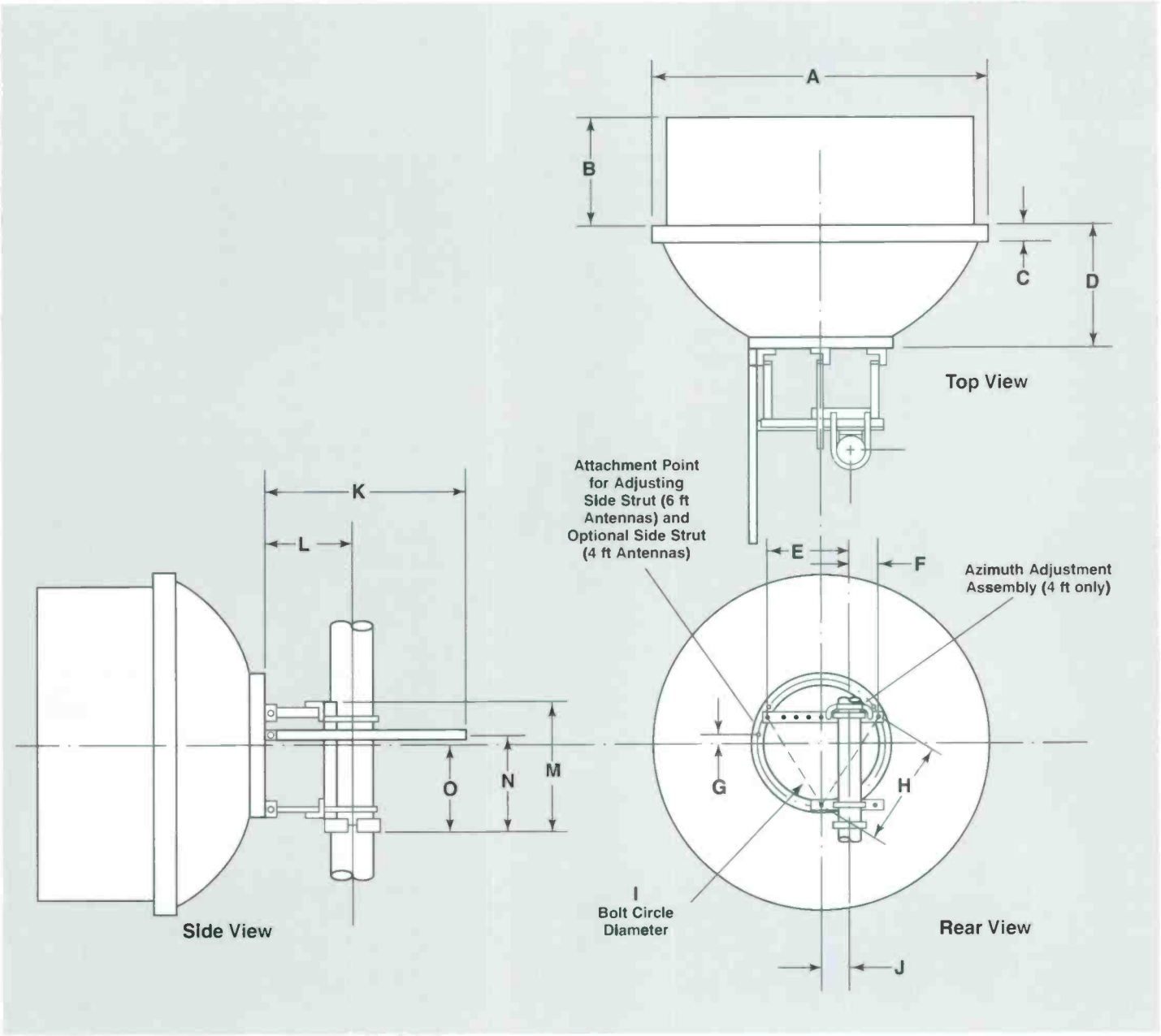


Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F*	G*	H	J	K	L
4 (1.2)	16.2 (411)	11.6 (295)	14.2 (361)	10.4 (264)	21.4 (544)	30.0 (762)	21.3 (541)	20.8 (528)	11.1 (288)	6.5 (165)	49.1 (1247)
	A	B*	C	D	E	F	G	H	J	K	L	M	N
6 (1.8)	76.5 (1945)	34.7 (881)	12.75 (325)	18.8 (476)	9.7 (246)	26.5 (675)	7.65 (195)	2.25 (60)	5.4 (175)	26.5 (675)	11.75 (300)	19.1 (488)	29.1 (740)

* Applicable only for VHP Series (shielded) antennas.

4 and 6 ft Shielded

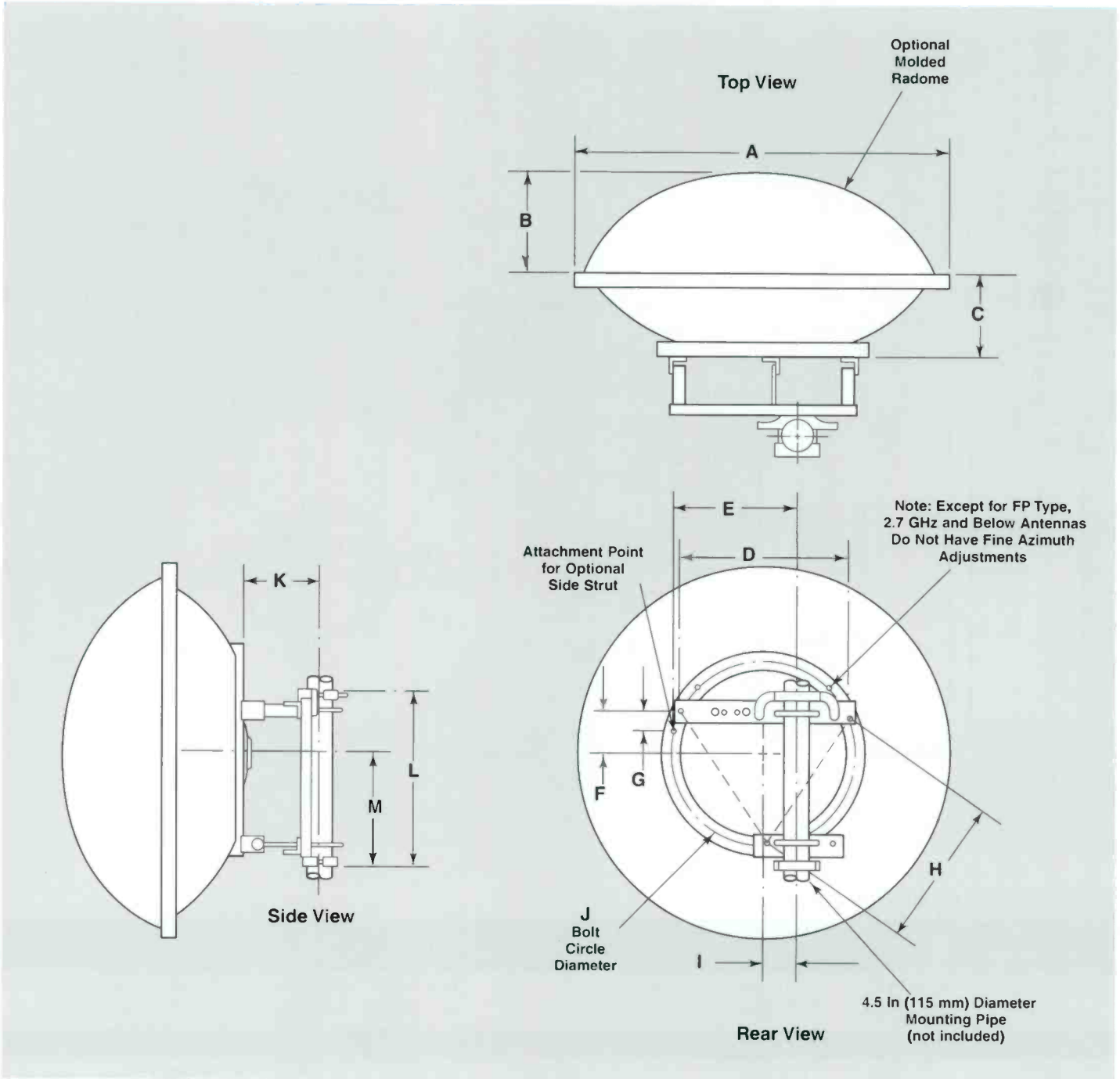


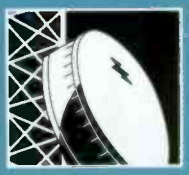
Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F	G	H
4 (1.2)	52.4 (1330)	23.1 (585)	3.5 (90)	7.75 (195)	19.6 (500)	6.9 (175)	2.25 (55)	26.5 (675)
6 (1.8)	76.5 (1945)	35.25 (895)	3.75 (95)	13.25 (335)	19.6 (500)	6.9 (175)	2.25 (55)	26.5 (675)

	I	J	K	L	M	N	O
4 (1.2)	30.6 (780)	6.4 (160)	–	11.62 (295)	29 (735)	21.5 (545)	19.25 (490)
6 (1.8)	30.6 (780	6.4 (160)	84.75 (2155)	11.62 (295)	29 (735)	21.5 (545)	19.25 (490)

4 and 6 ft Standard and Focal Plane



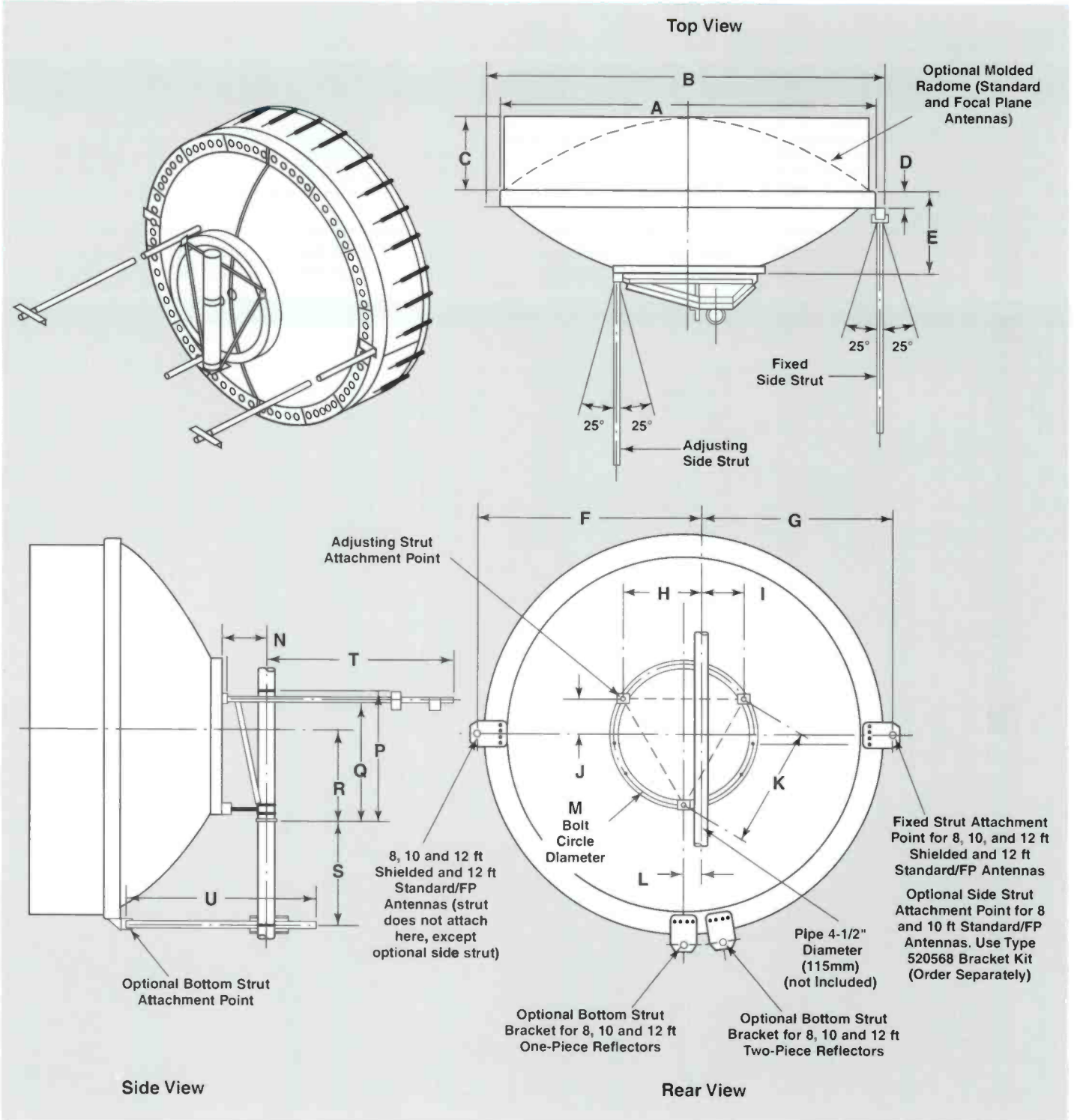


Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F	G
Standard Antennas							
4 (1.2)	52.4 (1330)	18.5 (470)	7.75 (195)	26.5 (675)	21.5 (545)	7.75 (195)	2.25 (60)
6 (1.8)	76.3 (1940)	27.75 (690)	13.2 (335)	26.5 (675)	21.5 (545)	7.75 (195)	2.25 (60)
Focal Plane Antennas							
4 (1.2)	50.75 (1290)	23.3 (590)	9.5 (245)	26.5 (675)	21.5 (545)	7.75 (195)	2.25 (60)
6 (1.8)	76 (1930)	13.46 (340)	17.5 (445)	26.5 (675)	21.5 (545)	7.75 (195)	2.25 (60)

	H	I	J	K	L	M
Standard Antennas						
4 (1.2)	26.5 (675)	6.4 (160)	30.6 (780)	11.6 (295)	30.75 (780)	19 (480)
6 (1.8)	26.5 (675)	6.4 (160)	30.6 (780)	11.6 (295)	30.75 (780)	19 (480)
Focal Plane Antennas						
4 (1.2)	26.5 (675)	6.4 (160)	30.6 (780)	11.6 (295)	30.75 (780)	19 (480)
6 (1.8)	26.5 (675)	6.4 (160)	30.6 (780)	11.6 (295)	30.75 (780)	19 (480)

8, 10 and 12 ft Shielded, Standard and Focal Plane



Dimensions in inches (mm)

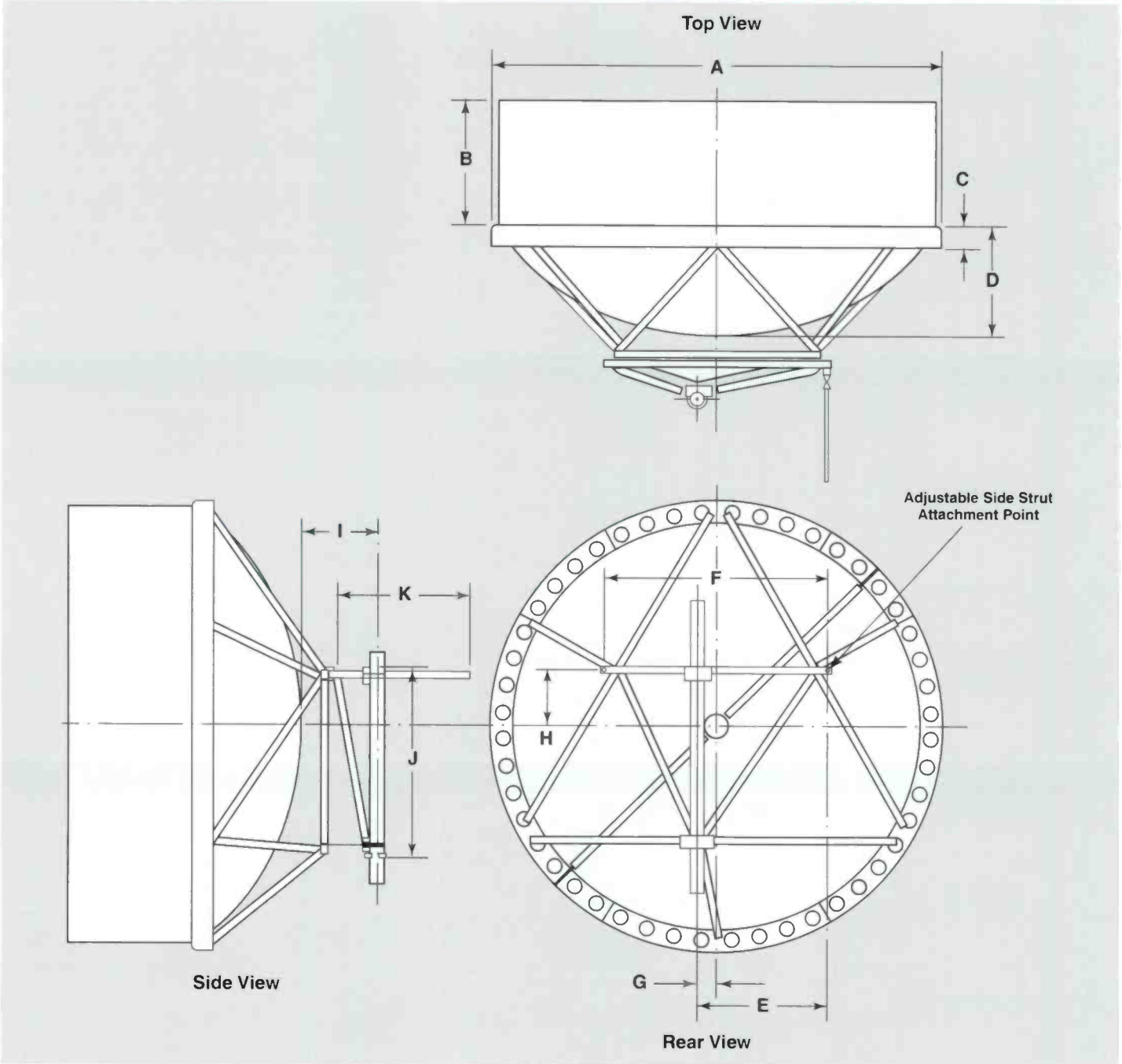
Antenna Size, ft (m)	A	B	C	D	E	F	G
Shielded Antennas (Except Dual Beam with Extended Mount)							
8 (2.4)	100.5 (2555)	106.5 (2705)	41.75 (1060)	5 (125)	15.5 (395)	59.75 (1520)	43.25 (1110)
10 (3.0)	124.5 (3160)	130.5 (3315)	31.5 (800)**	5.5 (140)	24.25 (615)	71.75 (1820)	55.75 (1415)
12 (3.7)	148.5 (3775)	154.5 (3915)	43 (1090)*	5.75 (145)	27 (685)	84.25 (2140)	67.25 (1710)
Dual Beam Antennas with Extended Mount (Sum and Difference)							
8 (2.4)	100.5 (2555)	106.5 (2705)	41.75 (1060)	5 (125)	15.5 (395)	62.75 (1595)	40.25 (1020)
10 (3.0)	124.5 (3160)	130.5 (3315)	31.5 (800)	5.5 (140)	24.25 (615)	74.75 (1900)	52.75 (1340)
12 (3.7)	148.5 (3775)	154.5 (3915)	43 (1090)	5.75 (145)	27 (685)	86.75 (2205)	64.75 (1645)
Focal Plane Antennas							
8 (2.4)	100.5 (2555)	106.5 (2705)	26.5 (670)	5 (125)	21.5 (545)	59.75 (1520)	43.25 (1110)
10 (3.0)	124.5 (3160)	130.5 (3315)	36.25 (920)	5.5 (140)	29.5 (750)	71.75 (1820)	55.75 (1415)
12 (3.7)	148.5 (3775)	154.5 (3915)	40.5 (1030)	5.75 (145)	35.5 (905)	84.25 (2140)	67.25 (1710)
Standard Antennas							
8 (2.4)	100.5 (2555)	–	36 (915)	5 (125)	15.5 (395)	–	–
10 (3.0)	124.5 (3160)	–	32.75 (830)	5.5 (140)	24.25 (615)	71.75 (1820)	
12 (3.7)	148.5 (3775)	154.5 (3925)	36.5 (930)	5.75 (145)	27 (685)	84.25 (2140)	67.25 (1710)

	H	I	J	K	L	M
Shielded Antennas (Except Dual Beam with Extended Mount)						
8 (2.4)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
10 (3.0)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
12 (3.7)	32.75 (835)	15.75 (400)	14 (355)	47.5 (1205)	8.5 (215)	56.25 (1430)
Dual Beam Antennas with Extended Mount (Sum and Difference)						
8 (2.4)	29.75 (755)	7.75 (195)	10.75 (275)	37.5 (950)	11.0 (280)	43.25 (1100)
10 (3.0)	29.75 (755)	7.75 (195)	10.75 (275)	37.5 (950)	11.0 (280)	43.25 (1100)
12 (3.7)	35.25 (895)	13.25 (335)	14 (355)	47.5 (1205)	11.0 (280)	56.25 (1430)
Focal Plane Antennas						
8 (2.4)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
10 (3.0)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
12 (3.7)	32.75 (835)	15.75 (400)	14 (355)	47.5 (1205)	8.5 (215)	56.25 (1430)
Standard Antennas						
8 (2.4)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
10 (3.0)	26.75 (680)	10.75 (275)	10.75 (275)	37.5 (950)	8 (200)	43.25 (1100)
12 (3.7)	32.75 (835)	15.75 (400)	14 (355)	47.5 (1205)	8.5 (215)	56.25 (1430)

	N	P	Q	R	S	T	U
Shielded Antennas (Except Dual Beam with Extended Mount)							
8 (2.4)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	27.25 (695)	120 (3050)	60 (1525)
10 (3.0)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	39.25 (1000)	120 (3050)	60 (1525)
12 (3.7)	13 (330)	48.25 (1225)	45 (1145)	31 (790)	44.75 (1140)	120 (3050)	60 (1525)
Dual Beam Antennas with Extended Mount (Sum and Difference)							
8 (2.4)	20 (510)	37.5 (950)	35.25 (895)	24.5 (625)	27.25 (695)	120 (3050)	60 (1525)
10 (3.0)	20 (510)	37.5 (950)	35.25 (895)	24.5 (625)	39.25 (1000)	120 (3050)	60 (1525)
12 (3.7)	20 (510)	48.25 (1225)	45 (1145)	31 (790)	44.75 (1140)	120 (3050)	60 (1525)
Focal Plane Antennas							
8 (2.4)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	27.25 (695)	120 (3050)	60 (1525)
10 (3.0)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	39.25 (1000)	120 (3050)	60 (1525)
12 (3.7)	13 (330)	48.25 (1225)	45 (1145)	31 (790)	44.75 (1140)	120 (3050)	60 (1525)
Standard Antennas							
8 (2.4)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	27.25 (695)	120 (3050)	60 (1525)
10 (3.0)	13 (330)	37.5 (950)	35.25 (895)	24.5 (625)	39.25 (1000)	120 (3050)	60 (1525)
12 (3.7)	13 (330)	48.25 (1225)	45 (1145)	31 (790)	44.75 (1140)	120 (3050)	60 (1525)

* C = 57-1/4 In (1455 mm) for UHX 12-59J
** C = 37.0 (940) for HDX 10-107

15 ft Shielded
15 ft Standard

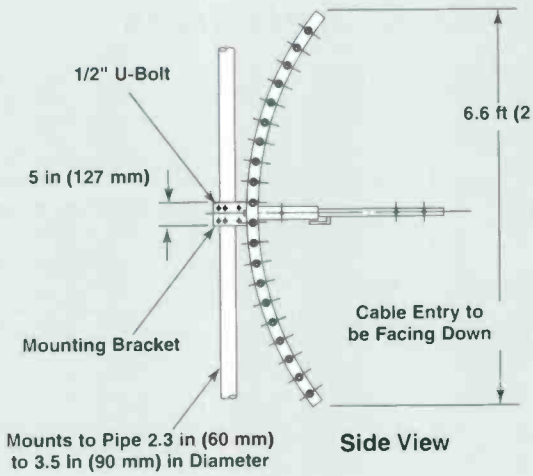


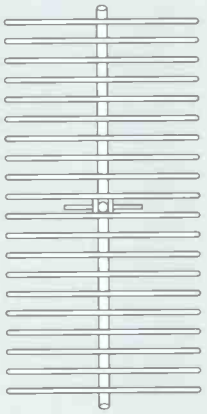
Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F	G	H	I	J	K
15 (4.6)	184.5 (4685)	49.0 (1245)	5.3 (135)	34.0 (865)	51.5 (1310)	87 (2210)	8 (200)	23.5 (595)	23.5 (595)	76.0 (1930)	108 (1240)

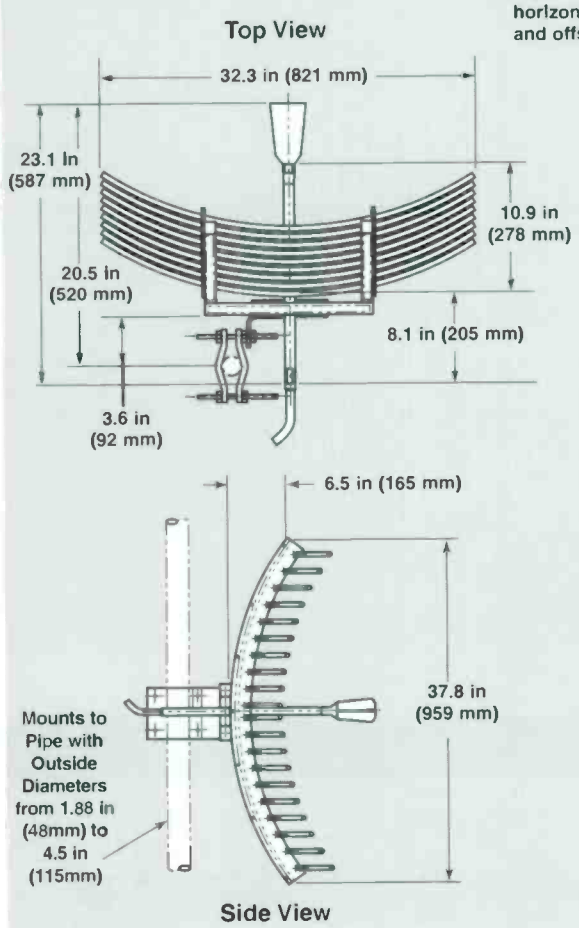
GRIDPAK® Antennas

Mini GRIDPAK® Antennas



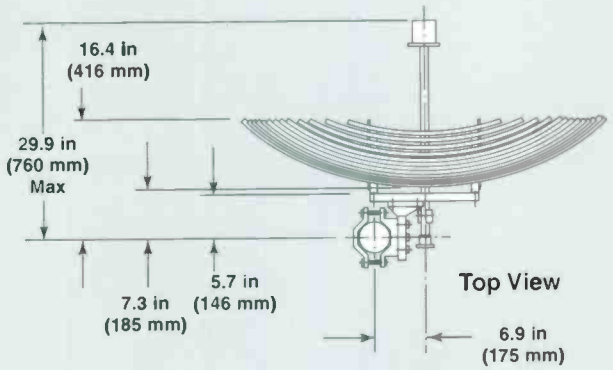


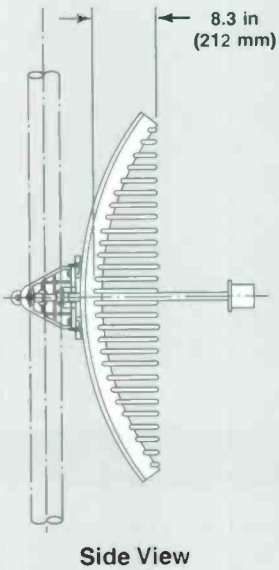
3 ft GRIDPAK® Antennas

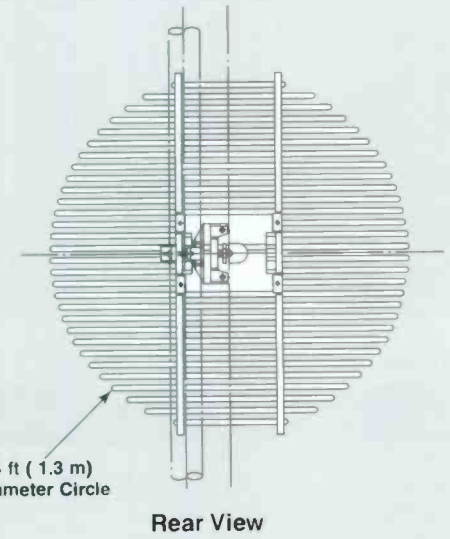


4 ft GRIDPAK® Antennas

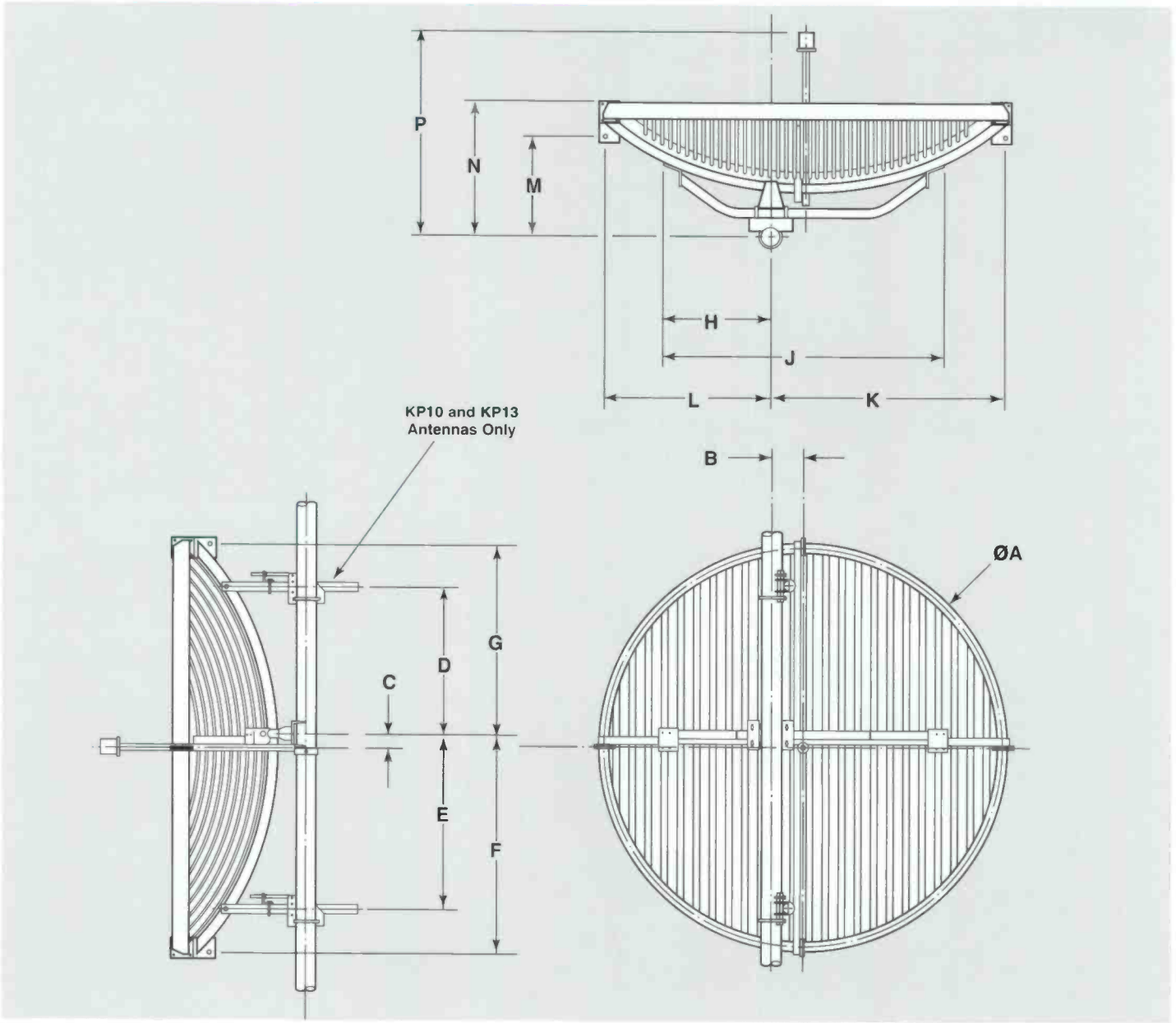
NOTE: Antenna shown is horizontally polarized and offset right







6, 8, 10 and 13 ft GRIDPAK® Antennas



Dimensions in inches (mm)

Antenna Size, ft (m)	A	B	C	D	E	F	G	H	J	K	L	M	N	P
6 (2.0)	84.4 (2144)	6.9 (175)	2.4 (62)	– –	35.1 (891)	44.4 (1129)	39.6 (1005)	22.6 (574)	59.0 (1498)	48.9 (1242)	35.1 (892)	21.2 (539)	28.6 (726)	47.0 (1194)
8 (2.4)	99.8 (2536)	6.9 (175)	2.7 (68)	– –	40.4 (1026)	52.5 (1333)	47.1 (1197)	29.9 (760)	73.6 (1870)	56.7 (1440)	42.9 (1089)	25.6 (651)	33.0 (838)	54.8 (1392)
10 (3)	124.0 (3149)	6.9 (175)	2.7 (68)	45.9 (1167)	51.3 (1303)	64.6 (1641)	58.3 (1505)	38.4 (976)	90.6 (2302)	68.8 (1748)	55.0 (1398)	34.2 (868)	41.5 (1055)	54.3 (1378)
13 (4)	162.7 (4135)	6.9 (175)	3.0 (76)	58.7 (1491)	64.7 (1643)	84.3 (2140)	78.3 (1988)	56.4 (1433)	126.6 (3216)	88.1 (2239)	74.4 (1889)	39.7 (1008)	47.0 (1195)	71.6 (1818)

Forces Produced by Microwave Antennas

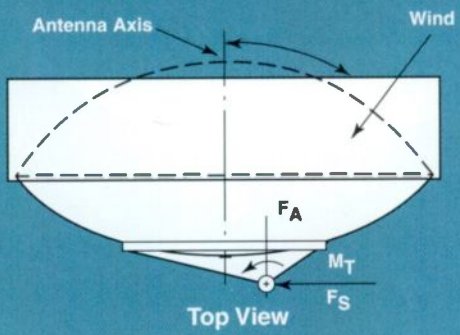
Wind Forces

The axial, side and twisting moment forces tabulated below and on page 134 are maximum values exerted on a supporting structure. They are, in every case, the result of wind from the most critical direction for each parameter. The individual maximums may not occur simultaneously. All forces are referenced to the antenna mounting pipe. The components are:

- *Axial Force, F_A*
- *Side Force, F_S*
- *Twisting Moment, M_T*

For calculations of forces produced by winds from any angle, consult Bulletin M113, Andrew AntWind™ Software.

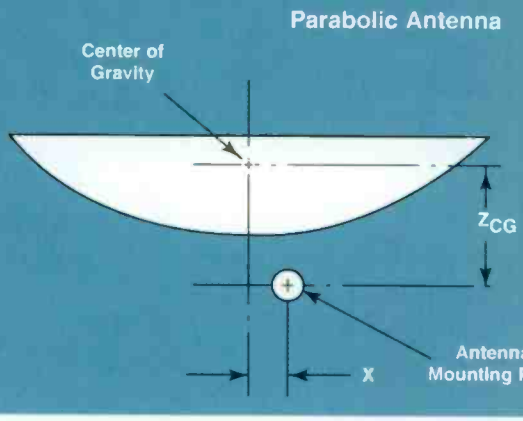
Parabolic Antennas



Wind Forces at 125 mph (200 km/h)

Antenna Type	Antenna Dia. ft (m)	F_A Max. lb	F_A Max. (N)	F_S Max. lb	F_S Max. (N)	M_T Max. lb-ft	M_T Max. (N•m)	α For M_T Max
Shielded Antenna	4 (1.2)	634	2821	314	1398	-632	-826	-110
With Planar Radome	6 (1.8)	1427	6348	707	3144	-1681	-2209	-110
(Except "other shielded"	8 (2.4)	2537	11284	1257	5590	-3615	-4901	-110
shown below)	10 (3.0)	3964	17632	1964	8734	-6365	-8630	-110
	12 (3.7)	5708	25390	2827	12577	-10423	-14132	-110
	15 (4.6)	8919	39672	4418	19652	22000	29828	110
Other Shielded, With Planar Radome								
UHX10-59J	10 (3.0)	4000	17790	1910	8500	-6880	-9330	-105
UMX10-459	10 (3.0)	4000	17790	1970	8760	-10100	-13700	-105
HDX10-107	10 (3.0)	4040	17970	2065	9190	-7260	-9850	-105
UHX12-59J	12 (3.7)	5800	25800	3020	13430	-13610	-18450	-105
UMX12-459	12 (3.7)	5760	25620	2830	12590	13400	18170	105
UMX12-465	12 (3.7)	5910	26290	3210	14280	-15590	-21140	-105
Focal Plane	4 (1.2)	918	4083	279	1240	-705	-937	-125
Antenna without	6 (1.8)	2065	9187	625	2790	-1936	-2635	-125
Radome	8 (2.4)	3672	16333	1115	4960	-4247	-5758	-125
	10 (3.0)	5737	25520	1742	7749	-7608	-10314	-125
	12 (3.7)	8261	36749	2509	11159	-12575	-17050	-125
Focal Plane and PAR Series	4 (1.2)	434	1930	267	1188	540	774	90
Antennas with	6 (1.8)	976	4343	685	2673	1597	2309	100
Radome	8 (2.4)	1736	7720	1068	4751	3714	5036	99
	10 (3.0)	2712	12064	1669	7424	6883	9333	99
Standard								
Antenna without	4 (1.2)	864	3843	236	1049	-647	-858	-130
Radome	6 (1.8)	1944	8647	531	2360	-1597	-2425	-130
(Except P6A-68)	8 (2.4)	3456	15372	943	4196	-3945	-5349	-125
	10 (3.0)	5400	24019	1474	6556	-7084	-9605	-125
	12 (3.7)	7775	34587	2122	9441	-11728	-15900	-125
	15 (4.6)	12149	54042	3316	14751	24294	32938	-125
Standard	2 (0.6)	109	483	67	297	94	128	-10
Antenna with	4 (1.2)	434	1930	267	1188	540	774	90
Radome	6 (1.8)	976	4343	685	2673	1597	2309	100
(Except P6A-68)	8 (2.4)	1736	7720	1068	4751	3714	5036	99
	10 ((3.0)	2712	12064	1669	7424	6883	9333	99
	12 (3.7)	3905	17372	2403	10691	11581	15702	99
P6A without Radome	6 (1.8)	2080	9250	610	2710	-2440	-3310	-125
P6A with Radome	6 (1.8)	1230	5470	680	3020	-2190	-2970	125
GRIDPAK® Antenna	4 (1.3)	325	1450	190	840	351	475	60
Without Ice	6 (2.0)	820	3650	430	1910	1342	1824	60
KP Series	8 (2.4)	1180	5250	600	2670	2200	2990	60
	10 (3.0)	1825	8120	1020	4540	3869	5259	60
	13 (4.0)	3135	13940	1750	7780	8022	10903	60

Microwave Antennas



Antenna Weight and Center of Gravity

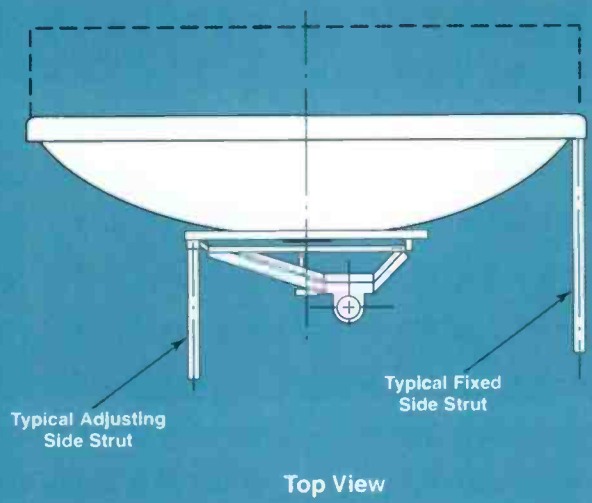
For parabolic antennas, the center of gravity is referenced to centerline of the antenna mounting pipe as illustrated. Dimension X, the transverse offset, can be found on pages 122 to 132. Dimension Z_{CG} and antenna weights with and without ice are tabulated below.

Antenna Weight and Center of Gravity, Parabolic Antenna Including Mount and Side Struts

Antenna Type	Antenna Dia. ft (m)	Without Ice Weight, lb (kg)	Without Ice Z_{CG}, in (mm)	With 1/2" (12 mm) Radial Ice Weight, lb (kg)	With 1/2" (12 mm) Radial Ice Z_{CG}, in (mm)
Shielded Antenna One-Piece Reflector with Planar Radome (except "Other Shielded" shown below)	1 (0.3)	22.9 (10.4)	3.9 (98)	30.6 (13.9)	5.1 (130)
	2 (0.6)	41 (18.5)	9.6 (244)	77 (35)	10.7 (272)
	2.5 (0.8)	78 (35.5)	6.9 (175)	96 (43.5)	8.5 (215)
	4 (1.2)	170 (77)	11.1 (282)	280 (127)	14.6 (371)
	6 (1.8)	281 (127)	20.0 (508)	501 (227)	22.8 (579)
	8 (2.4)	447 (203)	26.5 (673)	974 (430)	28.7 (729)
	10 (3.0)	541 (245)	30.2 (767)	1234 (560)	32.2 (818)
	12 (3.7)	850 (386)	31.2 (792)	1874 (850)	35.8 (909)
Shielded Antenna Two-Piece Reflector with Planar Radome	8 (2.4)	460 (209)	27.0 (686)	989 (449)	28.8 (732)
	10 (3.0)	560 (254)	30.7 (780)	1254 (569)	32.3 (820)
	12 (3.7)	860 (390)	31.8 (808)	1885 (855)	36.0 (914)
	15 (4.6)	1780 (807)	51.4 (1306)	2777 (1260)	54.0 (1372)
Other Shielded, with Planar Radome					
VHP1	1 (0.3)	22.9 (10.4)	3.9 (98)	30.6 (13.9)	5.1 (130)
VHP2	2 (0.6)	68 (31)	6.9 (175)	86 (39)	8.5 (215)
VHP4	4 (1.2)	140 (64)	12.5 (317)	282 (128)	16.7 (424)
VHP6	6 (1.8)	380 (173)	20.0 (508)	620 (282)	33.3 (848)
HDX8S-59	8 (2.4)	470 (213)	25.8 (655)	1010 (458)	28.2 (716)
UMX10-459B	10 (3.0)	705 (320)	46.0 (1168)	1310 (594)	51.0 (1295)
HDX10-107	10 (3.0)	555 (252)	30.7 (780)	1275 (578)	32.7 (831)
HDX10S-59	10 (3.0)	560 (254)	29.6 (752)	1270 (576)	32.0 (813)
UMX12-459A	12 (3.7)	895 (406)	44.0 (1118)	1660 (753)	49.0 (1245)
UMX12-465	12 (3.7)	960 (435)	29.9 (759)	2025 (919)	31.0 (787)
UHX12-59J	12 (3.7)	890 (404)	33.3 (846)	1815 (823)	39.3 (998)
HDX12S-59	12 (3.7)	890 (404)	30.3 (770)	1940 (880)	35.1 (892)
Standard Antenna One-Piece Reflector without Radome	2 (0.6)	14 (7)	6.5 (165)	58 (26)	7.9 (201)
	4 (1.2)	104 (47)	7.0 (178)	175 (79)	10.9 (277)
	6 (1.8)	143 (61)	10.0 (254)	294 (133)	13.5 (343)
	8 (2.4)	251 (114)	13.5 (343)	536 (243)	16.8 (427)
	10 (3.0)	317 (144)	18.0 (457)	784 (356)	21.7 (551)
	12 (3.7)	540 (245)	19.0 (483)	1158 (525)	22.3 (566)
Other Standard, One-Piece Reflector without Radome					
VP2	2 (0.6)	49 (22.3)	3.5 (88)	54.4 (24.3)	4.3 (110)
VP4	4 (1.2)	90 (41)	2.7 (38)	194 (88)	6.2 (157)
VP6	6 (1.8)	205 (93.2)	10 (254)	363 (165)	13.5 (343)
Standard Antenna One-Piece Reflector with Radome	2 (0.6)	17 (8)	8.7 (221)	81 (37)	9.9 (251)
	4 (1.2)	119 (54)	10.0 (254)	189 (86)	14.6 (371)
	6 (1.8)	162 (73)	13.7 (348)	321 (146)	19.6 (498)
	8 (2.4)	304 (138)	19.8 (503)	621 (282)	25.0 (635)
	10 (3.0)	402 (182)	25.8 (655)	916 (415)	31.7 (805)
	12 (3.7)	654 (297)	26.9 (683)	1356 (615)	32.8 (833)
Standard Antenna Two-Piece Reflector without Radome	8 (2.4)	264 (120)	14.0 (356)	550 (249)	17.3 (439)
	10 (3.0)	336 (152)	18.5 (470)	804 (365)	22.2 (564)
	12 (3.7)	600 (272)	19.6 (498)	1219 (553)	22.9 (582)
	15 (4.6)	1240 (562)	32.3 (820)	2269 (1029)	36.4 (925)
GRIDPAK® Antenna	4 (1.3)	51 (23)	10.0 (254)	–	–
	6 (2)	198 (90)	14.5 (368)	–	–
	8 (2.4)	282 (128)	16.0 (406)	–	–
	10 (3)	418 (190)	21.5 (546)	–	–
	13 (4)	517 (235)	25.5 (648)	–	–

Side Strut Axial Forces

Maximum axial forces produced on support structures by antenna side struts are tabulated below. In each case, the loads are the result of a 125 mph (200 km/h) wind from the most critical direction and each side strut is positioned at the most extreme angle permitted by the specifications on page 119. The forces are components of, not in addition to, the maximum forces which are referenced to the mounting pipe on page 134.



Maximum Antenna Side Strut Axial Force, 125 mph (200 km/h) Wind

Antenna Type	Size ft (m)	Adjustable Strut Force, lb (N)	Fixed Strut Force, lb (N)
Shielded Antenna	6 (1.8)	2070 (9207)	–
(except "Other Shielded"	8 (2.4)	958 (4261)	1265 (5627)
shown below)	10 (3.0)	1320 (5871)	1987 (8838)
	12 (3.7)	1799 (8001)	2585 (11498)
	15 (4.6)	7921 (35233)	–
Other Shielded Antennas			
UHX10-59J	10 (3.0)	1452 (6558)	2184 (9714)
UMX10-459	10 (3.0)	4086 (18175)	4492 (19980)
UHX12-59J	12 (3.7)	2392 (10640)	3437 (15288)
UMX12-459	12 (3.7)	4137 (18401)	4545 (20216)

Antenna Options

Input Flanges

Various standards exist for antenna flanges around the world. Andrew conveniently offers you multiple options for each antenna to meet your specific needs.

Below 3 GHz

Antennas having air-dielectric feeds have 7/8" EIA, 50 ohm flange inputs and require pressurization. Antennas intended for use in unpressurized systems have F flange, female; 7/8" EIA; or Type N female inputs. Available options are listed below.

Antenna Input Options - Below 3 GHz

Frequency, MHz	Air Dielectric	Unpressurized Type N	Unpressurized Flange
335-365	–	N female*	–
365-403	–	N female*	–
403-470	–	N female*	–
820-960	–	N female*	–
890-960	7/8" EIA	–	F Flange, female
1427-1535	7/8" EIA	N female*	F Flange, female
1700-2110	7/8" EIA	N female*	F Flange, female
1850-1990	7/8" EIA	–	F Flange, female
1900-2300	7/8" EIA	N female*	F Flange, female
2100-2200	7/8" EIA	–	F Flange, female
2300-2500	7/8" EIA	N female*	F Flange, female
2450-2500	–	–	F Flange, female
2480-2700	7/8" EIA	N female*	F Flange, female

All inputs have 50 ohm interfaces
* GRIDPAK® antenna only

Above 3 GHz

Antennas having waveguide feeds include industry standard rectangular waveguide flanges. Waveguide feeds require pressurization. Two or more flange options are standard for most antennas and you can specify any of the optional flanges from any Andrew location.

Antennas shipped from our plants in North America usually have EIA (Electronic Industry Association) flanges.

Antenna shipped from Europe or Australia typically have IEC (International Electrotechnical Commision) flanges. If the flange type is not specified, Andrew will provide the primary flange specified first in the ordering tables, in ***bold italic type***. For information about flanges on ValuLine® antennas, contact Andrew.

Flange Options for 3 GHz and above are summarized in the table below. For specific antennas, refer to the antenna ordering tables.

Flange Options - Above 3 GHz

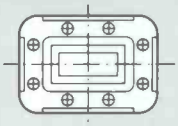
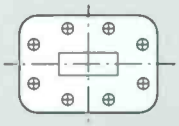
Frequency, GHz	Waveguide Type EIA	Waveguide Type IEC	Pressurized Contact Flanges EIA	Pressurized Contact Flanges IEC	Choke and Cover/Gasket Flanges MIL
3.4-4.2	WR229	R40	CPR229G	PDR40	–
4.4-5.0	WR187	R48	CPR187G	PDR48	UG-148C/U*
5.6-7.75	WR137	R70	CPR137G	PDR70	UG-343B/U*
7.125-8.5	WR112	R84	CPR112G	PDR84	UG-52B/U*
10.2-11.7	WR90	R100	CPR90G	PDR100	–
12.2-13.25	WR75	R120	–	PDR120	WR75*
14.25-15.35	WR62	R140	–	PDR140	UG-541A/U*
17.7-25.25	WR42	R220	–	PBR220	UG-595/U*
22.0-33.0	WR34	R260	–	PBR260	–
27.5-40.0	WR28	R320	–	PBR320	UG-600A/U

* Modified cover gasket flange mates with either choke or cover.

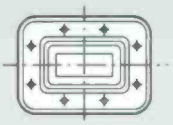
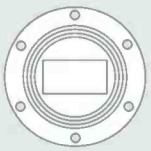
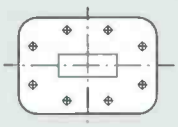
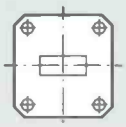
Flange Nomenclature - Above 3 GHz

The following examples illustrate the numbering system used for two of the most popular flange series:

EIA Standard, CPR Series

	C	P (Pressurized Contact)	R (Rectangular Waveguide)	112 (WR Size)	G (Grooved)
	C	P (No Gasket)	R (Rectangular Waveguide)	112 (WR Size)	F (Flat)

IEC Standard

	P (Pressurized) with Gasket Groove	D (Rectangular Flange)	R (Rectangular Waveguide)	84 (R Size)
	P (Pressurized) with Gasket Groove	B (Square Flange)	R (Rectangular Waveguide)	84 (R Size)
	C (Pressurized) with Gasket Groove and Choke	A (Clrcular Flange)	R (Rectangular Waveguide)	70 (R Size)
	U (Unpressurizable) Flat	D (Rectangular Flange)	R (Rectangular Waveguide)	84 (R Size)
	U (Unpressurizable) Flat	B (Square Flange)	R (Rectangular Waveguide)	84 (R Size)

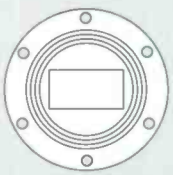
Military (UG Series) Flanges

Military choke and cover flanges are round or square, depending on frequency. A cover/gasket version is also available, which mates with a cover, a choke, or another choke/cover.

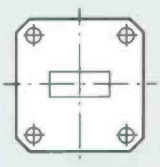
Waveguide Nomenclature

For EIA standards, the number following the "WR" relates to the physical size of the waveguide. For example, WR137 is 1.37 inches, inside dimension.

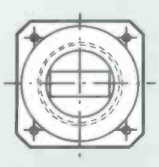
For IEC standards, the number following the R relates to frequency. For example, R120 is for the 12.2 to 13.25 GHz frequency range.



UG-343B/U
Round Choke



UG-51/U
Square Cover



WR75
Cover/Gasket
Square

Microwave Antennas

Radomes

Radomes are available for most Andrew antennas.

Radomes are used to:

- *Protect Your Investment. Radomes protect the antenna feed and RF absorber from accumulation of ice, snow and dirt for maximum reliability and long life.*
- *Maintain Performance. Provides guaranteed performance to detailed specifications.*
- *Reduce Wind Loading. Radomes reduce the loading on the tower and associated tower costs.*

Radome Types

Radomes are available in two basic types:

Flexible Planar Radomes are tensioned across the front of shielded antennas. They are made of either hypalon-coated nylon or a polymer-coated, fiberglass fabric.

Most Andrew shielded antennas include a flexible radome, either Hypalon or TEGLAR®, tensioned across the opening of the shield. The radome flexes slightly in the wind, readily shedding ice and snow in most environments. ValuLine® versions of shielded antennas are supplied with molded planar polymer radomes.

Molded Radomes are made of either molded fiberglass or plastic. Depending on the antenna size or type, molded radomes are conical, spherical or parabolic in shape and attach to the rim of the reflector. Andrew molded radomes are highly resistant to ultraviolet rays and provide high reliability under severe environmental conditions.

Radome Applications

Antenna Types	Antenna Series	Included Radome	Optional Radomes
Ultra High Performance	UHP®, UHX®, HDX, HSX	TEGLAR	–
UMX Multiband	UMX®	TEGLAR	–
High Performance	HP, HPX	Hypalon	TEGLAR
Standard	P, PX, PL, PXL, PAR	None	• Standard molded • Extra strength molded, 10 and 12 ft (3.0 and 3.7 m)
Focal Plane	FP, FPX	None	• Standard molded • Extra strength molded, 10 and 12 ft (3.0 and 3.7 m)
ValuLine®	VHP, VHPX VP	Polymer None	– • Standard molded

Radome Electrical Characteristics

Planar Radomes. The electrical characteristics of the planar radome are incorporated into the electrical performance specifications of the shielded antenna.

Molded Radomes. The use of a molded radome on standard (P-Series) or focal plane (FP-Series) antennas may slightly impact maximum antenna VSWR. Attenuation and system VSWR effects are listed in the table below. To determine the maximum VSWR across the band for the antenna/radome combination, add the figure from the table to the maximum antenna VSWR specification.

10' and 12' standard molded radomes are rated for 125 mph (200 km/h) while 4', 6' and 8' standard radomes are rated for 150 mph (240 km/h); extra strength molded radomes for 10' and 12' which are rated for 150 mph (240 km/h) are also available.

Typical Molded Radome Attenuation and VSWR

Radome Type	Diameter ft (m)	Attenuation 2 GHz	6 GHz	8 GHz	11 GHz	13 GHz	15 GHz	18 GHz	Add to Antenna VSWR 2 GHz	6 GHz	11 GHz and above
Standard Antenna Radomes											
Standard	2 (0.6)	0.1	0.4	0.6	1.0	1.2	1.5	2.7	0.02	0.03	0.05
Standard	4 (1.2)	0.1	0.4	0.7	1.2	1.5	2.0	2.9	0.02	0.03	0.05
Standard	6 (1.8)	0.1	0.5	0.9	1.4	1.7	2.1	2.9	0.02	0.03	0.03
Standard	8 (2.4)	0.1	0.6	1.0	1.5	1.8	2.2	–	0.02	0.03	0.03
Standard	10 (3.0)	0.2	0.9	1.3	1.8	2.1	2.5	–	0.02	0.03	0.03
Standard	12 (3.7)	0.2	1.0	1.3	1.9	2.2	2.6	–	0.02	0.03	0.03
Extra Strength	10 (3.0)	0.3	1.2	1.5	2.0	2.2	2.6	–	0.02	0.03	0.03
Extra Strength	12 (3.7)	0.03	1.4	1.7	2.0	2.3	2.6	–	0.02	0.03	0.03
Focal Plane Antenna Radomes											
Standard	4 (1.2)	0.1	0.4	–	–	–	–	–	0.03	0.03	–
Standard	6 (1.8)	0.1	0.5	–	–	–	–	–	0.03	0.03	–
Standard	8 (2.4)	0.1	0.6	–	–	–	–	–	0.03	0.03	–
Standard	10 (3.0)	0.2	0.9	–	–	–	–	–	0.03	0.03	–
Standard	12 (3.7)	0.2	1.0	–	–	–	–	–	0.03	0.03	–
Extra Strength	4 (1.2)	0.1	0.4	–	–	–	–	–	0.05	0.05	–
Extra Strength	6 (1.8)	0.2	0.8	–	–	–	–	–	0.05	0.05	–
Extra Strength	8 (2.4)	0.2	0.9	–	–	–	–	–	0.05	0.05	–
Extra Strength	10 (3.0)	0.3	1.2	–	–	–	–	–	0.05	0.05	–
Extra Strength	12 (3.7)	0.3	1.4	–	–	–	–	–	0.05	0.05	–

Ordering Radomes

Current Model Antennas. Specify Type Number from the tables below. The radomes listed in Table 1 fit most Andrew standard antennas and focal plane antennas, except for those listed in Table 2.

Older Model Antennas, with rolled-rim reflectors, may require a radome clip kit, listed below.

Note: Radomes are not available for dual-polarized antennas operating below 2.7 GHz.

Table 1 - Molded Radomes

Radome Type	Diameter ft (m)	Type No.
For Standard Antennas (P and PAR Series)		
Standard	2 (0.6)	**R2E**
Standard	4 (1.2)	**R4E***
Standard	6 (1.8)	**R6E** (See Table 2)
Standard	8 (2.4)	**R8F**
Standard	10 (3.0)	**R10G**
Standard	12 (3.7)	**R12F**
Extra Strength	10 (3.0)	**39193B**
Extra Strength	12 (3.7)	**39194**
For Focal Plane Antennas (FP Series)		
Standard	4 (1.2)	**FR4**
Standard	6 (1.8)	**FR6**
Standard	8 (2.4)	**FR8**
Standard	10 (3.0)	**FR10**
Standard	12 (3.7)	**FR12**
Extra Strength	4 (1.2)	**FR4-E**
Extra Strength	6 (1.8)	**FR6-E**
Extra Strength	8 (2.4)	**FR8-E**
Extra Strength	10 (3.0)	**FR10-E**
Extra Strength	12 (3.7)	**FR12-E**

* Not for use with PXL4-44 antennas.

Table 2 - Special Application Molded Radomes

Application	Diameter ft (m)	Type No.
PXL6-44, PXL6-59D PXL6-65D, PXL6-71E	6 (1.8)	**35255-26** (Extended)

Radome Clip Kits. Attachment of a molded radome to older standard P-series, 4, 6, 8, and 10-foot diameter, antennas having rolled-rim reflectors (in the U.S., 4 and 10-foot antennas shipped prior to 1 September 1987, 6-foot antennas shipped prior to 1 July 1991 and 8-foot antennas shipped prior to 1 February 1991) require a radome clip kit.

4 ft (1.2 m).....Type **207844-1**
6 ft (1.8 m).....Type **207844-2**
8 ft (2.4 m).....Type **207844-3**
10 ft (3.0 m).....Type **207844-4**

Flexible Planar Radome Replacement Kit. The kits listed below include one radome and hardware to replace an existing Andrew planar radome.

Replacement Kit Type Numbers

Antenna Diameter ft (m)	TEGLAR® Radome Kit Aviation White	Hypalon Radome Kit Aviation White
2 (0.6)	**207105***	–
4 (1.2)	**207106**	–
6 (1.8)	**45665-1**	**70010-10**
8 (2.4)	**45665-2**	**70010-8**
10 (3.0)	**45665-3**	**70010-6**
12 (3.7)	**45665-4**	**70010-7**
15 (4.6)	**45665-5**	**70010-9**

* Except 2 ft (0.6 m) is gray.

Antenna Paint

Type, Colors

The standard gray paint finish Andrew uses is a high quality alkyd enamel. An optional two-part polyurethane paint finish affords protection against the environment. Customized colors of both paint types are available on request.

Radome Colors

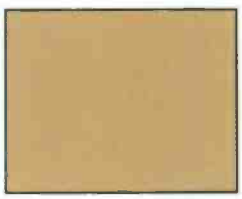
Radome Type	Standard Color	Color Options
Molded	Andrew gray	• Aviation white • Aviation orange • Most other colors available on request
TEGLAR®	Natural (white)	• Aviation orange • Green • Brown • Light tan • Gray • Beige
Hypalon	Aviation white*	• Field paintable

* Andrew can recommend suppliers for paint to be used on Hypalon radomes.

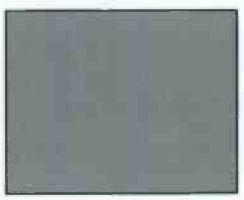
The TEGLAR® radome colors are similar to the indicated U.S. Federal Standard 595a Color Numbers:

Green
Color No. 34159

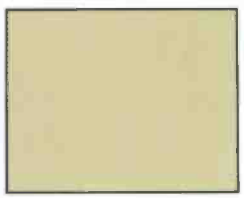
Brown
Color No. 20040



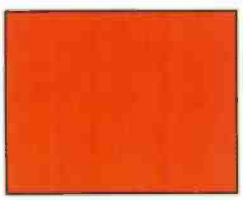
Light Tan
Color No. 33446



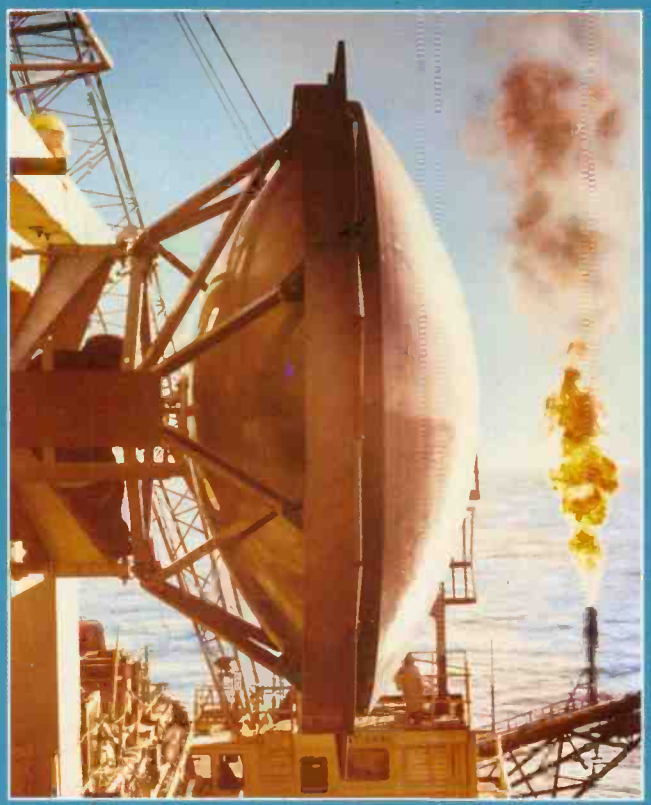
Gray
Color No. 36280



Beige
Color No. 30372



Aviation Orange
Color No. 12197



High Wind Survival with four point attachment diamond mount.

High Wind Survival Antennas

The Andrew line of standard and shielded antennas can be supplied with a four-point attachment mount which permits wind survival up to 200 mph (320 km/h) without the use of side struts.

These antennas feature strong back structures providing excellent pointing accuracy in adverse operating conditions.

Antennas with heavy duty versions of standard pipe or 4-point mounts for survival under severe wind conditions up to 155 mph (250 km/h) are also available.

High Wind Survival Antenna Components. High wind survival antennas consist of antenna feeds together with reflectors, mounts, struts, radomes and shields which may be standard or heavy duty, depending on the structural requirements for the specific antenna size and configuration. Heavy duty mounts and reflectors, where used, come in two versions - 155 mph (250 km/h) and 200 mph (320 km/h). For more information, ask for Andrew Bulletin 3522.

Corrosive Environment Antennas

Corrosive environment antennas will provide long-term protection in marine, urban and most industrial environments. To provide longest life, corrosive environment antennas provide protection on several levels:

- *Factory applied coatings and corrosion resistant materials such as epoxy painting, hot-dip galvanizing, aluminum coated stainless steel and stainless steel.*
- *Corrosion inhibiting compounds and protective sealants applied during installation.*

The antennas meet the requirements of U.S.A. Military Specifications MIL-F-14072C, MIL-STD-889B and MSFC-SPEC-250A. For more information, ask for Andrew Bulletin 3522.

Heavy Duty Export Pack

Standard Pack

Dual Pack

Packing Type

Standard Pack. In most cases, Andrew standard packing is suitable for export. Antennas are shipped as one unit. GRIDPAK® antennas and mounts are shipped in one carton or crate. 4-12 foot (1.2-3.7 m) radomes are shipped in wood crates.

Heavy Duty Export Pack. For your convenience, Andrew also offers a heavy duty export packing option, which includes plywood sheathing of the entire antenna crate. This packing is suitable for ocean, container or air shipment. Multiple packing is also available which will provide considerable savings to the customer.

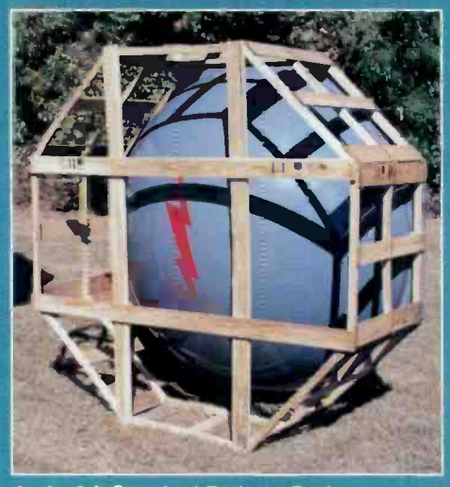
Dual Pack. Two antennas are packaged together in one crate, reducing overall shipping volume.

Packing Quantity

10-foot (3.0 m) and larger antennas and molded radomes may require special handling in shipping, depending on destination and routing. For systems requiring a large number of antennas, special packs can be quoted to reduce shipping volume. For example, it is often convenient to pack all antennas for the same site in the same box. Andrew can also provide bulk transport and on-site assembly of antennas.

For more details about crate dimensions and approximate weights, consult the price list for this catalog.

Microwave Antennas

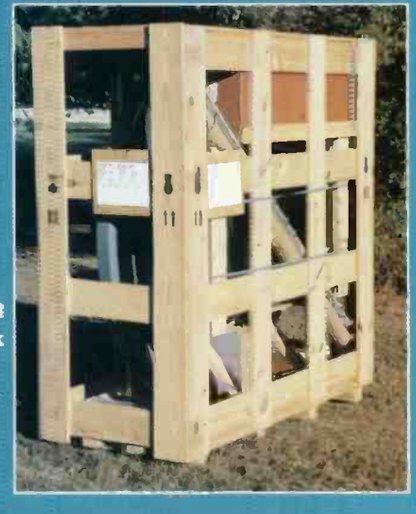


4 - 6 - 8 ft Standard Radome Pack

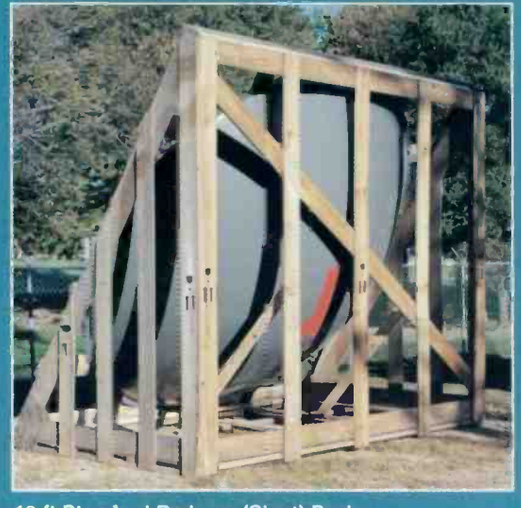
4 ft Shielded Antenna Pack

6 ft Shielded Antenna Pack

12 ft (split) Antenna Pack



8 - 10 ft Shielded Antenna Pack



12 ft Standard Radome (Slant) Pack

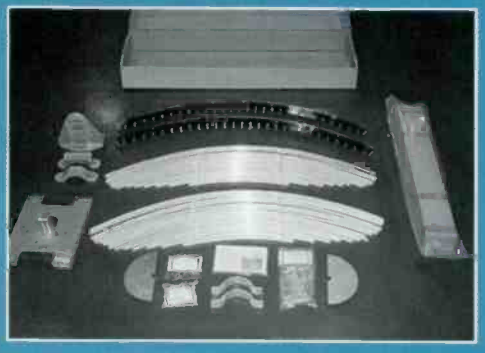
KP Series GRIDPAK® Antenna Pack

ValuLine® Packing

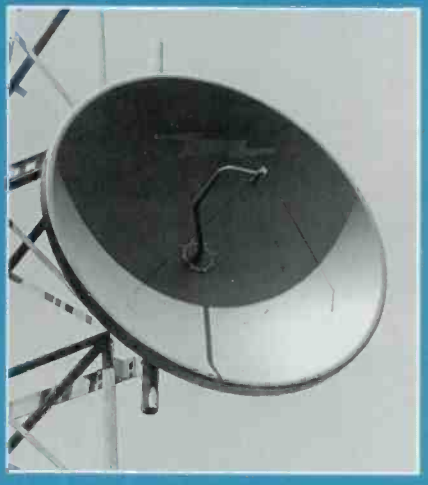
1 ft (0.3 m), 2 ft (0.6 m), and 2.5 ft (0.8 m) ValuLine antennas are shipped as standard in totally recyclable cardboard packaging. 4 ft (1.2 m) and 6 ft (1.8 m) antennas are supplied in wire-bound crates. For shipment to more remote areas of the world, heavy duty packing is available.

Contact Andrew for details.

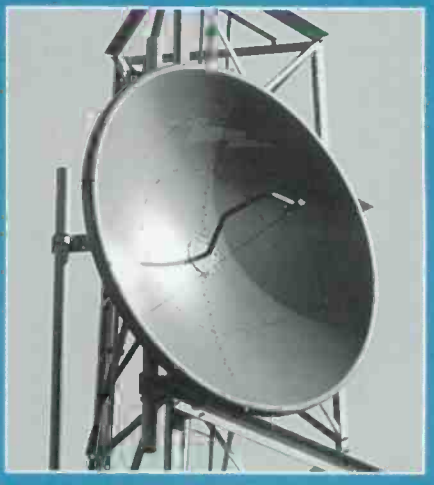
Microwave Antennas



GRIDPAK disassembled



One piece reflector



Two piece reflector

Reflector Type

One and Two-Piece Antennas. Antennas are supplied with one-piece reflectors or with two-piece reflectors split through the center and bolted together at the site. GRIDPAK® and Mini GRIDPAK antennas are supplied with reflectors that are completely disassembled. Standard and optional reflector types are dependent on antenna size and type. Refer to the table.

Special Purpose Mounts

In addition to the standard mounts listed on page 118, Andrew can provide horizontal and vertical tilt mounts and other mount options to meet most special requirements. Contact Andrew for further information.

Standard and Optional Reflectors

Antenna Diameter	Reflector Type Standard	Optional
Solid Antennas - Standard, High Performance and Ultra High Performance		
2-6 ft (0.3-1.8 m)	One-Piece	–
8-10 ft (2.4-3.0 m)	One-Piece	Two-Piece*
12 ft (3.7 m)	Two-Piece*	One-Piece
15 ft (4.6 m)	Two-Piece	–
GRIDPAK and Mini GRIDPAK Antennas - KP, KPR, MKP Series		
All	Reflector shipped Disassembled	–

* The following antennas are available with one-piece reflectors only; since electrical performance parameters cannot be guaranteed with two-piece reflectors.

UHX8-37H
UHX10-37H
UHX8-59H
UHX10-59H
UHX10-59J
UHX12-59J
UHX12-65J
UHX8-107H
UHX10-107H
UHX8-127H
UHX10-127H
UMX10-459B
UMX12-459A
UMX12-A465
UMX12-B465
HPX12-6511C

Antenna Accessories

Additional Struts for Microwave Antennas

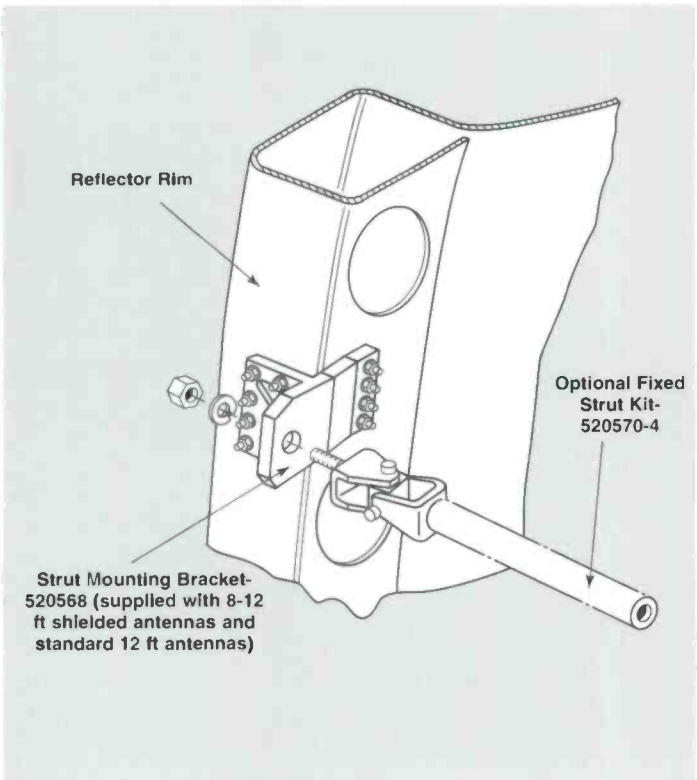
Fixed and Adjustable Side Struts provide increased rigidity. They can be added to any of the antennas, as indicated in the table, as a first or second strut.

Bottom Struts are recommended for high ice load environments. Requires mounting pipe which extends to bottom edge of antenna.

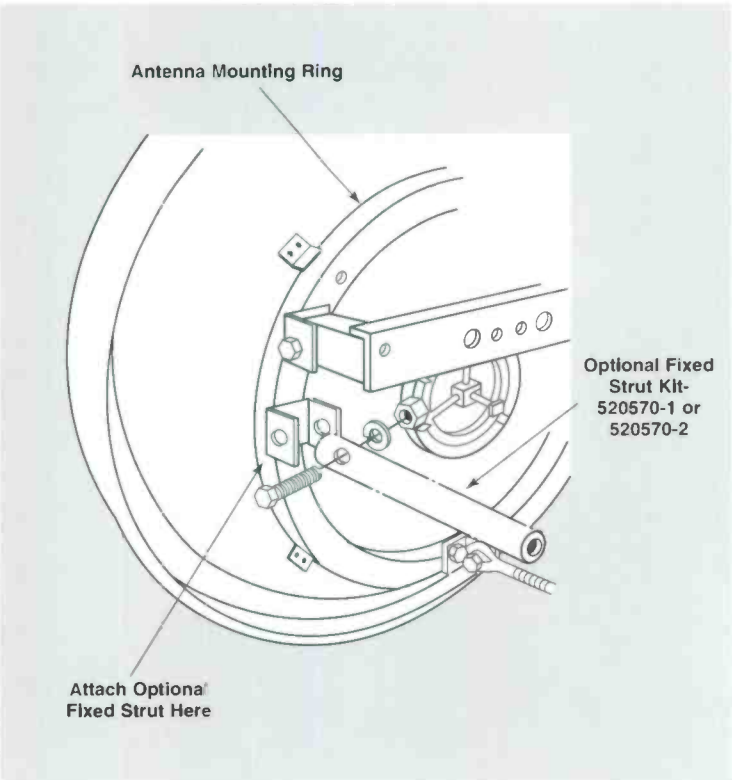
Attachment of Strut to Antenna

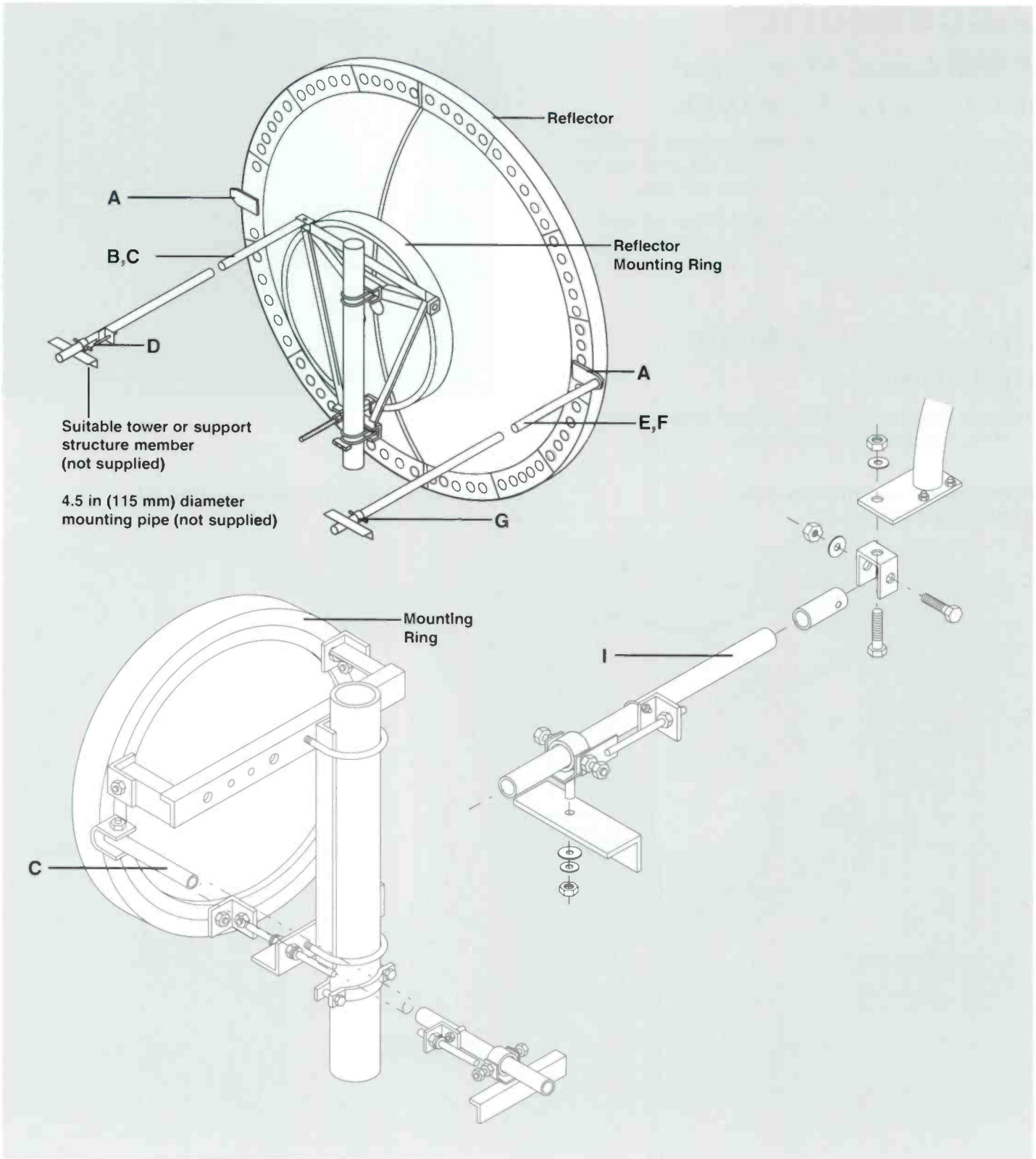
The strut attaches either to a bracket at the antenna rim or to the antenna mounting ring. See illustration.

Attachment at Antenna Rim
8 through 12 ft Sizes



Attachment at Antenna Mounting Ring
4 and 6 ft Sizes




Reflector
A
B,C
Reflector Mounting Ring
D
A
E,F
Suitable tower or support structure member (not supplied)
4.5 in (115 mm) diameter mounting pipe (not supplied)
G
Mounting Ring
I
C

A Reflector Strut Brackets, Type Number 520568 (replaces 44695)

Two brackets attach to the edge of 8 ft, 10 ft, and 12 ft reflectors to provide an attachment point for the fixed side strut. Brackets are cast aluminum and the kit contains all (metric) stainless steel hardware for attachment to the reflector. Quantity: 2 per kit.

B Adjustable Inboard Strut Kit, Type Number 520570-1 (replaces 221865)

Azimuth wind brace with threaded rod adjustment assembly allows for fine antenna alignment an lock down. Galvanized steel pipe and brackets include all (metric) galvanized hardware for attachment to antenna mount or reflector mounting ring. Also includes item D, and G for tower end attachment. Strut pipe is schedule 80, and 10.5 ft (3.2m) in length.

NEW!

C Inboard Strut Kit (less azimuth adjustment) Type Number 520570-2

Typically used as an optional side strut for 4 ft (1.2 m) and 6 ft (1.8 m) reflectors same as B less item D. Includes strut and strut collar assembly (G).

D Azimuth Adjustment Kit, Type Number 520569 (replaces 40186-2)

Attaches to inboard side strut (and strut collar assembly) to allow fine movement of the antenna during final alignment. Straight (metric) threaded rod assembly and associated hardware included. Order strut collar clamp (G) separately.

NEW!

E Outboard Strut Kit, Type Number 520570-3

Galvanized fixed side strut provides increased rigidity. Kit includes universal joint and (metric) hardware for attachment to reflector strut bracket (item A) included. Strut collar assembly (item G) also included to provide interface to tower. Strut pipe is schedule 80 and 10.5 ft (3.2m) in length.

F Outboard Strut Replacement Kit, Type Number 520570-4 (replaces 38891A)

Same as item E less item A reflector bracket.

G Strut Collar Assembly, Type Number 520477 (replaces 222944)

Provides tower interface and strut securement point. Galvanized clamp assembly includes stainless and galvanized hardware. (See tower interface options).

H Bottom Strut Kit, Type Number 520570-5 (replaces 40604)

Provides additional support to antennas due to weight of high ice loads. Reflector strut bracket, galvanized strut pipe, strut collar assembly, and (pipe mount) angle interface bracket included. All associated (metric) hardware is galvanized. Strut is schedule 80 and 5.0 ft (1.52m) in length. Existing (extended) antenna pipe mount is required for strut attachment.

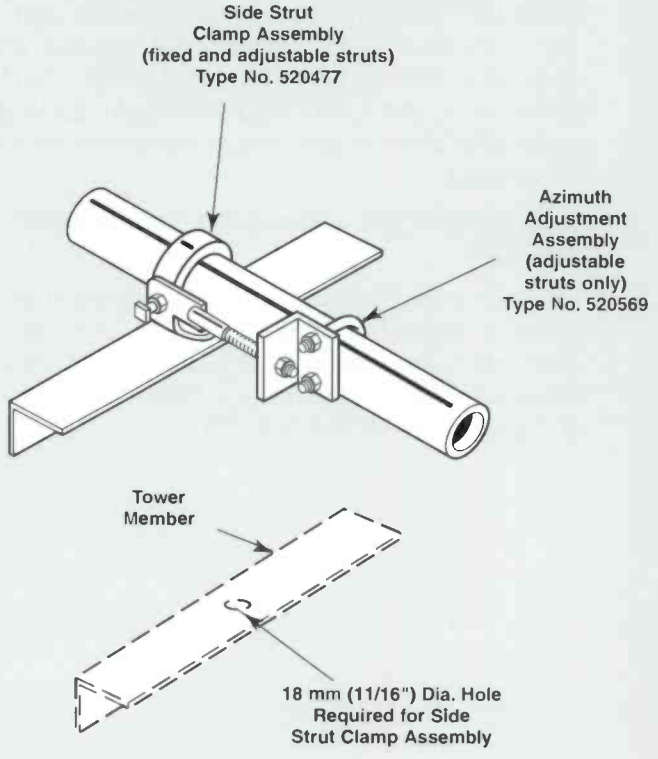
I Grid Strut Kit (KP series only), Type Number 100232-7

Provides added support in either the azimuth or elevation plane. Reflector strut bracket, strut pipe, strut collar assembly and hardware. All parts are galvanized including hardware. Strut is schedule 80 and 10.0 ft (3.05m) in length.

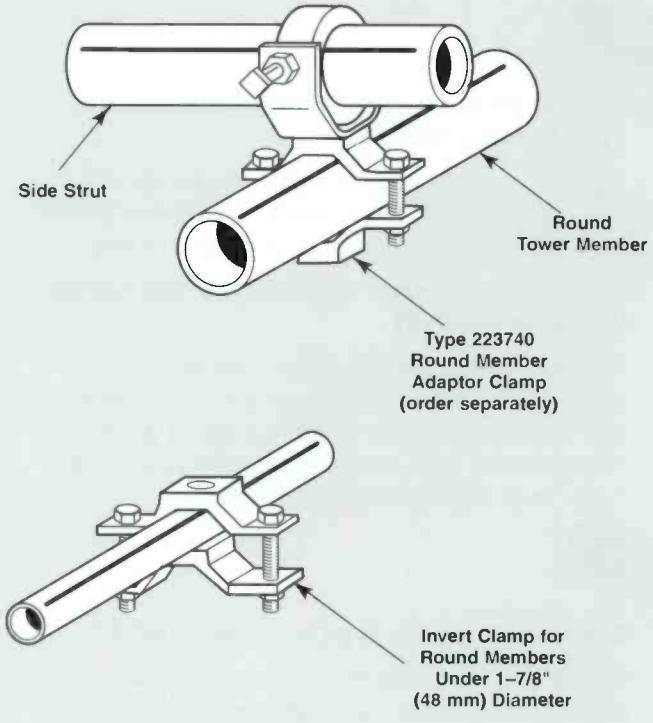
Attachment of Strut to Tower

Direct bolt attachment of the side strut clamp to angle members is recommended. An 11/16" (18 mm) hole should be drilled in the appropriate strut support member. **Note: holes should not be drilled without prior approval of the tower manufacturer.** Type 223740 round member clamp (order separately) can be used on members having a diameter of 1 to 3 in (25-76 mm). See illustration.

For Angle Tower Members



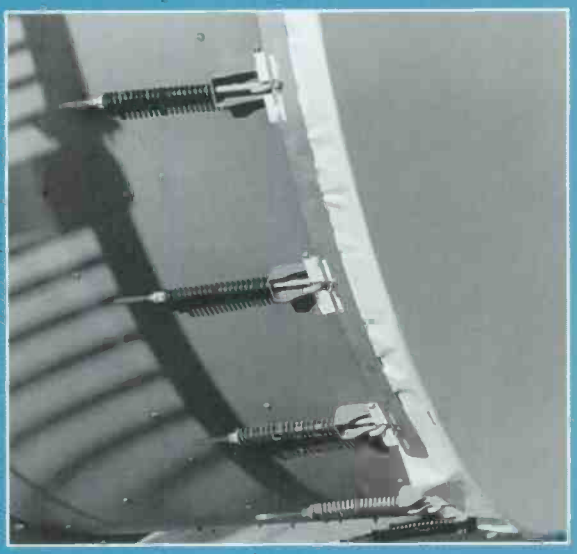
For Round Tower Members



Edge Protection Kit for TEGLAR® Long Life Radome

Prevents damage to the untensioned radome edge between J-bolt anchor points caused by unusually high gusting winds. Kit includes stainless steel edge protector strips and attachment hardware. The strips are fastened in pairs to form a band around the edge of the radome.

Antenna Diameter ft (m)	Edge Protection Kit Type No.
6 (1.8)	205866-3
8 (2.4)	205866-4
10 (3.0)	205866-1
12 (3.7)	205866-2
15 (4.6)	205866-5



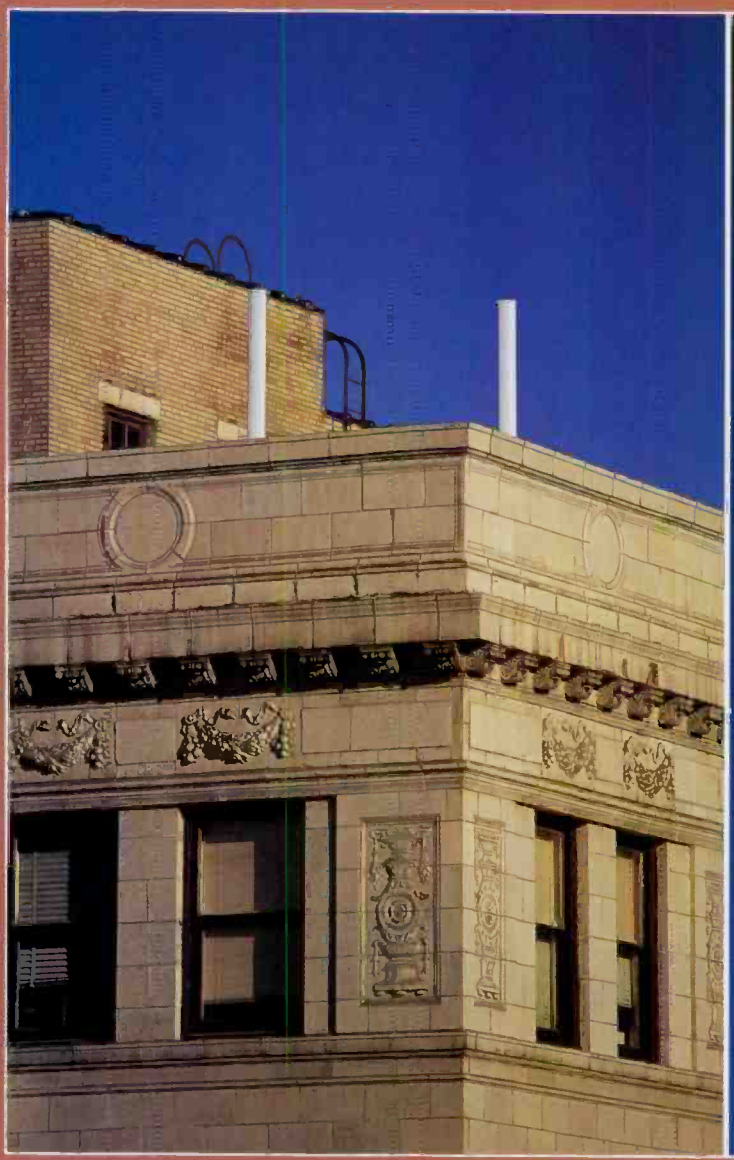
Termination Loads

When both ports of a dual polarized antenna are not being used, Andrew recommends using a termination load to ensure your antenna meets the stated Andrew specifications. Refer to page 232.

Replacement Components

Andrew can also supply the following replacement components for your Andrew antennas:

- *Reflectors*
- *Feeds*
- *Radomes (See page 138)*
- *Shield absorber kits*
- *Major hardware kits*
- *Mounts (See page 117)*
- *Universal guy wire kit*
- *Shields*
- *Struts (see page 147)*



Base Station Antennas

INDEX

Introduction

Andrew designs and manufactures patented base station antennas which are setting new industry standards for electrical and mechanical performance. Andrew base station antennas are the ideal choice for wireless applications, including PCS/PCN, Paging, Cellular, and GSM.

Superior Wideband Performance

Andrew base station antennas are available in omnidirectional, bidirectional, and sector configurations in a variety of patterns and gains. For added system flexibility, electrical downtilt and null fill options are available from stock to ensure excellent near-in coverage.

Outstanding Reliability

The Andrew patented omnidirectional antenna design has fewer internal components. This increases performance by reducing IM generation. The chance for internal connection/element failure due to wind and vibration is significantly reduced.

Excellent Durability

Andrew antennas are equipped with a high strength radome to minimize beam deflection and maintain beam integrity. Andrew durable radomes ensure long service life under extreme weather conditions.

Dedicated Engineering Staff and Production Facility

Andrew has a large engineering staff dedicated exclusively to the design and manufacture of the best base station antennas. Our new antenna production facility gives us the speed and flexibility to meet your delivery requirements and to help you keep a tight installation schedule.

Flexible Design

Our flexible electrical design allows us to easily produce antennas to your specific requirements (i.e., gain, downtilt, bandwidth pattern, etc.). This, coupled with dedicated test facilities, enables Andrew to meet your custom requirements, quickly and inexpensively.

Base Station Antennas

PCS/PCN Panel Antennas

Based on new technology, the performance of PCS 1800/1900 Panel Antennas enhance revenues in modern PCS/PCN applications by decreasing interference and reducing call drop-outs.

Meet your future system requirements more economically. By installing high performance Andrew antennas during initial system deployment, you will not have to upgrade your antennas to counter the added interference as traffic increases and cell sizes are reduced.

PCS/PCN Panel Antennas are designed with an aesthetically pleasing appearance, low weight and low wind loading. With broadband frequency ranges, they are well suited for transmit or receive applications.

Key Performance Advantages of Andrew PCS1800/1900 Panel Antennas Include:

High Performance Options:

- *Extensive null-fill, to eliminate gaps in coverage*
- *Reduced VSWR*
- *Upper side-lobe suppression for improved C/I*

Electrical downtilt option:

- *More accurate antenna footprint. Decreased co-channel and multipath interference*
- *Improved network quality*

Superior main-lobe/side difference:

- *Better carrier signal to interference ratio (C/I)*
- *Reduces number of call drop-outs*

Mechanical Features:

- *Low weight and low wind load for ease of installation*
- *Seamless radomes with closed-cell foam filling for long term reliability*
- *Slim profile for aesthetic acceptability*

Mount Options:

- *Vertical mount provides ± 45° azimuth adjustment when wall mounted*
- *Tilt Mounts provide preset downtilt steps and azimuth adjustment for pipe or wall mounting*

PCS/PCN Panel Antennas Characteristics

Electrical Characteristics – PCS1800

Frequency Range:	1710 - 1880 MHz	
Impedance:	50 ohms	
Return Loss (VSWR):	>15.6 dB (<1.4)	
Polarization:	Vertical	
Azimuth Beamwidths:	3 dB at 60°/65° and 90°	
Front-to-Back Ratio:	>25 dB (>20 dB for 9 dBd model)	
Elevation Upper Sidelobes:	HP Models (H)	<18 dB
Power:	Continuous	>250 W
	Peak	>4 kW

Enviromental Characteristics

Survival Wind Speed:	56 m/s (200 km/h) 125 mph
Temperature:	- 30° to 55°C
Humidity:	Up to 100%
Lightning Protection:	DC ground

Electrical Characteristics – PCS1900

Frequency Range:	1850 - 1990 MHz	
Impedance:	50 ohms	
Return Loss (VSWR):	>15.6 dB (<1.4)	
Polarization:	Vertical	
Azimuth Beamwidths:	3 dB at 90°	
Front-to-Back Ratio:	>25 dB (>20 dB for 10 dBd model)	
Elevation Upper Sidelobes:	HP Models (H)	<18 dB
Power:	Continuous	>250 W
	Peak	>4 kW

Mechanical Characteristics

Wind load at 45 m/s (160 km/h) 100 mph (16% turbulence):
Front = 187N (42 lbf) per meter of antenna height
Side = 37N (8 lbf) per meter of antenna height

PCS1800 Product Range - 60/65°

Model Number	Az Beamwidth degrees	Nominal Gain dBd	Downtilt degrees	El Beamwidth degrees	Weight lb (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
PCS18*-06309-xyz	60/65	9	0	42	1.7 (0.8)	9.8 (250)	6.3 (160)	2.2 (55)
PCS18*-06312-xyz	60/65	12	0	21	2.9 (1.3)	19.2 (490)	6.3 (160)	2.2 (55)
PCS18*-06313-xyz	60/65	13	0	14	4.0 (1.8)	28.7 (730)	6.3 (160)	2.2 (55)
PCS18*-06314-xyz	60/65	14	0	10	5.3 (2.4)	38.2 (970)	6.3 (160)	2.2 (55)
PCS18*-06316-xyz	60/65	16	0	7	7.6 (3.5)	57.1 (1450)	6.3 (160)	2.2 (55)

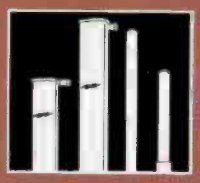
PCS1900 Product Range - 60/65°

Model Number	Az Beamwidth degrees	Nominal Gain dBd (dBi)	Downtilt** degrees	El Beamwidth degrees	Weight lb (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
PCS19*A-06312-0DG	63	11.5 (13.7)	0	20.5	2.9 (1.3)	19 (490)	6.3 (160)	2.2 (55)
PCS19*A-06313-0DG	63	13.1 (15.3)	0	14.4	5.4 (2.5)	28.7 (730)	6.3 (160)	2.2 (55)
PCS19*A-06315-0DG	63	14.9 (17.1)	0	10.2	8.5 (3.9)	38.2 (970)	6.3 (160)	2.2 (55)
PCS19*A-06316-0DG	63	16 (18.2)	0	6.5	10 (4.5)	57.1 (1450)	6.3 (160)	2.2 (55)

PCS1900 Product Range - 90°

Model Number	Az Beamwidth degrees	Nominal Gain dBd (dBi)	Downtilt** degrees	El Beamwidth degrees	Weight lb (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
PCS19*A-09010-xyz	90	10 (12.2)	0	17.5	3.1 (1.4)	19.3 (490)	6.3 (160)	2.2 (55)
PCS19*A-09012-xyz	90	12.2 (14.2)	0	14.0	4.4 (2.0)	28.7 (730)	6.3 (160)	2.2 (55)
PCS19*A-09013-xyz	90	13 (15.2)	0	9.0	5.5 (2.5)	38.2 (970)	6.3 (160)	2.2 (55)
PCS19*A-09014-xyz	90	14 (16.2)	0	6.0	8.4 (3.8)	57 (1450)	6.3 (160)	2.2 (55)
PCS19*A-09015-xyz	90	15 (17.2)	0	5.6	8.5 (3.9)	63 (1600)	6.3 (160)	2.2 (55)
PCS19*A-09016-xyz	90	16 (18.2)	0	4.8	10 (4.5)	74 (1880)	6.3 (160)	2.2 (55)

* "S" is for standard, "H" is for high performance
** Other electrical beam tilt models available



Base Station Antennas

Dual Polarized Panel Antennas for Polarization Diversity

Dual Polarized Panel Antennas are the high performance solution to cell coverage, especially where aesthetics are of primary importance.

PCSD Panel Antennas from Andrew are designed for modern PCS base stations. New technology brings high performance and a trim profile enhances antenna aesthetics.

Dual Polarization allows for receive diversity without the need for large structures on top of the tower.

Polarization diversity is a proven attractive alternative to space diversity techniques.

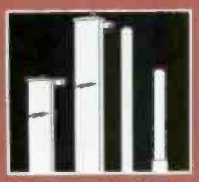
Key Performance Advantages of Andrew PCSD 1800/1900 Panel Antennas include:

Superior main-lobe/side difference:

- *Better carrier signal to interference ratio (C/I)*

Mechanical Features:

- *Low weight and low wind load for ease of installation*
- *Slim profile for aesthetic acceptability*



Dual Polarized Panel Antennas Characteristics

Model Numbering System

For example:

PCSD19SA - 06814 - xyz
① ② ③
PCSD19SA - 06814 -0DW

① application and frequency band: 18 = 1710-1880,
19 = 1850 - 1990 MHz product revision code: A, B, C etc.

② azimuth 3dB beamwidth: 068, nominal gain (dBd): 14, 16, etc.

③ x = electrical downtilt (degrees): 0° to 9°, A (10°),
B (11°), etc.
y = connector: D (7-16 DIN).
z = color - w = white, other colors optional.

Enviromental Characteristics

Humidity:	Up to 100%
Lightning Protection:	DC ground

Electrical Characteristics

Frequency Range:	1710 - 1990 MHz	
Impedance:	50 ohms	
Return Loss (VSWR):	<15	
Azimuth Beamwidths:	3 dB at 68° or 3 dB at 85°	
Elevation Upper Sidelobes:	<18 dB	
Power:	Continuous	>200 W
	Peak	>4 kW

PCS 1800 Dual Polarized Panel Antennas

Model Number*	Az Beamwidth degrees	El Beamwidth degrees	Nominal Gain dBd (dBi)	Downtilt degrees	Weight lbs (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
PCSD18SB-06813-0DZ	68	9.5	13.3 (15.4)	0	5.5 (2.5)	43.3 (1100)	5.1 (130)	2.8 (70)
PCSD18SB-06816-0DZ	68	5.5	15.6 (17.7)	0	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD18SB-06816-2DZ	68	5.5	15.6 (17.7)	2	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD18SB-06816-4DZ	68	5.5	15.4 (17.5)	4	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD18SB-08512-0DZ	85	9.5	12.3 (14.4)	0	5.5 (2.5)	43.3 (1100)	5.1 (130)	2.8 (70)
PCSD18SB-08514-0DZ	85	5.5	14.6 (16.7)	0	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD18SB-08514-2DZ	85	5.5	14.6 (16.7)	2	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD18SB-08514-4DZ	85	5.5	14.4 (16.5)	4	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)

* Part number shown reflects 7-16 DIN connectors

PCS 1900 Dual Polarized Panel Antennas

Model Number*	Az Beamwidth degrees	El Beamwidth degrees	Nominal Gain dBd (dBi)	Downtilt degrees	Weight lbs (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
PCSD19SB-06813-0DZ	68	9.5	13.3 (15.4)	0	5.5 (2.5)	43.3 (1100)	5.1 (130)	2.8 (70)
PCSD19SB-06816-0DZ	68	5.5	15.6 (17.7)	0	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD19SB-06816-2DZ	68	5.5	15.6 (17.7)	2	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD19SB-06816-4DZ	68	5.5	15.4 (17.5)	4	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD19SB-08512-0DZ	85	9.5	12.3 (14.4)	0	5.5 (2.5)	43.3 (1100)	5.1 (130)	2.8 (70)
PCSD19SB-08514-0DZ	85	5.5	14.6 (16.7)	0	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD19SB-08514-2DZ	85	5.5	14.6 (16.7)	2	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)
PCSD19SB-08514-4DZ	85	5.5	14.4 (16.5)	4	11.0 (5.0)	68 (1730)	5.1 (130)	2.8 (70)

* Part number shown reflects 7-16 DIN connectors

Omni Antennas

Based on patented technology, Andrew Omni Antennas have superior performance, outstanding reliability and excellent durability.

Omni Antennas are designed for an aesthetically pleasing appearance and low wind loading.

Andrew Base Station Antennas are also available for other frequency bands and beamwidths. Please contact your Andrew Representative for additional information.

Key Performance Advantages:

Superior Wideband Performance:

- *Omnidirectional, bidirectional and sector configurations*
- *Variety of patterns and gains*
- *Low VSWR across frequency band*
- *Electrical downtilt and null-fill options for excellent near-in coverage*

Outstanding Reliability:

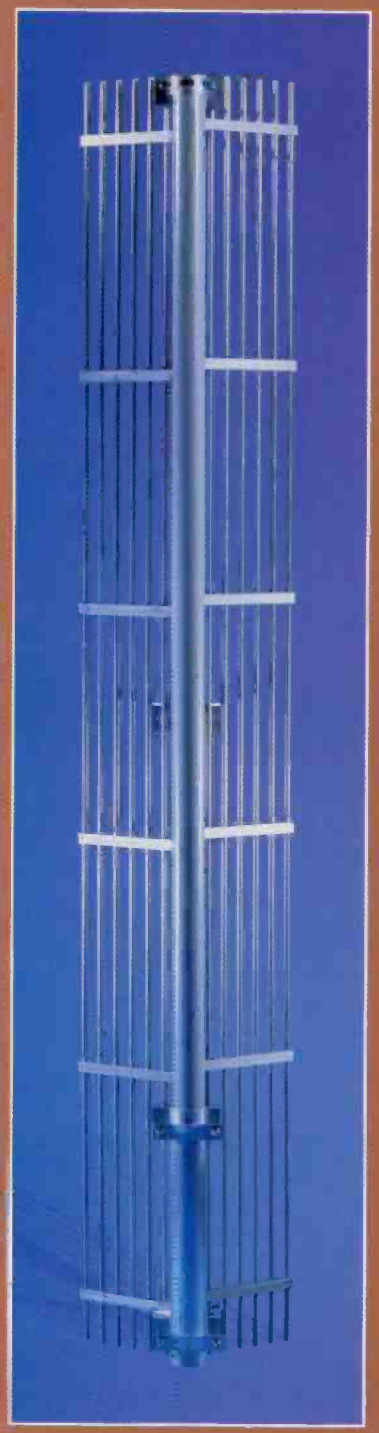
- *Patented design requires fewer internal components*
- *Reduced intermodulation (IM) generation and internal connection/element failure from wind and vibration*

Excellent Durability:

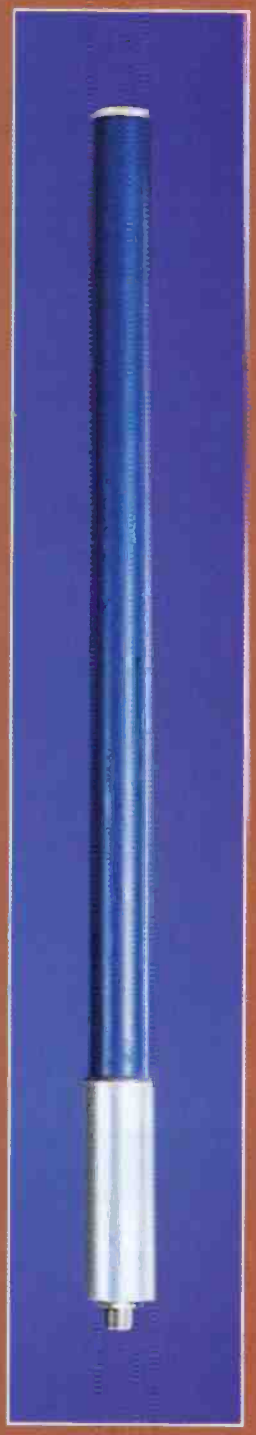
- *High Strength Radome minimizes beam deflection, maintains beam integrity, ensures long service life in extreme climates*

Flexible Electrical Design:

- *Gain, downtilt, bandwidth, and patterns to meet your needs*
- *Customized solutions available*



PG900 Antennas



PC1900 Antennas

Omni Antennas Characteristics

PG900 Product Range

Model Number	Type	Frequency MHz	Gain dBd (dBi)	Downtilt Degree
PG1N0F-0091-006	Omni (Rx)	901–902	4 (6)	0
PG1N0F-0091-009	Omni (Rx)	901–902	7 (9)	0
PG1N0F-0091-011	Omni (Rx)	901–902	9 (11)	0
PG1N0F-0091-111	Omni (Rx)	901–902	9 (11)	1
PG1N0F-0091-311	Omni (Rx)	901–902	9 (11)	3
PG1N0F-0091-608	Omni (Rx)	901–902	6 (8)	6
PG1N0F-0091-610	Omni (Rx)	901–902	8 (10)	6
PG1*0F-0093-006	Omni (Tx)	928–944	4 (6)	0
PG1*0F-0093-009	Omni (Tx)	928–944	7 (9)	0
PG1*0F-0093-011	Omni (Tx)	928–944	9 (11)	0
PG1*0F-0093-209	Omni (Tx)	928–944	7 (9)	2
PG1*0F-0093-311	Omni (Tx)	928–944	9 (11)	3
PG1*0F-0093-606	Omni (Tx)	928–944	4 (6)	6
PG1*0F-0093-608	Omni (Tx)	928–944	6 (8)	6
PG1*0F-0093-610	Omni (Tx)	928–944	8 (10)	6
PG1*0F-0093-810	Omni (Tx)	928–944	8 (10)	8
PG1*0F-0090-011	Omni	901–944	9 (11)	0
PG7*0F-0090-013	Cardioid	901–944	11 (13)	0
PG7*0F-0090-014	Cardioid	901–944	12 (14)	0
PG1*0F-0090-310	Omni	901–944	8 (10)	3
PG7*0F-0090-313	Cardioid	901–944	11 (13)	3
PG7*0F-0090-314	Cardioid	901–944	12 (14)	3

* N= Type "N" Connector D= 7-16 DIN Connector

Model Numbering System

Six fields fully define each model and available options.
For example:

PG 1 N0F - 0091 - 0 09
① ② ③ ④ ⑤ ⑥
(PG1N0F-0091-009)

① Application: PG = Paging
② Pattern: 1 = Omni Directional 7 = 180° Sector
③ Connector: N = Type N connector, female
D = 7-16 DIN connector, female
④ Frequency:
0090 = 901 - 944 MHz
0091 = 901 - 902 MHz
0093 = 928 - 944 MHz
⑤ Degree of Downtilt
⑥ Nominal gain (dBi)

Electrical Characteristics

Impedance:	50 ohms	
Return Loss (VSWR):	>14.0 dB (<1.5:1)	
Polarization:	Vertical	
Power:	Continuous	>500 W (-0090, -0093)
		>100 W (-0091)
	Peak	>4 kW

PC1900 Product Range

Model Number	Type	Frequency MHz	Gain dBd (dBi)	Downtilt Degree
PC1N0F-0190A-002	Omni	1850-1990	0 (2)	0
PC1*0F-0190A-006	Omni	1850-1990	4 (6)	0
PC1*0F-0190-008	Omni	1850-1990	6 (8)	0
PC1*0F-0190-010	Omni	1850-1990	8 (10)	0
225077**	Magnet Mount Omni	1850-1990	0 (2)	0

* N= Type "N" Connector D= 7-16 DIN Connector
** Mechanical specs do not apply to magnet mount version

Model Numbering System

Three fields fully define each model and available options.
For example:

PC 1 N0F - 0190A - 0 06
① ② ③ ④ ⑤ ⑥
(PC1N0F-0190A-006)

① Application: PC = Personal Communications
② Pattern: 1 = Omni Directional
③ Connector: N0F = Type N connector, female
D0F = 7-16 DIN connector, female
④ Frequency and product revision:
0190A = 1850-1990 MHz, revision A
⑤ Degree of Downtilt
⑥ Nominal gain (dBi)

Enviromental Characteristics

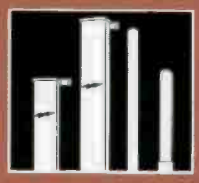
Survival Wind Speed:	56 m/s (200 km/h) 125 mph
Temperature:	-40°C to 55°C
Humidity:	Up to 100%
Lightning Protection:	DC ground

Mechanical Characteristics

Support Pipe Material:	Aluminum
Radome Material:	UV Protected Fiberglass
Radome Color:	Gray
Mounting Hardware:	Ordered Separately

Electrical Characteristics

Frequency Range:	1850 - 1990 MHz	
Impedance:	50 ohms	
Return Loss (VSWR):	>14.0 dB (<1.5:1)	
Polarization:	Vertical	
Power:	Continuous	>200 W
	Peak	>4 kW



Base Station Antennas

Cellular Panel Antennas

High performance solution where interference is a challenge.

Based on a new, efficient design, the performance of Andrew Cellular Panel Antennas enhance revenues in modern cellular applications by decreasing call drop-outs, decreasing interference and allowing for easy upgrades. They will also help you to meet future system requirements more economically. By installing high performance Andrew antennas during initial system deployment you will not have to upgrade your antennas as cell sizes are reduced to accommodate increased traffic.

Andrew Cellular Panel Antennas are the technical solution with an aesthetically pleasing appearance. Designed for low wind loading, they are intended for base station applications where high traffic or geography creates a need to reduce co-channel and multipath interference. With a broadband frequency range of 820 to 960 MHz, they are well suited for GSM, AMPS or TACS networks where a 60 degree beamwidth is used in the cell site design.

Key Performance Advantages of Andrew Cellular Panel Antennas include:

Electrical downtilt option:

- *Improves network quality with a more accurate footprint, decreasing co-channel and multipath interference*

Superior main-lobe/side difference:

- *With an increased carrier signal to interference signal ratio (C/I), improves network efficiency by reducing the number of call drop-outs*

Broad bandwidth:

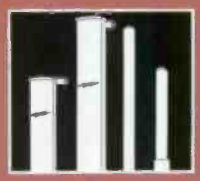
- *Allows use of the same antenna when a system changes from analog to digital and covers GSM, AMPS and TACS bands (820 - 960 MHz)*

Rugged, low profile radome:

- *Imparts low visual impact, delivers long-life in direct sun exposure and induces low wind load on the supporting structure*

Antenna color options:

- *Match the surrounding environment with custom color matching or choose one of our four standard colors*



Cellular Panel Antennas Characteristics

Cellular Product Range

Model Number	Nominal Gain dBd (dBi)	Downtilt degrees	El Beamwidth 820-890 MHz degrees	El Beamwidth 890-960 MHz degrees	Mid-Band Gain 890 MHz dBd (dBi)	Weight lb (kg)	Length in (mm)	Width in (mm)	Depth in (mm)
H13C060-890VC-Ayz	13 (15)	0	<16.9	<15.6	13.3 (15.5)	24.2 (11)	55.7 (1415)	15.6 (395)	3.9 (100)
H13C060-890VC-Gyz	13 (15)	6	<16.9	<15.6	13.3 (15.5)	24.2 (11)	55.7 (1415)	15.6 (395)	3.9 (100)
H13C060-890VC-Nyz	13 (15)	12	<16.9	<15.6	13.3 (15.5)	24.2 (11)	55.7 (1415)	15.6 (395)	3.9 (100)
H16C060-890VC-Ayz	16 (18)	0	<9.2	<8.7	15.6 (17.8)	48.4 (22)	92.9 (2360)	15.6 (395)	3.9 (100)
H16C060-890VC-Dyz	16 (18)	3	<9.2	<8.7	15.6 (17.8)	48.4 (22)	92.9 (2360)	15.6 (395)	3.9 (100)
H16C060-890VC-Gyz	16 (18)	6	<9.2	<8.7	15.6 (17.8)	48.4 (22)	92.9 (2360)	15.6 (395)	3.9 (100)
H16C060-890VC-Kyz	16 (18)	9	<9.2	<8.7	15.6 (17.8)	48.4 (22)	92.9 (2360)	15.6 (395)	3.9 (100)

Model Numbering System

Three fields fully define each model and available options.
For example:

H13C060 - 890VC - ANG
① ② ③
H13C060 - 890V**C** - ANG

① standard or high performance pattern: S or H
nominal gain (dBd): 13 or 16
application: Cellular
azimuth 3dB beamwidth: 60°

② midband frequency (MHZ): 890
polarization: V = vertical
product revision code: A, B, C etc.

③ electrical downtilt (degrees): A, D, G etc. A = 0, D = 3 etc.
connector: N (N female) or D (7-16 DIN female)
color: G = light gray

Enviromental Characteristics

Survival Wind Speed:	55 m/s (198 km/h) 124 mph
Temperature:	-30°C to 55°C
Humidity:	Up to 100%
Lightning Protection:	DC ground

Electrical Characteristics

Frequency Range:	820 - 960 MHz	
Impedance:	50 ohms	
Return Loss (VSWR):	820 - 890 MHz	>14.0 dB (>1.50)
	890 - 925 MHz	>17.7 dB (>1.30)
	925 - 960 MHz	>20.8 dB (>1.20)
Polarization:	Vertical	
Azimuth Beamwidths:	3 dB at 60°	
Front-to-Back Ratio:	>25 dB	
Elevation Upper Sidelobes:	<20 dB	
Power:	Continuous	>250 W
	Peak	>4 kW

Mechanical Characteristics

Wind load at 55 m/s (198 km/h) 124 mph (22% turbulence):

Front = 461 N (102 lbf) per meter of antenna height
Side = 89 N (20 lbf) per meter of antenna height

Dual Polarized 900 MHz Panel Antennas

CTSD 900 Dual Polarization Panel Antennas are the high performance solution to cell coverage, especially where aesthetics are of primary importance.

CTSD 900 Panel Antennas from Andrew are designed for modern cellular base stations. New Microstrip technology brings high performance and a trim profile enhances antenna aesthetics.

Dual Polarization allows for receive diversity without the need for large structures on top of the tower.

Polarization diversity is a proven attractive alternative to space diversity techniques.

Key Performance Advantages of Andrew CTSD 900 Panel Antennas include:

Superior main-lobe/side difference:

- *Better carrier signal to interference ratio (C/I)*

Mechanical Features:

- *Low weight and low wind load for ease of installation*
- *Slim profile for aesthetic acceptability*

CTSD 900 Panel Antennas Characteristics

CTSD 900 Product Range

Model Number	Az Beamwidth degrees	Nominal Gain dBd	Downtilt degrees	El Beamwidth degrees	Weight lbs	Length mm	Width mm	Depth mm
CTSD09SA-06815-0DW	68	15.5	0/2/4	8	20	2950	250	80
CTSD09SA-07214-0DW	72	14.5	0/6	10	15	2340	227	80
CTSD09SA-08514-0DW	85	14.0	0/2/4	8	20	2950	250	80

Model Numbering System

Three fields fully define each model and available options.
For example:

CTSD09SA - 06815 - xyz
① ② ③
CTSD09SA - 06815 -0DW

① application and frequency band: 09 = 900 MHz
product revision code: A, B, C etc.

② azimuth 3dB beamwidth 68, 72, 85: nominal gain (dBd):
14.0, 15.5, etc.

③ x = electrical downtilt (degrees): 0° to 9°, A (10°),
B (11°), etc.
y = connector: D (7-16 DIN) or N (N female).
z = color - w = white, other colors optional.

Electrical Characteristics

Frequency Range:	870 - 960 MHz
Impedance:	50 ohms
Return Loss (VSWR):	<15
Azimuth Beamwidths:	3 dB at 68°, 72°, or 85°
Elevation Upper Sidelobes:	>18 dB
Power:	Continuous >200 W

Note: Antenna radiation patterns are available upon request

Environmental Characteristics

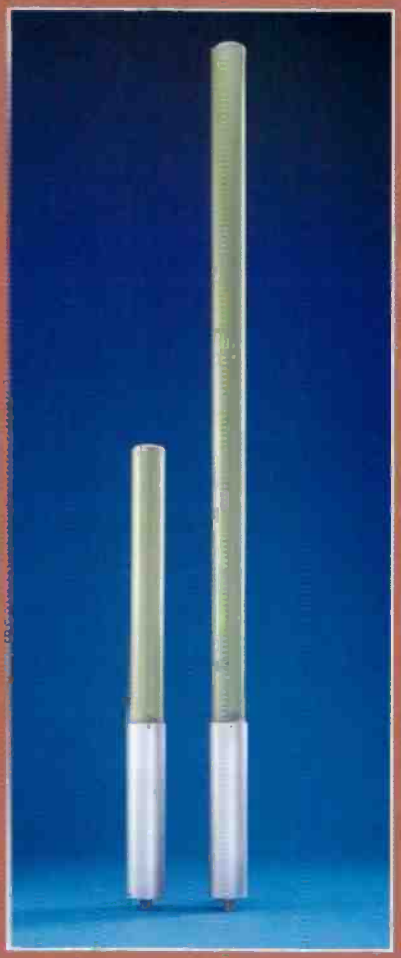
Humidity:	Up to 100%
Lightning Protection:	DC ground

Mechanical Characteristics

Wind load at 45 m/s (160 km/h)

Front = 0.66m² / 800N
Side = 0.17m² / 200N

Base Station Antennas

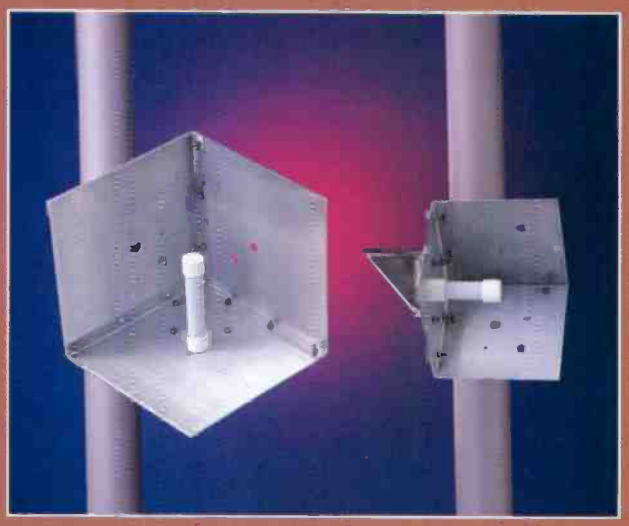


Rural Telephony Antenna Products

Andrew base station antennas for Rural Telephony applications are available in vertical and horizontal polarizations with gain characteristics from 8 dBi to 13 dBi.

The omnidirectional antennas feature low VSWR characteristics, low intermodulation distortion and can be optimized with electrical downtilt and null-fill based upon the gain configuration to optimize total coverage.

Andrew TRI-CORNER™ subscriber antennas for Rural Telephony systems operate in either horizontal or vertical polarization. They feature excellent polarization discrimination and are available in 14 and 17 dBi nominal gain configurations. Their superior front-to-back ratio maximizes the carrier signal and minimizes interference with adjacent system cells.



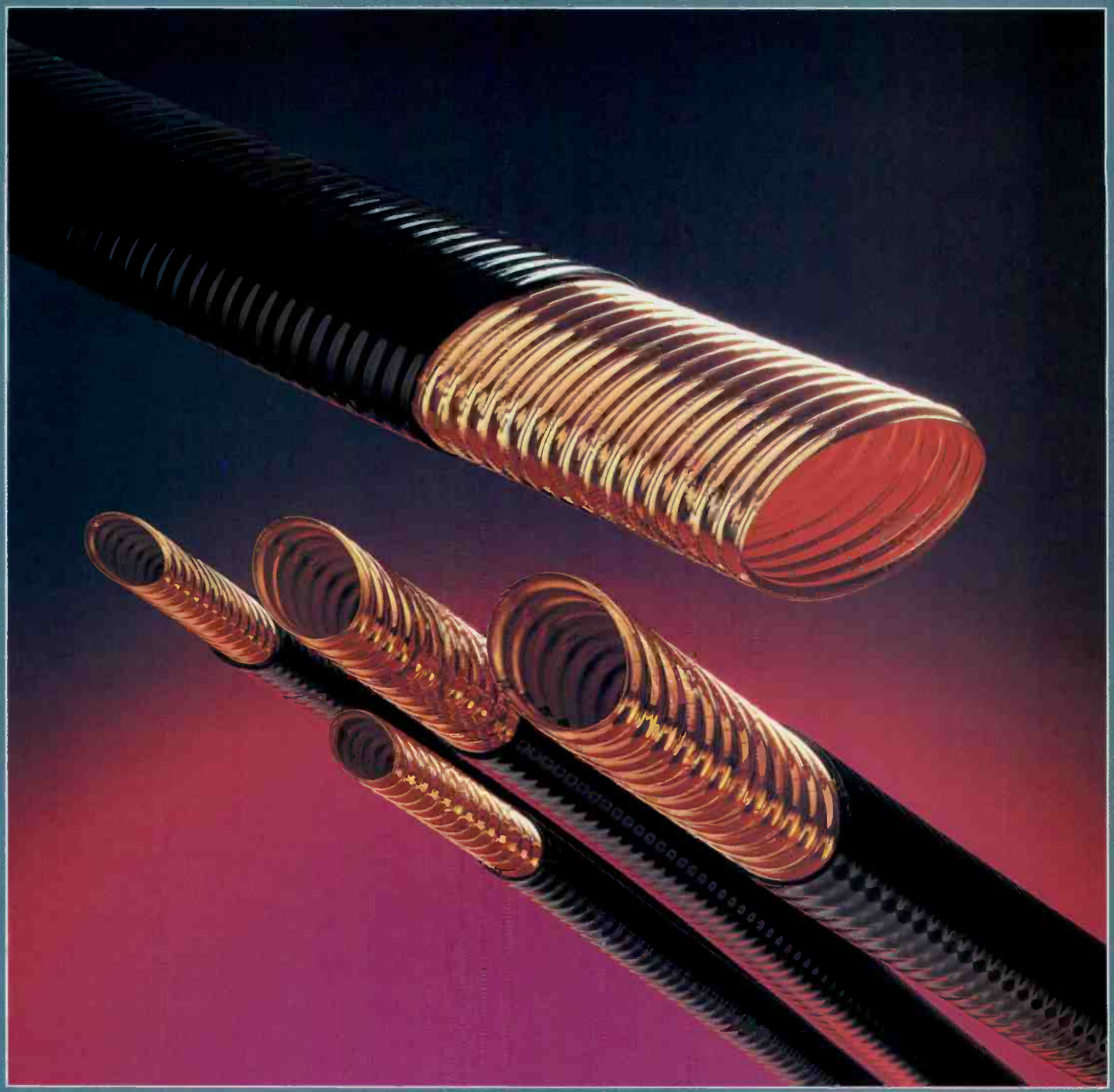
Rural Telephony Antennas Characteristics

Omni Antennas

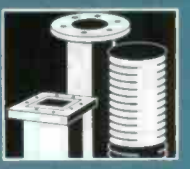
Model Number	Frequency MHz	Nominal Gain, dBi	Polarization	Downtilt	Input Connector
RT1N0F-015V-008	1425-1535	8	Vertical	0°	Type N Female
RT1N0F-015V-010	1425-1535	10	Vertical	0°	Type N Female
RT1N0F-015V-011	1425-1535	11	Vertical	0°	Type N Female
RT1N0F-015H-008	1425-1535	8	Horizontal	0°	Type N Female
RT1N0F-015H-0011	1425-1535	11	Horizontal	0°	Type N Female
RT1N0F-024V-010	2300-2485	10	Vertical	0°	Type N Female
RT1N0F-024V-013	2300-2485	13	Vertical	0.8°	Type N Female
RT1N0F-026V-110	2485-2690	10	Vertical	1°	Type N Female

Tri-Corner Antennas

Model Number	Frequency MHz	Nominal Gain, dBi	Input Connector
RT8N0F-0150-014	1425-1535	13.5	Type N Female
RT8N0F-0150-017	1425-1535	17	Type N Female
RT8N0F-0180-014	1700-1880	14	Type N Female
RT8N0F-0180-017	1700-1880	17	Type N Female
RT8N0F-0190-014	1850-1990	14	Type N Female
RT8N0F-0190-017	1850-1990	17	Type N Female
RT8N0F-0240-014	2300-2485	14.5	Type N Female
RT8N0F-0240-017	2300-2485	17	Type N Female
RT8N0F-0260-014	2485-2690	14.5	Type N Female
RT8N0F-0260-017	2485-2690	17	Type N Female



Microwave Transmission Lines



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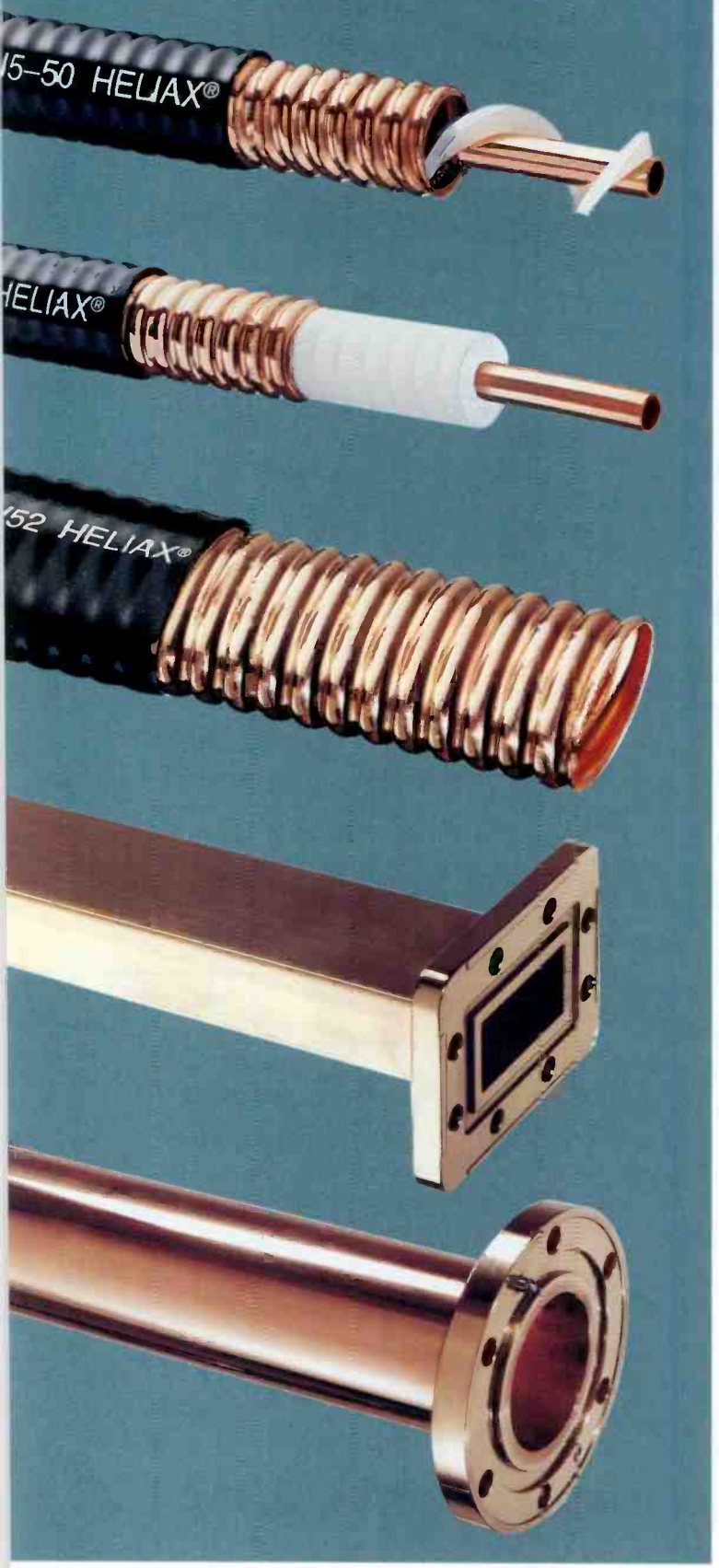


Microwave Transmission Lines

Widest Selection

of microwave transmission lines in the industry. Andrew offers sizes and types that are optimized for nearly every application.

HELIAX® Coaxial Cables and Elliptical Waveguides

have been, for many years, the standard transmission lines of the microwave industry. HELIAX cables and waveguides are proven performers in thousands of applications worldwide. Use of these products ensures the ultimate in quality, reliability and performance.

Andrew Circular Waveguides

offer lowest possible attenuation for long vertical runs and can result in antenna and tower cost savings.

Low VSWR

Andrew offers all types of microwave transmission lines in low VSWR versions for minimum group delay distortion and system noise.

How to Select Transmission Lines

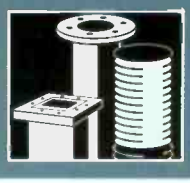
Andrew offers a complete range of HELIAX elliptical, rigid rectangular and rigid circular waveguides for use in terrestrial microwave and earth station antenna systems. HELIAX coaxial cables are offered for systems operating in microwave bands below 3 GHz.

The selector chart on page 169 lists recommended transmission lines by frequency band. Several options are listed for each band. The choice is typically based on evaluation of the features of each as described below.

Low VSWR HELIAX Air-Dielectric Coaxial Cable is the recommended feeder for antennas with air-dielectric feeds for 2.7 GHz and below. HELIAX cable is available in long continuous lengths for ease of installation and maintenance-free service. 7/8", 1-5/8" and 2-1/4" are the sizes typically used. HELIAX air-dielectric cables for microwave applications are described on pages 172 and 173.

Low VSWR HELIAX Foam-Dielectric Coaxial Cable is recommended for use with antennas having unpressurized feeds. 1/2", 7/8", 1-1/4" and 1-5/8" LDF series are the sizes typically used. HELIAX foam-dielectric cables for microwave applications are described on pages 170 and 171.

HELIAX Elliptical Waveguide is the recommended feeder for most microwave antenna systems in the 3.4 to 26.5 GHz frequency range. Long, continuous, flexible



lengths result in easier and less costly system planning and installation compared with rigid waveguides. The performance and reliability of HELIAX® elliptical waveguide have been proven in thousands of microwave systems. The corrugated copper walls give HELIAX elliptical waveguide excellent crush strength and good flexibility. A rugged black polyethylene jacket provides protection during handling and installation. Assemblies consist of waveguide cut to a specified length and terminated with connectors. Alternatively, bulk lengths may be ordered and individual feeders cut to length on site prior to installation.

Low VSWR, premium (EWP Series) assemblies are recommended for long-haul or high channel density systems. Standard VSWR (EW Series) assemblies are recommended for short and medium-haul radio relay systems with low and medium channel densities and medium-haul color television microwave relay systems. Super premium versions are available for selected sizes and offer lowest VSWR. HELIAX elliptical waveguides are described on pages 174-219.

Circular Waveguide minimizes feeder attenuation and is particularly suited for long vertical waveguide runs to tower-mounted antennas. A single waveguide run can carry two polarizations with 30 dB minimum isolation. Circular waveguide is recommended for systems where lower attenuation is critical or where multi-band capability is needed. The economic choice between elliptical and circular waveguides depends on total antenna and feeder system equipment, transportation, installation and tower costs. Circular waveguides are described on pages 238-245.

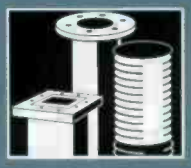
Rectangular Waveguide Components such as elbows, twists, pressure windows, and flex-twists are used in elliptical and circular waveguide systems for connections with the antenna and radio equipment. Rectangular waveguide also may be used for short feeder systems where space is limited. A full range of components for bands in the 3.4 - 40 GHz frequency range is offered. Rectangular waveguides are described on pages 220-237.

Transmission Line Selector Chart

Frequency Band, GHz	HELIAX Coaxial Cable Air Dielectric	HELIAX Coaxial Cable Foam Dielectric	HELIAX Elliptical Waveguide Type	Pages	Rectangular Waveguide (See Pages 220-237)	Circular Waveguide (See Pages 238-245)
Below 1.427	HJ( )-50 Series	LDF( )-50 Series				
1.427-1.535	HJ( )-50 Series	LDF( )P-50 Series				
1.7-2.3	HJ( )P-50 Series	LDF( )P-50 Series	EW17, EWP17	178	–	–
2.5-2.7	HJ( )P-50 Series	LDF( )P-50 Series	EW20	180	–	–
2.9-3.4			EW28	182	–	–
3.4-4.2	–	–	EW34, EWP34, EW37, EWP37 & EWP37S	184 186	WR229 –	WC281 –
4.4-5.0	–	–	EW43 & EWP43	188	WR187	–
5.6-6.425	–	–	EW52, EWP52	190	WR159, WR137	–
5.925-6.425	–	–	EW52, EWP52 & EWP52S		WR159, WR137	WC281, WC166
6.425-7.125	–	–	EW63, EWP63 & EWP63S	192	WR137	WC281, WC166
7.125-7.750	–	–	EW64, EWP64	194	WR137, WR112	WC166
7.125-8.5	–	–	EW77, EWP77	196	WR112	WC166
8.5-9.8	–	–	EW85	198	WR90, WR112	–
10.5-10.7	–	–	EW90, EWP90		WR90	–
10.7-11.7	–	–	EW90, EWP90 & EWP90S	200	WR90	WC109
11.7-13.25	–	–	EW127A, EWP127A	202	WR75	WC109
14.0-14.5	–	–	EW132, EWP132		WR75	–
14.5-15.35	–	–	EW132, EWP132	204	WR62	–
17.7-19.7	–	–	EW180, EWP180	206	WR42	WC109
21.2-23.6	–	–	EW220	208	WR42	–
24.25-26.50	–	–	EW240	210	WR42	–
26.5-40	–	–	–	*	WR51, 28	–

Size	HJ( )-50 Series Type	HJ( )-50 Series Pages	HJ( )P-50 Series Type	HJ( )P-50 Series Pages	LDF( )-50 Series Type	LDF( )-50 Series Pages	LDF( )P-50 Series Type	LDF( )P-50 Series Pages
1/2"	HJ4-50	490	–		LDF4-50A	461	LDF4P-50A	461
7/8"	HJ5-50	511	HJ5P-50	511	LDF5-50A	465	LDF5P-50A	465
1-1/4"			–		LDF6-50	469	LDF6P-50	469
1-5/8"	HJ7-50A	517	HJ7P-50A HJ7SP-50A	517 517	LDF7-50A	474	LDF7P-50A	474

* On request



Microwave Transmission Lines

Microwave Cables, Foam Dielectric

Low VSWR
Minimize group delay distortion and system noise.

Low Attenuation
Low loss foam for efficient signal transfer.

Long Continuous Lengths
Simplifies installation, eliminates the need for splices and provides for convenient stocking on site. Also, fewer joints mean increased reliability.

Foam-Dielectric Cables
Eliminates the need for pressurization equipment for easier installation and lower maintenance costs.

HELIAX® low-VSWR, foam-dielectric coaxial cables are the industry standard for use in unpressurized microwave radio relay systems. These cables are for use with the "F" series antennas operating from 1427 to 2700 MHz listed on pages 67-76. Type LDF6P-50 has a pressure path through the inner conductor and is also suitable for use with air-dielectric feed antennas. For applications below 1427 MHz, the standard HELIAX cables described on pages 461-478 are recommended.

Cables and fitted connectors are available for any standard U. S., Canadian, or CCIR frequency band. Other frequency bands are available on special order. Every assembly is guaranteed not to exceed the maximum VSWR specified.

Accessories described on pages 551-572 apply to low-VSWR HELIAX cable.

Low-VSWR HELIAX Jumper Assemblies

LDF series foam jumper assemblies offer low attenuation, low VSWR, complete RF shielding, flexibility, and high mechanical strength for equipment room connections. Low-VSWR, 1/2", 50 ohm HELIAX cable and connectors are used. Every assembly is guaranteed not to exceed the maximum VSWR specified. Type N Plug (male) connectors have gold-plated inner contact pins and silver-plated external surfaces. Other connectors and cable lengths are also available.

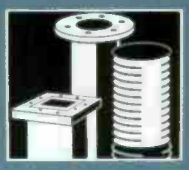
Weatherproof. Connector "O" ring seals, in conjunction with the annular corrugations of the cable, provide a longitudinal moisture block. To eliminate differential expansion, the dielectric is mechanically locked to the outer conductor and bonded to the inner conductor.

To Order. Specify cable type number including frequency band code, connector type numbers, "first-off" connector and cable length in feet or meters. See sample order on page 438.

Characteristics - LDF Series Foam-Dielectric HELIAX Cable Assemblies

Size	1/2"	7/8"	1-1/4"	1-5/8"	2-1/4"
Type No.	LDF4P-50A	LDF5P-50A-(*)	LDF6P-50-(*)	LDF7P-50A-(*)	LDF12P-50
Impedance, ohms	50	50	50	50	50
Low VSWR, Max, (RL)	Refer to Page 463	Refer to Page 467	Refer to Page 471	Refer to Page 476	Refer to Page 479
Attenuation at 2 GHz** dB/100 ft (dB/100 m)	3.45 (11.3)	1.97 (6.46)	1.45 (4.77)	1.25 (4.10)	1.060 (3.47)
Velocity, percent	88	89	89	88	88
Diameter over Jacket, in (mm)	0.63 (16)	1.09 (28)	1.55 (39.4)	1.98 (51)	2.35 (59.7)
Minimum Bending Radius, in (mm)	5 (125)	10 (250)	15 (380)	20 (508)	24 (610)
Cable Weight, lb/ft (kg/m)	0.15 (0.22)	0.33 (0.49)	0.66 (0.98)	0.92 (1.37)	1.29 (1.91)

* Insert frequency band code in Type Number when ordering. See referenced page. ** For other frequencies, refer to pages 461-474.



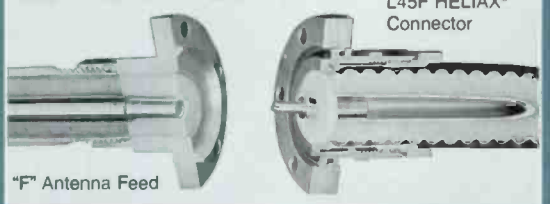
Self-Flaring. This patented* innovation results in simplified assembly, excellent electrical contact and high resistance to connector pull-off and twist-off. Each connector is designed for low VSWR up to the cut-off frequency of the cable.

Type "F" Flange. Most standard connectors used on air-dielectric cables and some unpressurized antenna feeds have air spaces (Figure 1) where moisture can collect if they are not pressurized. Because a small amount of moisture can seriously degrade VSWR and increase loss at microwave frequencies, these connectors are not suitable for use in an unpressurized system. To insure a completely void-free connection between the cable an antenna, Andrew developed a special weatherproof "F" foam-filled feed input flange and the mating "F" connector (Figure 2).

* U. S. Patent 4,046,451.

Figure 1 – 7/8" EIA Flange Connection

Figure 2 – "F" Flange and "F" Antenna Feed

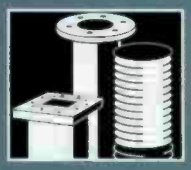


Type No.	Frequency MHz	Length feet (m)	VSWR Max. (R.L.)
Type N Plug/Type N Plug Connectors			
L4P4-PNMNM-3	1427 - 1535	3 (0.9)	1.10 (26.4)
L4P4-PNMNM-6	1427 - 1535	6 (1.8)	1.10 (26.4)
L4P3-PNMNM-3	940 - 2700	3 (0.9)	1.12 (24.9)
L4P3-PNMNM-6	940 - 2700	6 (1.8)	1.12 (24.9)
48695A-3	2300 - 2700	3 (0.9)	1.10 (26.4)
48695A-6	2300 - 2700	6 (1.8)	1.10 (26.4)
L4P3-PNMNM-3	2300 - 2700	3 (0.9)	1.10 (26.4)
L4P3-PNMNM-6	2300 - 2700	6 (1.8)	1.10 (26.4)
7/8" EIA Flange/N Plug Connectors			
200834A-3	2500 - 2700	3 (0.9)	1.10 (26.4)
200834A-6	2500 - 2700	6 (1.8)	1.10 (26.4)
202638A-3	1700 - 2300	3 (0.9)	1.06 (30.7)
202638A-6	1700 - 2300	6 (1.8)	1.06 (30.7)
"F" Flange Male/"F" Flange Male Connectors			
L4P3-FMFM-3	1700 - 2300	3 (0.9)	1.15 (23.1)
L4P3-FMFM-6	1700 - 2300	6 (1.8)	1.15 (23.1)

Connectors and Components

	Interface	For 1/2" LDF4P-50A	For 7/8" LDF5P-50A	For 1-1/4" LDF6P-50	For 1-5/8" LDF7P-50A	For 2-1/4" LDF12P-50A	Components
A	N Plug (male), mates with UG-23	L4NM	L5NM	L6PNM*	L7PNM	–	–
B	N Jack (female), mates with UG-21	L4NF	L5NF	L6PNF*	L7PNF	L12PNF	–
C	"F" Flange (male), for attachment to "F" series antennas	L44F	L45F	L46F	L47F	–	–
D	"F" Flange (female), use with jumper cables having "F" Flange (male) connectors.	209865	48041	–	201942	–	–
E	7/8" EIA Flange, includes inner Conductor, No gas barrier.	L44R	L45R	L46S*	L47S	–	–
F	Adapter "F" Flange (female), Type N Jack (female). Allows testing of feeders terminated with "F" Flange male connectors.	–	–	–	–	–	104300-2
G	Elbow, "F" Flange (male), "F" Flange (female)	–	–	–	–	–	203361

* For pressure port and pipe plug, order type number L6PNM-PR or L6PNF-PR



Microwave Transmission Lines

Microwave Cables, Air Dielectric

Low VSWR
Minimum group delay distortion and minimum noise

Low Attenuation
Lowest loss for efficient signal transfer

Long Continuous Lengths
Simplifies installation, eliminates the need for splices and provides for convenient stocking on site. Also, fewer joints mean increased reliability.

Air-Dielectric Cables
Provide pressure path to pressurizable antenna feeds.

HELIAX low-VSWR, air-dielectric coaxial cables are the industry standard for use in pressurized microwave antenna systems. These cables are for use with the air-dielectric feeds operating from 1700 to 2700 MHz listed on pages 69-76.

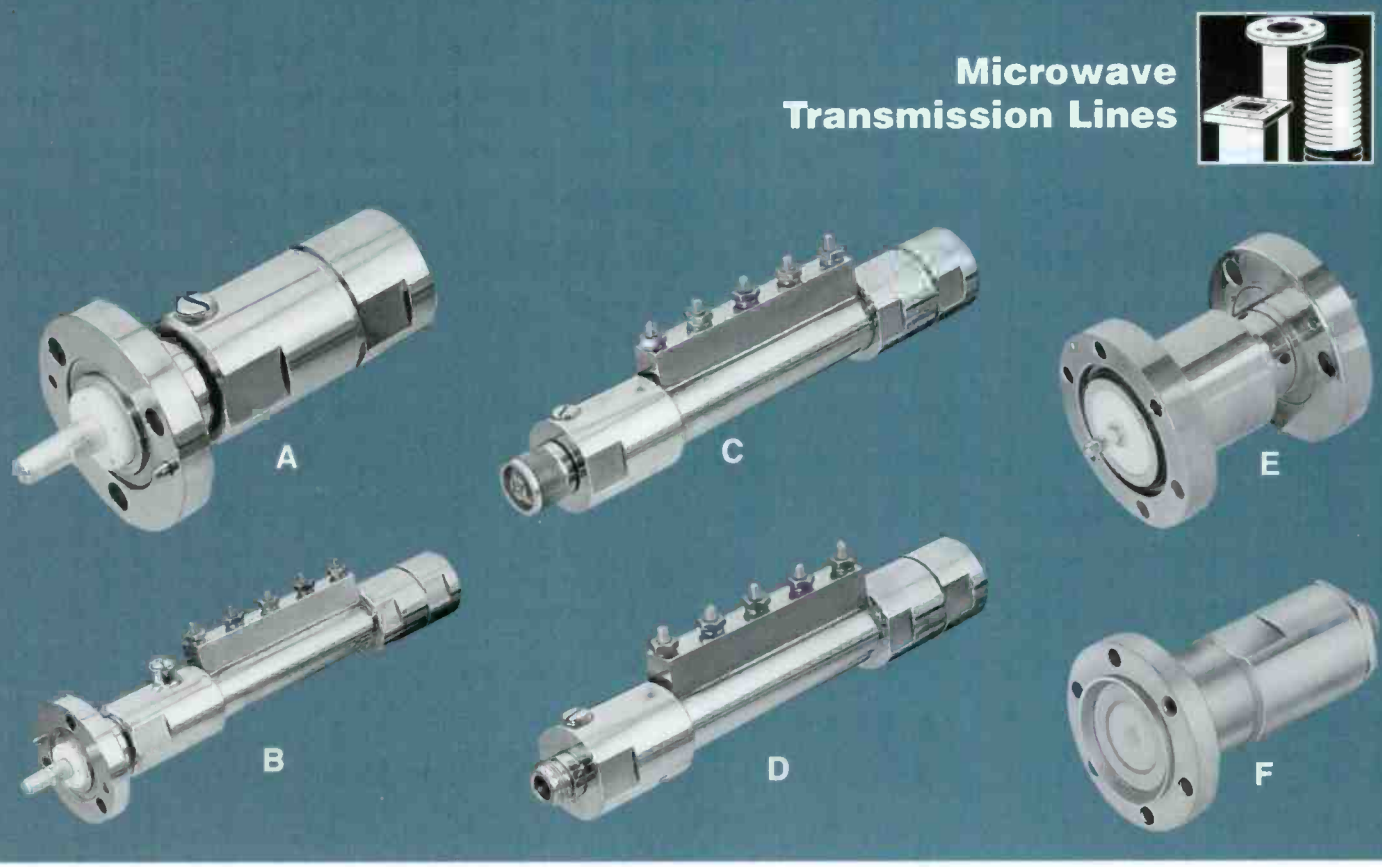
Characteristics - Air-Dielectric HELIAX Cable Assemblies

Size	Frequency Band Code	7/8"	1-5/8"	1-5/8"	2-1/4"
Type No.		HJ5P-50-(**)	HJ7SP-50A-(**)	HJ7P-50A-(**)	HJ12P-50-(**)
VSWR, (R.L.) Maximum (with recommended connectors)		1.08 (28.3)	1.10 (26.4)†	1.15 (23.1)	1.15 (23.1)
Attenuation at 2 GHz* dB/100 ft (dB/100 m)		1.85 (6.07)	1.05 (3.45)	1.05 (3.45)	0.88 (2.89)
Impedance, ohms		50	50	50	50
Frequency, MHz,	-17L	1700 - 1900	1700 - 1900	1700 - 1900	1700 - 1900
	-18	1850 - 1990	1850 - 1990	1850 - 1990	1850 - 1990
	-21	2110 - 2200	2110 - 2200	2110 - 2200	2110 - 2200
	-17	1700 - 2110	1700 - 2110	1700 - 2110	1700 - 2110
	-19	1900 - 2300	1900 - 2300	1900 - 2300	1900 - 2300
	-23W	2300 - 2700	–	2300 - 2700	–
Velocity, percent		91.6	92.1	92.1	93.1
Diameter over Jacket, in (mm)		1.1 (28)	1.98 (50.3)	1.98 (50.3)	2.38 (60.4)
Minimum Bending Radius, in (mm)		10 (250)	20 (508)	20 (508)	22 (560)
Cable Weight, lb/ft (kg/m)		0.54 (0.80)	1.04 (1.55)	1.04 (1.55)	1.16 (1.73)

* For other frequencies, refer to pages 511-520. ** Insert frequency band code in Type Number when ordering. † 1.12 (24.8) with H7NM-T and H7NF-T

Recommended Connectors

Cable Type	Bandwidth	7/8" EIA Flange No Gas Barrier	7/8" EIA Flange Gas Barrier	Type N Plug (male)	Type N Jack (female)
HJ5P-50	Up to 200 MHz	75AR	75AG	H5NM-T	H5NF-T
	200 - 410 MHz	75ART	75AGT	H5NM-T	H5NF-T
HJ7SP-50A	Up to 410 MHz	87ST	87SGT	H7NM-T	H7NF-T
HJ7P-50A	Up to 150 MHz	87S	87SG	H7NM-T	H7NF-T
	150 - 410 MHz	87ST	87SGT	H7NM-T	H7NF-T
HJ12P-50	Up to 410 MHz	82S	–	–	H12NF



Cables and fitted connectors are available for any standard U.S., Canadian, or CCIR frequency band. Other frequency bands are available on special order. All cable assemblies are sweep tested at the factory to ensure low VSWR performance across the specified operating band.

Accessories described on pages 551-572 apply to low-VSWR HELIAX cable.

To Order. Specify cable type number including frequency band code, connector type numbers, "first-off" connector and cable length in feet or metres. See sample order on page 438.

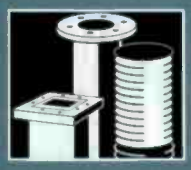
Selection of Connectors

Some applications, depending on bandwidth and cable type, require tunable connectors to achieve the specified VSWR ratings. Refer to the table on page 122 for connector recommendations. For example, tunable Type N or non-tunable 7/8" EIA connectors are recommended for use with Type HJ5P-50 cable operating in the 1850 - 1990 MHz band (under 200 MHz bandwidth).

Connectors and Components

	Interface	For 7/8" HJ5P-50	For 1-5/8" HJ7P-50A and HJSP-50A	For 2-1/4" HJ12P-50	Components
A	7/8" EIA Flange, no gas barrier at interface	75AR	87S	82S	–
A	7/8" EIA Flange, gas barrier	75AR	87SG	–	–
B	Tunable 7/8" EIA Flange, no gas barrier at Interface	75ART	87ST	–	–
B	Tunable 7/8" EIA Flange, gas barrier	75AGT	87SGT	–	–
C	Tunable N Plug (male), mates with UG-23	H5NM-T	H7NM-T	–	–
D	Tunable* N Jack (female), mates with UG-21	H5NF-T	H7NF-T	H12PNF*	–
E	Adapter, 7/8" EIA, "F" Flange (male). For attaching air-dielectric HELIAX cable with 7/8" EIA Flange to "F" Series antenna, includes gas barrier.	–	–	–	33682
F	Adapter, "F" Flange (female), Type N Jack (female). Allows testing of feeders terminated with "F" Flange male connectors.	–	–	–	104300-2

* H12PNF not tunable



Microwave Transmission Lines

HELIAX® Elliptical Waveguide General Information

HELIAX elliptical waveguide is the optimum choice for most microwave antenna feeder systems. HELIAX is precision-formed from corrugated high-conductivity copper and has an elliptical cross section. The corrugated wall gives the waveguide excellent crush strength, light weight and good flexibility for ease of handling. A rugged black polyethylene jacket provides protection during handling and installation. A full range of waveguide sizes is available for application from 1.7 to 26.5 GHz.

High Performance

Low Loss. HELIAX elliptical waveguides are optimized for lowest loss in specific user bands. Attenuation is significantly lower than that of standard rectangular waveguides for these bands. You get highly efficient signal transfer which optimizes overall system performance.

Low Signal Distortion. The elliptical cross section propagates the $_eTE_{11}$ dominate mode, which is similar to the TE_{10} mode in rectangular waveguide, and operates below the cutoff frequencies of higher order modes. Operating in the frequency band where only the dominant mode can exist eliminates signal distortion due to mode conversion and minimizes VSWR.

Guaranteed VSWR Performance. All factory assemblies are guaranteed to meet stated VSWR specifications. You get the performance you expect. No surprises, no risk.

Advanced Connector Design. Pre-tuned and fixed-tuned premium connector designs provide low VSWR performance, eliminating the need for field tuning.

Long Service Life Means Cost Effective Performance

Solid Copper Corrugated Wall gives the waveguide excellent crush strength, light weight and good flexibility.

Rugged Black Polyethylene Jacket provides protection during handling and installation. The jacket is weatherproof and ultraviolet stabilized to prevent deterioration. Standard jacketing material is suitable for operation down to -54°C (-65°F) and installation down to -40°C (-40°F).

Investment Cast Silicon Brass and Forged Brass connector material, for most sizes, ensures long lasting pressure tightness and corrosion resistance. Connector hardware is stainless steel for corrosion protection and long life.

Advanced Design Accessories are integral HELIAX system components and are engineered for long term reliability.

Minimum Installation Cost and Simplified System Planning

HELIAX elliptical waveguide minimizes the cost of detailed waveguide system planning and has lower installation cost compared with other types of waveguide.

Good Flexibility of the corrugated copper construction provides ease of handling during installation. Saves time and labor.

One-Stop Shopping. A broad range of accessories and components is available from Andrew, all engineered to work together as a system. With Andrew you can avoid the costly problems of out of sequence deliveries and non-compliant material which can result from dealing with multiple vendors.

Long Continuous Length availability is a major advantage of HELIAX elliptical waveguide. It can be easily cut to length for any waveguide run eliminating the need for multiple joints and elbows of flex sections. The result: lower installation cost, easier system planning and increased reliability. Long lengths also permit convenient stocking at the site.

Connector Attachments are designed so that special tools or compounds are not required.

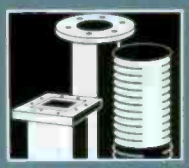
Easy to Use Flaring Tools are available for most sizes. Special training is not required.

Additional Services Make the Andrew Difference

Andrew offers a broad range of services including delivery, installation, and testing of antenna/transmission line systems. We are also prepared to handle all of the other details necessary for complete site construction.

Fast Delivery. Rapid product availability allows Andrew to be a real problem solver for you at installation time. With schedules to meet, you need to avoid delivery delays, contain costs and get your system operating on time. With HELIAX elliptical waveguide from Andrew, you can do it.

Applications Engineering Support. Andrew offers applications engineering support to solve system design problems and ensure that your waveguide system is properly designed. We can provide expert assistance to make sure that your waveguide investment will provide a cost-effective return.



VSWR Characteristics

Recommended waveguide and connector assemblies for the commonly used frequency bands are listed in the tables on pages 178-211. VSWR characteristics shown are guaranteed for factory assemblies within the indicated bands. They are also typical for assemblies with field-installed connectors. Performance data for other bands are available on request.

HELIAX® elliptical waveguide is available in standard VSWR, premium (low VSWR) and super premium (lowest VSWR) versions. Selection of waveguide is completed by VSWR testing which is an integral part of the manufacturing process. For this reason, standard, premium and super premium versions all carry the EW marking. Except for attainable VSWR, standard, premium and super premium waveguides have the same electrical and mechanical characteristics.

All waveguide is tested as part of the manufacturing process, and is verified to be at least 0.01 better than the published VSWR specifications. This ensures that the published specifications will be maintained upon delivery to the site. See page 219 for details of the high directivity Andrew Hybrid Reflectometer.

Cutting Tolerance

Waveguide lengths are measured from connector flange face to connector flange face. Standard cutting tolerance is +2%, -0%. Closer tolerances are available on special order.

Elliptical Waveguide Connectors

Connectors are tapered or multi-step transitions from elliptical to rectangular waveguide cross sections and mate with industry standard rectangular waveguide flanges. Each connector includes a pressure inlet with a 1/8" female pipe thread, flange gasket, flange hardware and assembly instructions. "M" suffix connectors, such as 143SEM, have IEC154 compliant flanges, and are supplied with metric flange hardware and gasket.

Connector Types Available

Non-Tunable Connectors are tapered transitions which do not include tuning screws. They are recommended for use with standard HELIAX elliptical waveguide and have designations such as 163DE.

Tunable Connectors are tapered transitions which include tuning screws to minimize assembly VSWR. Tunable connectors are identified by a "T" suffix. For example, 163DET is a tunable version of the 163DE non-tunable connector mentioned above.

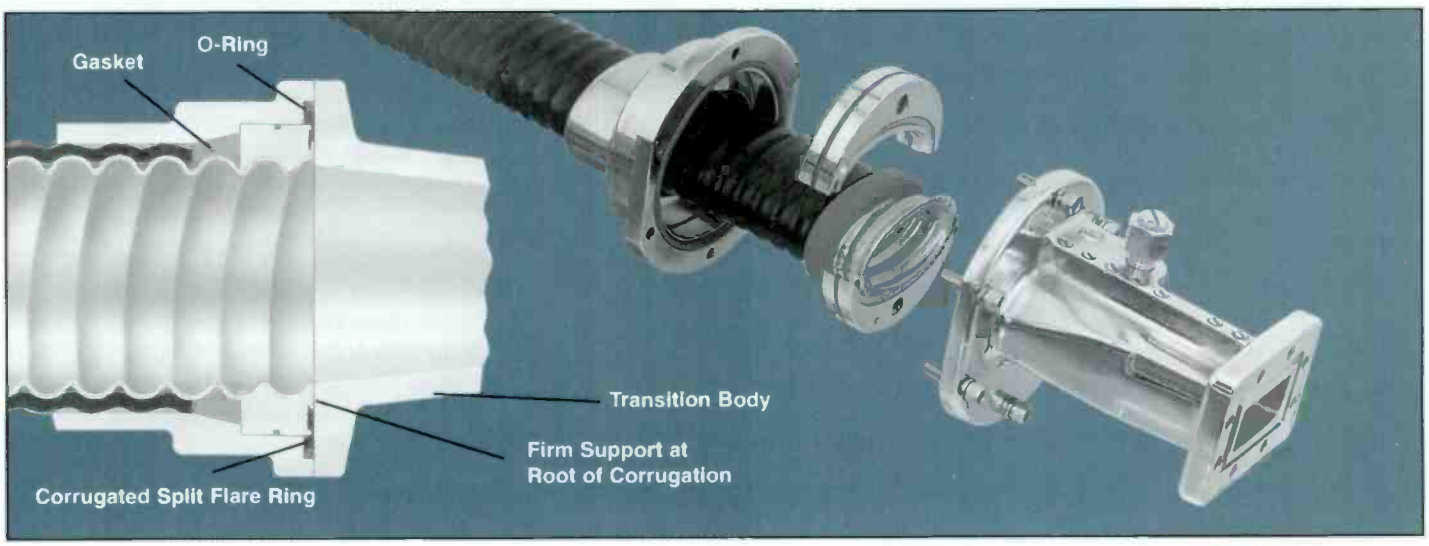
When ordered as part of a premium or super premium factory assembly, the connectors are factory attached and tuned. Tunable connectors are suitable for field attachment when the capability for field tuning exists. Tunable connectors are recommended for use with premium and super premium HELIAX elliptical waveguide.

Pre-Tuned Connectors are similar to the above tunable connectors except they are factory tuned and shipped unattached. Pre-tuned connectors are identified by a "P" suffix. For example, 163DEP is a pre-tuned version of the tunable 163DET tunable connector mentioned above. Pre-tuned connectors are ideal for field fitted applications requiring low VSWR without the need for field tuning. They are recommended for use with standard and premium HELIAX elliptical waveguide.

Fixed-Tuned Connectors have a multi-step mating section which is precisely machined to provide low VSWR over a broad bandwidth without the use of tuning screws. Fixed-tuned connectors are recommended for use with standard and premium HELIAX elliptical waveguide. The connectors have designations which include an "S" after the series number. Types are: 143SEM, 163SEM*, 164SEM*, 290SC**, 1220ASC* and 2180SEM.

* Patented United States 4,540,959; Australia 565,511; Canada 1,221,751.
** Patented United States 4,642,585; Australia 578,507; Canada 1,224,897.

Cutaway View of D Series Connector



Microwave Transmission Lines

Connector Materials

All connectors except for the 117, 120 and 128 series, are constructed of brass. 117, 120 and 128 series are silicone impregnated, nickel plated aluminum. Both materials are long lasting, pressure tight and compatible with the waveguide material to prevent corrosion. A precision molded silicone rubber gasket conforms to the shape of the waveguide corrugations and provides a reusable pressure seal without the need for sealing compounds. All hardware is stainless steel for corrosion protection and long life.

Connectors Are Easy to Attach

All connectors, except those for EW17, 20, 28 and 85, incorporate a corrugated split flare ring to accurately position the elliptical waveguide relative to the transition. When used with the new compact flaring tool kit, this allows consistent VSWR to be achieved for connectors which do not require field tuning.

Saw Guide. Split flare ring connectors include a disposable plastic saw guide to assure a square cut of the waveguide and the proper length for flaring.

Integral Flare Aid. The corrugated split flare ring functions as a flare aid. This innovation results in:

- *Improved electrical performance through optimum positioning of the corrugation runout relative to the electrical axis of the waveguide.*
- *Firm support throughout the corrugation allowing high mating pressure at the point of electrical contact to eliminate intermodulation distortion.*
- *Fast, accurate field connector attachment.*
- *Field attachment with standard hand tools.*

Compact Flaring Tool

New compact flaring tool*** kits are now available exclusively from Andrew with many advantages over other flaring tools. See page 216.

HELIAX* Elliptical Waveguide Assemblies

Assemblies consist of waveguide cut to length and terminated with connectors on each end. Connectors are transitions from the elliptical to rectangular cross section and are described in detail above.

Assemblies are available in standard and premium versions. Super premium (lowest VSWR) versions are available for certain sizes.

Standard Assemblies consist of standard waveguide and non-tunable, fixed tuned or pre-tuned connectors.

Premium Assemblies consist of premium waveguide and tunable connectors or fixed-tuned premium connectors. Premium waveguide has excellent VSWR characteristics for very low group delay distortion and noise.

Super Premium Assemblies consist of super premium waveguide and tunable connectors. Super premium assemblies offer the lowest available VSWR for minimum group delay distortion and noise.

Factory or Field Assemblies

All of the above assembly types can be configured as factory or field assemblies. VSWR specifications given in this catalog are guaranteed for factory assemblies and are typical for field fitted assemblies.

For long bulk lengths of premium elliptical waveguide it is not possible to verify the return loss performance along the entire length. Therefore, when possible, premium waveguide should be ordered in the lengths in which it will be used.

Field Fitted Assemblies. Bulk lengths may be ordered and individual feeders cut to length and connectors installed on site for minimum waste. Connectors can be attached without need of special tools or compounds. Compact flaring tools are available to ensure consistent VSWR performance. Pre-tuned or fixed-tuned premium connectors are recommended for field-fitted applications requiring low VSWR without field tuning.

Factory Assemblies. When specific lengths are known, waveguide can be cut to the desired length and connectors factory attached and, where applicable, tuned.

Optional Fire-Retardant Jacket

Selected sizes of HELIAX elliptical waveguide are available with a fire-retardant, non-halogenated jacket to avoid the need for costly conduit.

For use in the United States, these fire-retardant jacketed elliptical waveguides are UL listed as Type CATVR and marked accordingly on the gray jacket. The Type CATVR rating permits installation in building risers.

This jacketing material is intended for installation indoors or in other confined areas where there is limited exposure to sunlight or ultra-violet radiation.

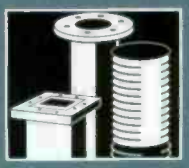
The CATVP elliptical waveguide is available in selected sizes. Products with this rating are found in ducts, plenums or other spaces used for environmental air. Types of unjacketed CATVP waveguide pass the most stringent fire resistance tests and are tagged as "UL® Type CATVP."

Typical Systems

Example microwave antenna systems using HELIAX elliptical waveguide are described on pages 34-43. Typical components and mounting accessories are illustrated.

* HELIAX is the registered trademark under which flexible elliptical wave guides are sold by Andrew.

*** Patented United States 4,590,785



Pressurization

The waveguide should be maintained under dry air or dry nitrogen pressure to prevent moisture condensation. All sizes are pressurizable to 10 lb/in² (70 kPa) maximum.

Installation

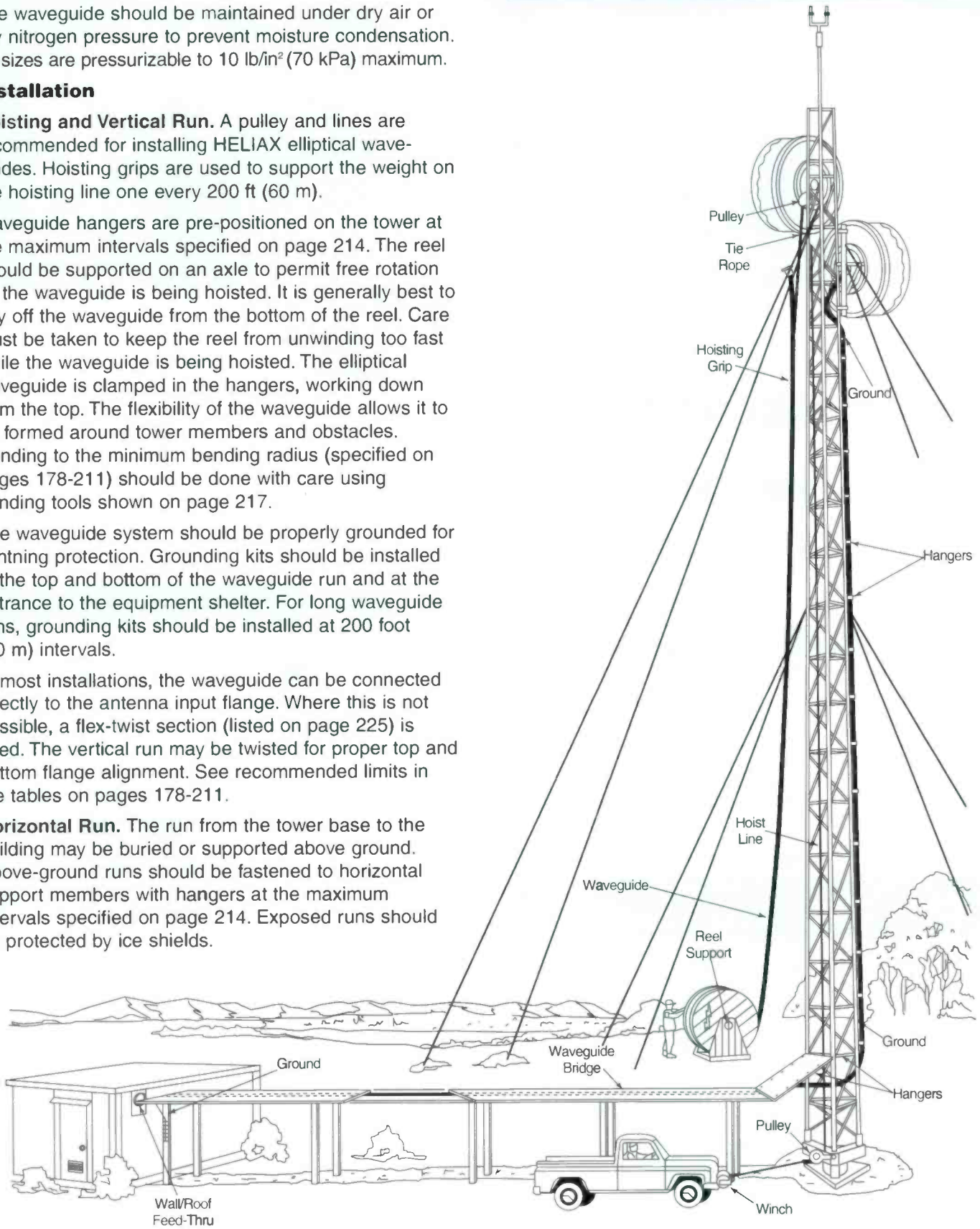
Hoisting and Vertical Run. A pulley and lines are recommended for installing HELIAX elliptical waveguides. Hoisting grips are used to support the weight on the hoisting line one every 200 ft (60 m).

Waveguide hangers are pre-positioned on the tower at the maximum intervals specified on page 214. The reel should be supported on an axle to permit free rotation as the waveguide is being hoisted. It is generally best to pay off the waveguide from the bottom of the reel. Care must be taken to keep the reel from unwinding too fast while the waveguide is being hoisted. The elliptical waveguide is clamped in the hangers, working down from the top. The flexibility of the waveguide allows it to be formed around tower members and obstacles. Bending to the minimum bending radius (specified on pages 178-211) should be done with care using bending tools shown on page 217.

The waveguide system should be properly grounded for lightning protection. Grounding kits should be installed at the top and bottom of the waveguide run and at the entrance to the equipment shelter. For long waveguide runs, grounding kits should be installed at 200 foot (60 m) intervals.

In most installations, the waveguide can be connected directly to the antenna input flange. Where this is not possible, a flex-twist section (listed on page 225) is used. The vertical run may be twisted for proper top and bottom flange alignment. See recommended limits in the tables on pages 178-211.

Horizontal Run. The run from the tower base to the building may be buried or supported above ground. Above-ground runs should be fastened to horizontal support members with hangers at the maximum intervals specified on page 214. Exposed runs should be protected by ice shields.



Microwave Transmission Lines

Characteristics

Type Numbers	
Premium Waveguide	EWP17
Standard Waveguide	EW17
Electrical	
Max. Frequency Range, GHz	1.7-2.4
${}_{e}TE_{11}$ Mode Cutoff Frequency, GHz	1.364
Group Delay at 2.0 GHz, ns/100 ft (ns/100 m)	139 (456)
Peak Power Rating at 2.0 GHz, kW	
with 117E or 117ET Connectors	1036
with 117RT Connectors	90
Mechanical	
Minimum Bending Radii, without rebending in (mm)	
E Plane	20 (510)
H Plane	57 (1450)
Minimum Bending Radii, with rebending, in (mm)	
E Plane	28 (710)
H Plane	81 (2060)
Maximum Twist, degrees/ft (degrees/m)	0.25 (0.75)
Dimension over Jacket, in (mm)	5.65 x 2.99 (143.5 x 75.9)
Weight, lb/ft (kg/m)	2.73 (4.06)

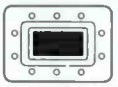
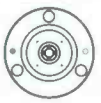
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
1.70	0.46 (1.51)	35.35	59.7
1.80	0.41 (1.35)	39.48	65.3
1.90	0.38 (1.25)	42.58	69.6
2.00	0.36 (1.19)	44.99	73.1
2.10	0.35 (1.14)	46.91	76.0
2.20	0.34 (1.10)	48.47	78.5
2.30	0.33 (1.07)	49.76	80.5
2.40	0.32 (1.05)	50.82	82.3

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Types EW17 and EWP17

Connectors - Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
117E, 117ET Figure 1		15.9 (404)	6.9 (175)	12.0 (305)	7.0 (3.2)
117RT Figure 2		8.9 (225)	4.6 (116)	5.0 (127)	5.0 (2.3)

Connector Material: Nickel Plated Aluminum

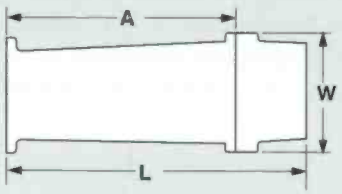


Figure 1

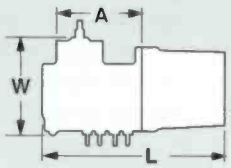
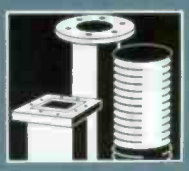


Figure 2

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479



Ordering Information for Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector Tunable	VSWR, max.** (R.L., dB) Up to 300 ft (90 m)
Premium Waveguide Assemblies				
1.7-2.1	**EWP17-17**	CPR430G	**117ET**	1.19 (21.2)
		7/8" EIA (gas block)	**117RT**	1.23 (19.7)
		7/8" EIA (gas pass)	**117RT-3**	1.23 (19.7)
1.9-2.3	**EWP17-19**	CPR430G	**117ET**	1.17 (22.1)
		7/8" EIA (gas block)	**117RT**	1.27 (18.5)
		7/8" EIA (gas pass)	**117RT-3**	1.27 (18.5)
Standard Waveguide Assemblies			**Non-Tunable**	
1.7-2.3	**EW17**	CPR430G	**117E**	1.25 (19.1)

* Contact Andrew for information on other frequency bands.
** VSWR, max. (R.L.,dB) Up to 300 ft (90 m). The indicated maximum characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories - Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 6 ft (1.83 m)*	31766A-9
Hardware Kit of 10, 3/8" bolts, lock washers and nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Two kits are required with each EW17 hanger kit. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	42334
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Splice	117Z
Grounding Kit with factory attached lug	204989-6
Grounding Kit with field attachable crimp-on lug	204989-26
Grounding Kit with field attachable screw-on lug	204989-36
Crimping Tool to field attach lug to Grounding Kit	207270
Wall/Roof Feed-Thru	35849A-10
Hoisting Grip	34759
Bending Tool Kit. One each E and H Plane tool	33586-4
Connector Reattachment Kit	33544-10

How to Order

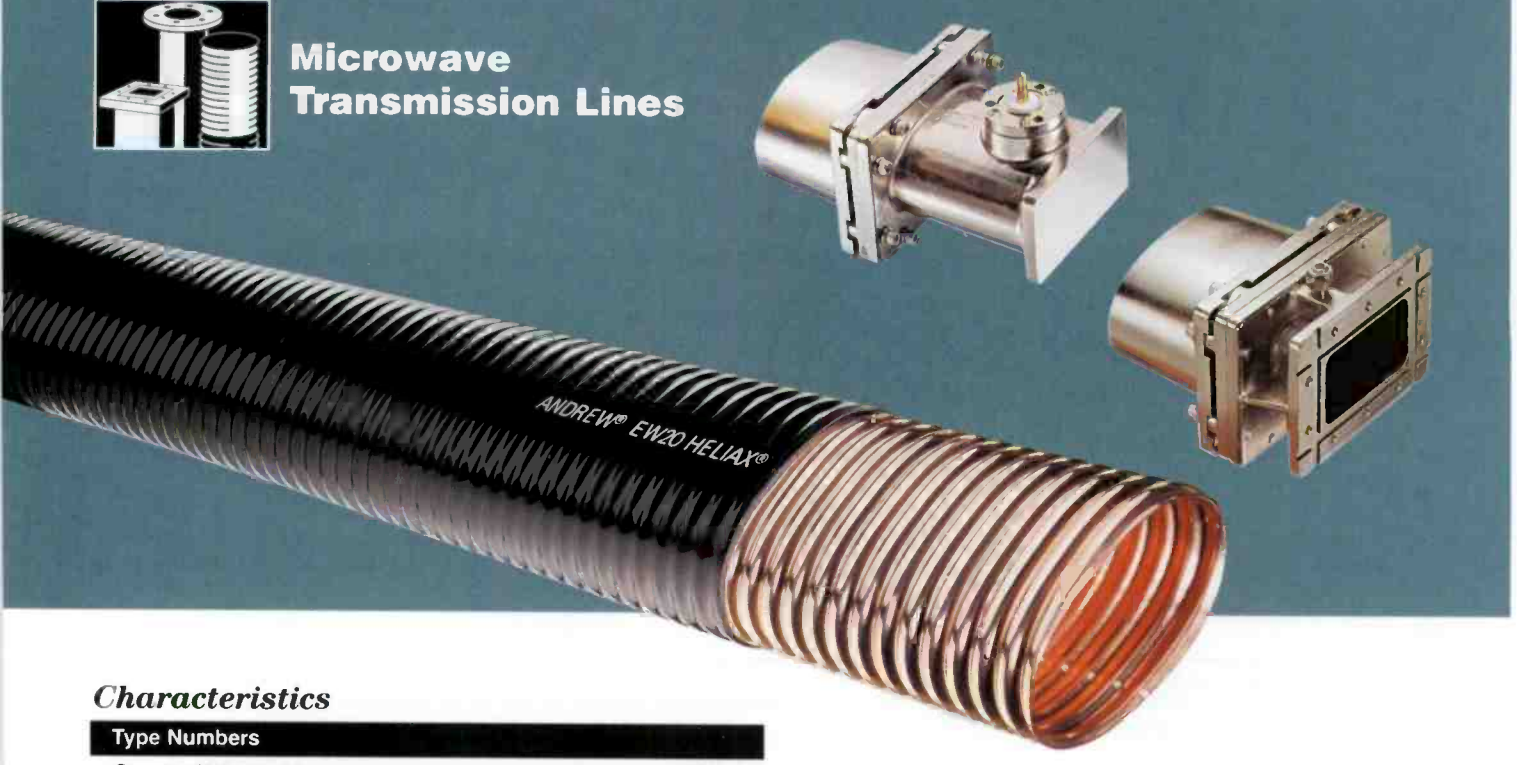
To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX elliptical waveguide, see pages 174-177.

Microwave Transmission Lines



Characteristics

Type Numbers	
Standard Waveguide	EW20
Electrical	
Max. Frequency Range, GHz*	1.9-2.7
${}_{e}TE_{11}$ Mode Cutoff Frequency, GHz	1.57
Group Delay at 2.6 GHz, ns/100 ft (ns/100m)	127 (418)
Peak Power Rating at 2.6 GHz, kW	
with 120E Connectors	663
with E20MB-014 and E20MP-014 Connectors	90
Mechanical	
Minimum Bending Radii, without rebending, in (mm)	
E Plane	18 (460)
H Plane	50 (1270)
Minimum Bending Radii, with rebending, in (mm)	
E Plane	26 (660)
H Plane	71 (1800)
Maximum Twist, degrees/ft (degrees/m)	0.25 (0.75)
Dimension over Jacket, in (mm)	5.02 x 2.83 (127.5 x 71.9)
Weight, lb/ft (kg/m)	1.85 (2.76)

* Actual usable range is limited by the connecting rectangular waveguide.

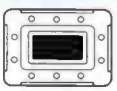
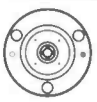
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
1.9	0.61 (2.01)	24.06	56.3
2.0	0.55 (1.81)	26.65	61.9
2.1	0.51 (1.69)	28.64	66.4
2.2	0.49 (1.60)	30.22	70.0
2.3	0.47 (1.53)	31.50	73.0
2.4	0.45 (1.48)	32.56	75.6
2.5	0.44 (1.45)	33.44	77.8
2.6	0.43 (1.41)	34.19	79.7
2.7	0.42 (1.39)	34.82	81.4

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Type EW20

Connectors - Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
120E Figure 1		5.8 (147)	6.2 (157)	1.8 (46)	3.5 (1.6)
E20MB-014, E20MP-014 Figure 2		9.0 (229)	4.4 (111)	4.4 (111)	4.8 (2.2)

Connector Material: Nickel Plated Aluminum

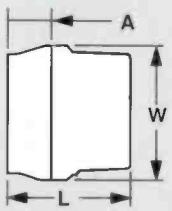


Figure 1

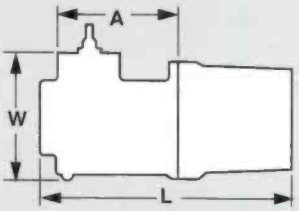


Figure 2

Ordering Information for Waveguide Assemblies

Frequency*, GHz	Waveguide Type	Flange Type††	Connector	Pressure Window	VSWR, max.** (R.L., dB) Up to 300 ft (90 m)
2.5-2.7	**EW20-25**	mates with CPR340G	**120E**	**55001-340**	1.15 (23.0)
2.5-2.7	**EW20-25**	7/8" EIA (with gas barrier)	**E20MB-014**	***	1.15 (23.0)
		7/8" EIA (without gas barrier)	**E20MP-014**	–	1.15 (23.0)
2.1-2.7	**EW20-21W**	7/8" EIA (with gas barrier)	**E20MB-014**	***	1.15 (23.0)
		7/8" EIA (without gas barrier)	**E20MP-014**	–	1.15 (23.0)

* Contact Andrew for information on other frequency bands.
** VSWR, max. (R.L.,dB) Up to 300 ft (90 m). The indicated maximum characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Not applicable
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 5.5 ft (1.68 m)*	31766A-10
Hardware Kit of 10, 3/8" bolts, lock washers and nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Two kits are required with each EW20 hanger kit. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Splice	120Z
Grounding Kit with factory attached lug	204989-6
Grounding Kit with field attachable crimp-on lug	204989-26
Grounding Kit with field attachable screw-on lug	204989-36
Crimping Tool to field attach lug to Grounding Kit	207270
Wall/Roof Feed-Thru	35849A-9
Hoisting Grip	34759
Bending Tool Kit. One each E and H Plane tool	33586-4
Connector Reattachment Kit	33544-11

How to Order

To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX elliptical waveguide, see pages 174-177.

Microwave Transmission Lines

Characteristics

Type Numbers	
Standard Waveguide	EW28
Electrical	
Max. Frequency Range, GHz	2.6-3.4
$_eTE_{11}$ Mode Cutoff Frequency, GHz	2.20
Group Delay at 3.2 GHz, ns/100 ft (ns/100 m)	137 (451)
Peak Power Rating at 3.2 GHz, kW	446
Mechanical	
Minimum Bending Radii, without rebending, in (mm)	
E Plane	22 (560)
H Plane	52 (1320)
Minimum Bending Radii, with rebending, in (mm)	
E Plane	22 (560)
H Plane	52 (1320)
Maximum Twist, degrees/ft (degrees/m)	0.25 (0.75)
Dimensions over Jacket, in (mm)	3.65 x 2.33 (92.5 x 59.2)
Weight, lb/ft (kg/m)	1.37 (2.04)

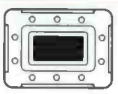
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
2.60	0.87 (2.87)	12.75	53.3
2.70	0.78 (2.56)	14.28	58.0
2.80	0.72 (2.36)	15.50	61.9
2.90	0.68 (2.22)	16.51	67.0
3.00	0.64 (2.11)	17.35	69.6
3.10	0.62 (2.03)	18.07	71.9
3.20	0.60 (1.96)	18.68	74.0
3.30	0.58 (1.90)	19.22	75.8
3.40	0.57 (1.86)	19.69	77.4

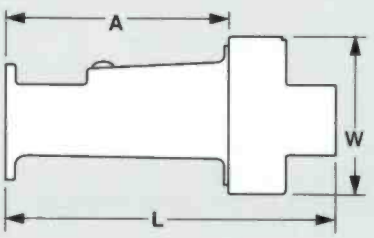
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

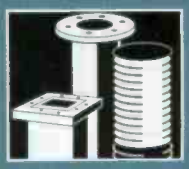
Type EW28

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
128AE		12.7 (322)	5.0 (127)	10.0 (254)	7.3 (3.3)

Connector Material: Nickel Plated Aluminum





Ordering Information for Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector	Pressure Window	VSWR, max.** (R.L., dB) Up to 300 ft (90 m)
2.9-3.1	**EW28**	CPR284G	**128AE**	**55001-284**	1.20 (20.8)
3.1-3.4	**EW28**	CPR284G	**128AE**	**55001-284**	1.15 (23.1)

* Contact Andrew for information on other frequency bands.
** VSWR, max. (R.L.,dB) Up to 300 ft (90 m). The indicated maximum characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 5 ft (1.52 m)*	31766A-11
Hardware Kit of 10, 3/8" bolts, lock washers and nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Splice	128AZ
Grounding Kit with factory attached, one-hole lug	204989-5
Grounding Kit with factory attached, two-hole lug	241088-5
Grounding Kit with field attachable crimp-on, one-hole lug	204989-25
Grounding Kit with field attachable crimp-on, two-hole lug	241088-10
Grounding Kit with field attachable screw-on lug	204989-35
Crimping Tool to field attach lug to Grounding Kit	207270
Wall/Roof Feed-Thru	35849-13
Holsting Grip	26985A
Bending Tool Kit. One each E and H Plane tool	33586-5

How to Order

To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX elliptical waveguide, see pages 174-177.

Types EWP34 and EW34

Characteristics

Type Numbers	
Premium Waveguide	EWP34
Standard Waveguide	EW34
Electrical	
Max. Frequency Range, GHz*	3.1-4.2
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	2.376
Group Delay at 3.95 GHz, ns/100 ft (ns/100 m)	127 (417)
Peak Power Rating at 3.95 GHz, kW	306
Mechanical	
Minimum Bending Radii, without rebending, in (mm)	
E Plane	17 (432)
H Plane	47 (1194)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	17 (432)
H Plane	47 (1194)
Maximum Twist, degrees/foot (m)	0.5 (1.5)
Dimensions over Jacket, in (mm)	3.31 x 1.90 (84.1 x 48.3)
Weight, pounds per foot (kg/m)	1.13 (1.68)

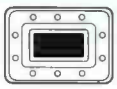
* Actual usable range is limited by the connecting rectangular waveguide.

Attenuation, Average Power, Group Velocity

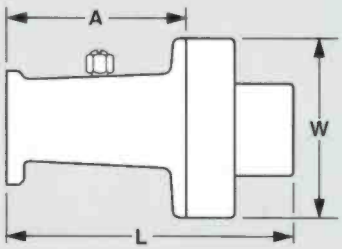
Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation,%
3.10	0.81 (2.67)	12.34	64.2
3.20	0.78 (2.55)	12.90	67.0
3.30	0.75 (2.46)	13.39	69.4
3.40	0.73 (2.38)	13.81	71.5
3.50	0.71 (2.32)	14.18	73.4
3.54	0.70 (2.30)	14.31	74.13
3.60	0.69 (2.27)	14.51	75.1
3.70	0.68 (2.23)	14.79	76.7
3.80	0.67 (2.19)	15.03	78.0
3.90	0.66 (2.16)	15.25	79.3
4.00	0.65 (2.13)	15.43	80.4
4.10	0.64 (2.11)	15.60	81.5
4.20	0.64 (2.09)	15.73	82.5

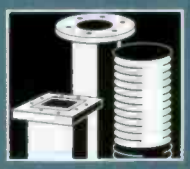
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
134DE, 134DET, 134 DEP, 134 DEMT, 134 DEMP		6.8 (174)	4.3 (109)	4.3 (109)	8.0 (3.6)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)	VSWR, max.** (R.L. dB) Up to 300 ft (90 m)
Premium Waveguide Assemblies							
3.4-3.9	**EWP34-34**	CPR229G	**134DET**		**55001-229**	**F229PC0240CS**	1.10 (26.4)
3.54-4.2	**EWP34-35**	CPR229G	**134DET**	**134DEP-2**	**55001-229**	**F229PC0240CA**	1.08 (28.3)
		PDR40	**134DEMT**	**134DEMP-2**	**223306-40**	**F229MH0600HA**	1.08 (28.3)
3.6-4.2	**EWP34-36**	CPR229G	**134DET**		**55001-229**	**F229PC0240CA**	1.08 (28.3)
3.7-4.2	**EWP34-37**	CPR229G	**134DET**	**134DEP-1**	**55001-229**	**F229PC0240CA**	1.08 (28.3)
Standard Waveguide Assemblies			**Non-Tunable**				
3.1-3.6	**EW34**	CPR229G	**134DE**		**55001-229**	**F229PC0240CS**	1.20 (20.8)
3.4-3.9	**EW34**	CPR229G	**134DE**		**55001-229**	**F229PC0240CS**	1.15 (23.1)

* Contact Andrew for information on other frequency bands.
** VSWR, max. (R.L.,dB) Up to 300 ft (90 m). The indicated maximum characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m)*	**42396A-15**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 In (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Splice	**134DZ**
Grounding Kit with factory attached, one-hole lug	**204989-5**
Grounding Kit with factory attached, two-hole lug	**241088-5**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-25**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-10**
Grounding Kit with field attachable screw-on lug	**204989-35**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**26985A**
Bending Tool Kit. One each E and H Plane tool	**33586-11**
Connector Reattachment Kit	**33544-43**
Wall-Roof Feed Thru	**35849A-17**
Waveguide Boot for Plates (below), 4 in (102 mm) dia.	**204679-34**
5 In (127 mm) dia	**48939-34**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

Types EWP37S, EWP37 and EW37

Characteristics

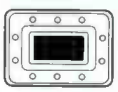
Type Numbers	
Super Premium Waveguide	EWP37S
Premium Waveguide	EWP37
Standard Waveguide	EW37
Electrical	
Max. Frequency Range, GHz	3.3-4.3
${}_{e}TE_{11}$ Mode Cutoff Frequency, GHz	2.79
Group Delay at 4.0 GHz, ns/100 ft (ns/100 m)	140 (459)
Peak Power Rating at 4.0 GHz, kW	309
Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	12 (300)
H Plane	30 (760)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	17 (430)
H Plane	41 (1040)
Maximum Twist, degrees/foot (m)	0.5 (1.5)
Dimensions over Jacket, in (mm)	2.90 x 1.86 (73.7 x 47.2)
Weight, pounds per foot (kg/m)	0.84 (1.25)

Attenuation, Average Power, Group Velocity

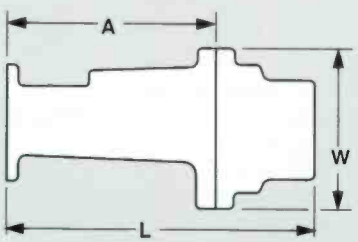
Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
3.30	1.22 (4.00)	7.39	53.4
3.40	1.11 (3.63)	8.14	57.1
3.50	1.03 (3.37)	8.77	60.4
3.60	0.97 (3.18)	9.31	63.2
3.70	0.92 (3.03)	9.77	65.7
3.80	0.89 (2.91)	10.17	67.9
3.90	0.86 (2.81)	10.52	69.9
4.00	0.83 (2.73)	10.83	71.7
4.10	0.81 (2.66)	11.11	73.3
4.20	0.79 (2.60)	11.36	74.7
4.30	0.78 (2.55)	11.59	76.1

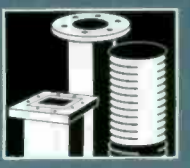
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
137DE, 137DET, 137DEP, 137DEMP		6.5 (165)	4.6 (117)	4.3 (109)	6.0 (2.7)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency GHz*	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies						VSWR 1.06 (30.7)**
3.7–4.2	**EWP37S**	CPR229G	**137DET**		55001-229	**F229PC0240CA**
Premium Waveguide Assemblies						VSWR 1.08 (28.3)**
3.4–3.9	**EWP37-34*** **	CPR229G	**137DET**		55001-229	**F229PC0240CS**
3.4-3.9	**EWP37-34**	PDR40	–	**137DEMP-3**	223306-40	**F229MH0600HS**
3.54–4.2	**EWP37-35**	CPR229G	**137DET**	**137DEP-2**	55001-229	**F229PC0240CA**
		PDR40		**137DEMP-2**	223306-40	**F229MH0600HA**
3.6–4.2	**EWP37-36**	CPR229G	**137DET**		55001-229	**F229PC0240CA**
3.7–4.2	**EWP37-37**	CPR229G	**137DET**	**137DEP-1**	55001-229	**F229PC0240CA**
Standard Waveguide Assemblies			**Non-Tunable**			VSWR 1.15 (23.1)**
3.6–4.2	**EWP37**	CPR229G	**137DE**		55001-229	**F229PC0240CS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237
*** VSWR 1.10 (26.4)

Accessories – Photos and detailed descriptions on pages 212-218.

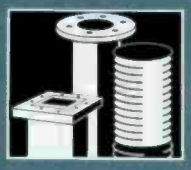
Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m)*	42396A-4
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Stainless stee	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	205869
Splice	137DZ
Grounding Kit with factory attached, one-hole lug	204989-5
Grounding Kit with factory attached, two-hole lug	241088-5
Grounding Kit with field attachable crimp-on, one-hole lug	204989-25
Grounding Kit with field attachable crimp-on, two-hole lug	241088-10
Grounding Kit with field attachable screw-on lug	204989-35
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	31535
Bending Tool Kit. One each E and H Plane tool	33586-3
Connector Reattachment Kit	33544-24
Wall-Roof Feed Thru Assembly	35849A-8
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	204679-37
5 in (127 mm) dia	48939-37

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 In (13 mm) radial ice. For other conditions see page 214.



Microwave Transmission Lines

Characteristics

Type Numbers	
Premium Waveguide	**EWP43**
Standard Waveguide	**EW43**
Electrical	
Max. Frequency Range, GHz	4.4-5.0
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	2.78
Group Delay at 4.7 GHz, ns/100 ft (ns/100 m)	126 (413)
Peak Power Rating at 4.7 GHz, kW	187
Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	11 (280)
H Plane	28 (711)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	15 (381)
H Plane	35 (889)
Maximum Twist, degrees/foot (m)	0.5 (1.5)
Dimensions over Jacket, in (mm)	2.81 x 1.60 (71 x 41)
Weight, pounds per foot (kg/m)	0.81 (1.2)

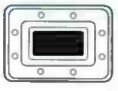
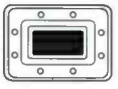
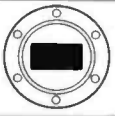
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
4.4	0.911 (2.9)	9.5	77.5
4.5	0.899 (2.9)	9.6	78.6
4.6	0.889 (2.9)	9.7	79.7
4.7	0.880 (2.8)	9.8	80.5
4.8	0.872 (2.8)	9.9	81.5
4.9	0.866 (2.8)	10.0	82.4
5.0	0.862 (2.8)	10.1	83.1

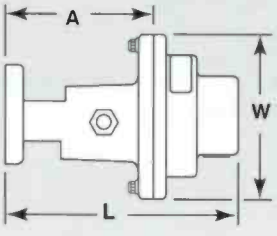
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%.
Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

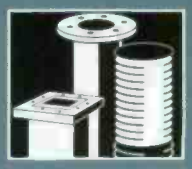
Types EWP43 and EW43

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
143SE, 143SEM		6.12 (155.4)	4.6 (117)	4.0 (102)	7.5 (3.4)
143DET		6.4 (163)	4.6 (117)	4.3 (109)	8.6 (3.9)
143DCT		6.4 (163)	4.6 (117)	4.3 (109)	9 (4.1)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Fixed Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						VSWR 1.07 (29.4)**
4.4–5.0	**EWP43**	UG-149/U†††	**143DCT**		55000A-187	F187PA0240BA
		CPR187G	**143DET**	**143SE**	55001-187	F187PA0240CA
		PDR48		**143SEM**	223306-48	F187MH0600HA
Standard Waveguide Assemblies						VSWR 1.15 (23.1)**
4.4–5.0	**EW43**	PDR48		**143SEM**	223306-48	F187MH0600HS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The Indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 4 ft (1.22 m)*	42396A-16
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° **Adapter Kit** of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for connector attachment	EWFTK-43
Splice	143DZ
Grounding Kit with factory attached, one-hole lug	204989-10
Grounding Kit with field attachable crimp-on, one-hole lug	204989-28
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	31535
Bending Tool Kit. One each E and H Plane tool	33586-3
Connector Reattachment Kit	33544-45
Wall-Roof Feed Thru	35849A-7
Waveguide Boot for Plates (below), 4 in (102 mm) dia.	204679-43

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots
1	204673-1
1	204673-2
4	204673-4
8	204673-8

Microwave Transmission Lines

Characteristics

Type Numbers	
Super Premium Waveguide, Standard Jacket	**EWP52S**
Premium Waveguide, Standard Jacket	**EWP52**
Standard Waveguide, Standard Jacket	**EW52**
Premium Waveguide, Fire Retardant, Non-Halogenated Jacket	**35409-20****
Type CATVP	**222040-3**

Electrical	
Max. Frequency Range, GHz	4.6-6.425*
$_eTE_{11}$ Mode Cutoff Frequency, GHz	3.65
Group Delay at 6.2 GHz, ns/100 ft (ns/100 m)	124 (408)
Peak Power Rating at 6 GHz, kW	
with 152 Series Connectors	153
with 252 Series Connectors	92

Mechanical	
Minimmum Bending Radii, without rebending, inches (mm)	
E Plane	8 (200)
H Plane	22 (560)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	12 (305)
H Plane	32 (810)
Maximum Twist, degrees/foot (m)	1 (3)
Dimensions over Jacket, in (mm)	2.25 x 1.31 (57.2 x 33.3)
Weight, pounds per foot (kg/m)	0.59 (0.88)

* Actual usable range is limited by the connecting rectangular waveguide.
** UL® listed Type CATVR.

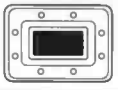
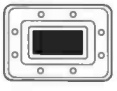
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
4.6	1.63 (5.34)	4.40	60.9
4.8	1.50 (4.92)	4.75	64.9
5.0	1.41 (4.63)	5.06	68.3
5.2	1.35 (4.42)	5.31	71.2
5.4	1.30 (4.26)	5.51	73.7
5.6	1.26 (4.13)	5.69	75.8
5.8	1.23 (4.02)	5.84	77.7
5.85	1.22 (4.00)	5.87	78.1
5.925	1.21 (3.96)	5.92	78.8
6.0	1.20 (3.93)	5.96	79.4
6.2	1.18 (3.86)	6.07	80.8
6.4	1.16 (3.80)	6.17	82.1
6.425	1.16 (3.80)	6.18	83.2

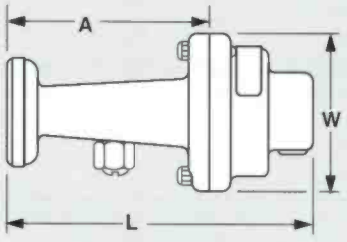
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Types EWP52S, EWP52 and EW52

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
152DE, 152DET, 152DEP-1		5.6 (143)	3.8 (97)	3.7 (94)	4.2 (1.9)
252DC, 252DCT		5.8 (148)	3.8 (97)	3.9 (100)	4.1 (1.9)
252DE, 252DET, 252DEP-1, 252DEMP, 252DEMT		5.8 (148)	3.8 (97)	3.9 (100)	4.0 (1.8)

Connector Material: Brass



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies						**VSWR 1.05 (32.3)****
5.925–6.425	**EWP52S**	CPR159G	**152DET*****		**55001-159**	**F159PC0240CA**
		UG-344/U†††	**252DCT*****		**55000A-137**	**F137PA0240BA**
		CPR137G	**252DET*****		**55001-137**	**F137PC0240CA**
		PDR70	**252DEMT**		**223306-70**	**F137MH0600HA**
Premium Waveguide Assemblies						**VSWR 1.06 (30.7)****
5.6–6.2	**EWP52-56**	CPR159G	**152DET**		**55001-159**	**F159PC0240CG**
		UG-344/U†††	**252DCT**		**55000A-137**	**F137PA0240BG**
		CPR137G	**252DET**	**252DEP-3**	**55001-137**	**F137PC0240CG**
		PDR70	**252DEMT**	**252DEMP-3**	**223306-70**	**F137MH0600HG**
5.85–6.425	**EWP52-58**	CPR159G	**152DET**		**55001-159**	**F159PC0240CA**
		UG-344/U†††	**252DCT**		**55000A-137**	**F137PA0240BA**
		CPR137G	**252DET**	**252DEP-2**	**55001-137**	**F137PC0240CA**
		PDR70	**252DEMT**	**252DEMP-2**	**223306-70**	**F137MH0600HA**
5.925–6.425	**EWP52-59**	CPR159G	**152DET**	**152DEP-1**	**55001-159**	**F159PC0240CA**
		UG-344/U†††	**252DCT**		**55000A-137**	**F137PA0240BA**
		CPR137G	**252DET**	**252DEP-1**	**55001-137**	**F137PC0240CA**
		PDR70	**252DEMT**	**252DEMP-1**	**223306-70**	**F137MH0600HA**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
5.85–6.425	**EW52**	CPR159G	**152DE**		**55001-159**	**F159PC0240CS**
		UG-344/U†††	**252DC**		**55000A-137**	**F137PA0240BS**
		CPR137G	**252DE**		**55001-137**	**F137PC0240CS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** 1.036 (35.0 dB) for lengths 150 ft (46 m) and shorter.
† "Tunable" connectors ordered with factory assemblies are factory tuned. "Pre-tuned" connectors are for field attachment only.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3.5 ft (1.07 m)*	**42396A-8**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	**EWFTK-52**
Splice	**152DZ**
Grounding Kit with factory attached, one-hole lug	**204989-4**
Grounding Kit with factory attached, two-hole lug	**241088-4**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-24**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-9**
Grounding Kit with field attachable screw-on lug	**204989-34**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**24312A**
Bending Tool Kit. One each E and H Plane tool	**33586-7**
Connector Reattachment Kit	**33544-38**
Wall-Roof Feed Thru	**35849A-14**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	**204679-52**
5 in (127 mm) dia	**48939-52**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Microwave Transmission Lines

Characteristics

Type Numbers	
Super Premium Waveguide, Standard Jacket	**EWP63S**
Premium Waveguide, Standard Jacket	**EWP63**
Standard Waveguide, Standard Jacket	**EW63**
Premium Waveguide, Fire Retardant, Non-Halogenated Jacket	**35409-18***
Type CATVP	**222040-1**
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	**35409-19***

Electrical	
Max. Frequency Range, GHz	5.10-7.125
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	4.00
Group Delay at 6.775 GHz, ns/100 ft (ns/100 m)	125 (411)
Peak Power Rating at 6.775 GHz, kW	102

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	7 (180)
H Plane	20 (510)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	10 (260)
H Plane	29 (740)
Maximum Twist, degrees/foot (m)	1 (3)
Dimensions over Jacket, in (mm)	2.01 x 1.16 (51.1 x 29.5)
Weight, pounds per foot (kg/m)	0.51 (0.76)

* UL® listed Type CATVR.

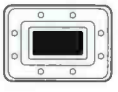
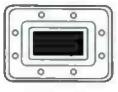
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
5.85	1.50 (4.94)	4.34	73.0
5.925	1.49 (4.88)	4.45	73.8
6.0	1.47 (4.82)	4.50	74.5
6.2	1.43 (4.70)	4.62	76.4
6.4	1.40 (4.59)	4.73	78.1
6.425	1.40 (4.58)	4.74	78.3
6.525	1.38 (4.53)	4.79	79.0
6.6	1.37 (4.50)	4.82	79.5
6.775	1.35 (4.44)	4.89	80.7
6.8	1.35 (4.43)	4.90	80.9
6.875	1.34 (4.40)	4.93	81.3
7.0	1.33 (4.37)	4.97	82.1
7.125	1.32 (4.33)	5.01	82.7

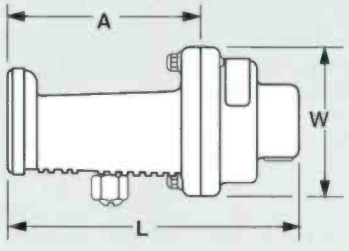
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Types EWP63S, EWP63 and EW63

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
163DC, 163DCT, 163DCP		5.3 (135)	3.4 (86)	3.3 (84)	3.7 (1.7)
163DE, 163DET, 163DEP		5.3 (135)	3.4 (86)	3.3 (84)	3.5 (1.6)
163SEM		5.5 (140)	3.4 (86)	3.5 (89)	3.7 (1.7)

Connector Material: Brass



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies							VSWR 1.05 (32.3)**
6.425–7.125	EWP63S	UG-344/U†††	163DCT	163DCP-2		55000A-137	F137PA0240BS
		CPR137G	163DET	163DEP-2		55001-137	F137PC0240CB
		PDR70			163SEM	223306-70	F137MH0600HS
Premium Waveguide Assemblies							VSWR 1.06 (30.7)**
5.925–6.575	EWP63-59	UG-344/U†††	163DCT			55000A-137	F137PA0240BA***
		CPR137G	163DET			55001-137	F137PC0240CA***
		PDR70			163SEM	223306-70	F137MH0600HA***
5.925–7.125	EWP63-59W	UG-344/U†††	163DCT			55000A-137	F137PA0240BA***
		CPR137G	163DET			55001-137	F137PC0240CA***
		PDR70			163SEM	223306-70	F137MH0600HA***
							VSWR 1.05 (32.3)*
6.525–6.875	EWP63-65N	UG-344/U†††	163DCT	163DCP-1		55000A-137	F137PA0240BS
		CPR137G	163DET	163DEP-1		55001-137	F137PC0240CA
		PDR70			163SEM	223306-70	F137MH0600HS
							VSWR 1.06 (30.7)**
6.425–7.125	EWP63-65	UG-344/U†††	163DCT	163DCP-2		55000A-137	F137PA0240BS
		CPR137G	163DET	163DEP-2		55001-137	F137PC0240CB
		PDR70			163SEM	223306-70	F137MH0600HS
Standard Waveguide Assemblies			Non-Tunable				VSWR 1.15 (23.1)**
6.425–7.125	EW63	UG-344/U†††	163DC			55000A-137	F137PA0240BS
		CPR137G	163DE			55001-137	F137PC0240CB
		PDR70			163SEM	223306-70	F137MH0600HS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Low VSWR guaranteed for 5.925 to 6.425 GHz, nominal for 5.925 to 6.575 GHz.
† "Tunable" connectors ordered with factory assemblies are factory tuned. "Pre-tuned" connectors are for field attachment only.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

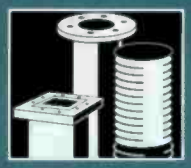
Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	42396A-7
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	EWFTK-63
Splice	163DZ
Grounding Kit with factory attached, one-hole lug	204989-4
Grounding Kit with factory attached, two-hole lug	241088-4
Grounding Kit with field attachable crimp-on, one-hole lug	204989-24
Grounding Kit with field attachable crimp-on, two-hole lug	241088-9
Grounding Kit with field attachable screw-on lug	204989-34
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	24312A
Bending Tool Kit. One each E and H Plane tool	33586-8
Connector Reattachment Kit	33544-33
Wall-Roof Feed Thru	35849A-6
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	204679-63
5 in (127 mm) dia	48939-63

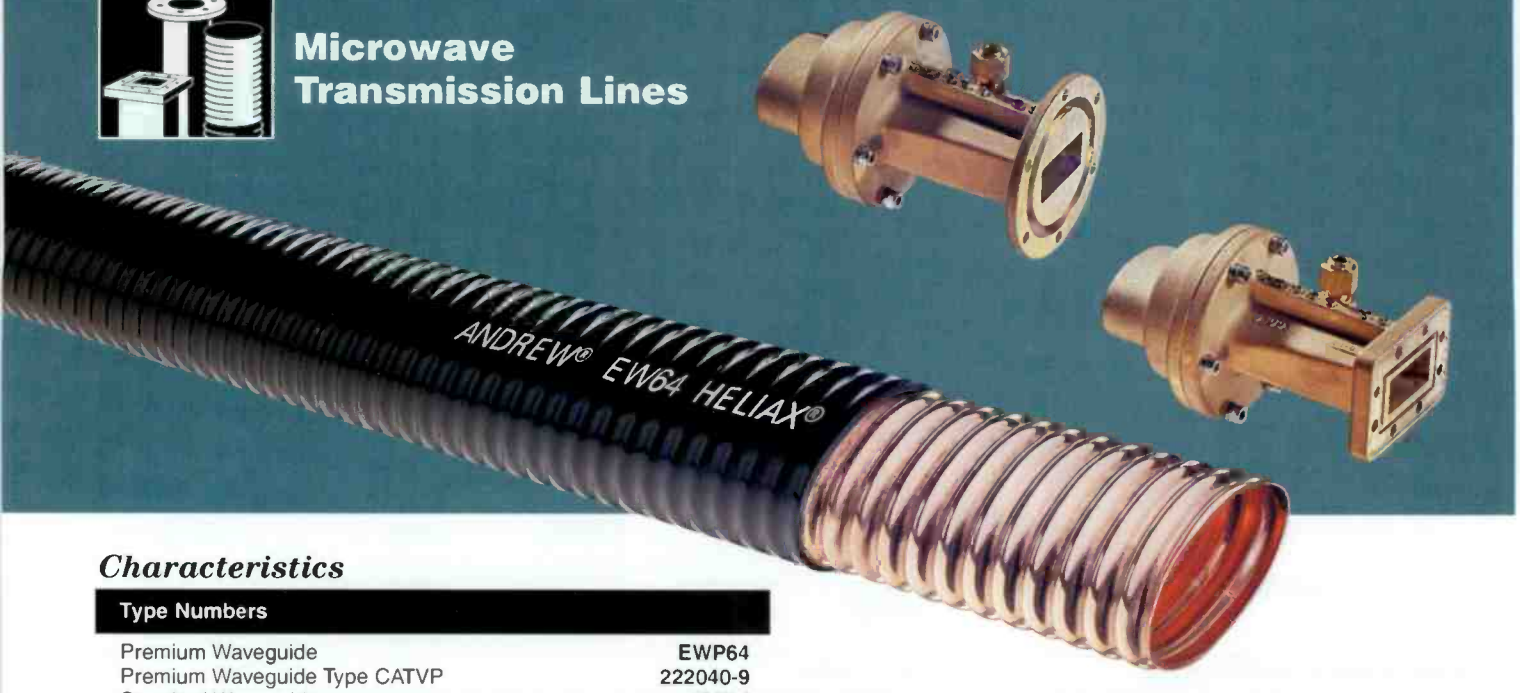
Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.



Microwave Transmission Lines



Types EWP64 and EW64

Characteristics

Type Numbers	
Premium Waveguide	EWP64
Premium Waveguide Type CATVP	222040-9
Standard Waveguide	EW64

Electrical	
Max. Frequency Range, GHz*	5.3-7.75
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	4.32
Group Delay at 7.4 GHz, ns/100 ft (ns/100 m)	124 (408)
Peak Power Rating at 7.4 GHz, kW	
with 164 series connectors	107
with 264 series connectors	60

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	10 (260)
H Plane	27 (685)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	10 (260)
H Plane	27 (685)
Maximum Twist, degrees/foot (m)	1 (3)
Dimensions over Jacket, in (mm)	1.91 x 1.12 (48.5 x 28.4)
Weight, pounds per foot (kg/m)	0.49 (0.73)

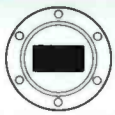
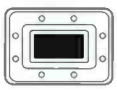
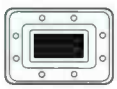
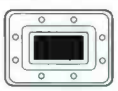
* Actual usable range is limited by the connecting rectangular waveguide.

Attenuation, Average Power, Group Velocity

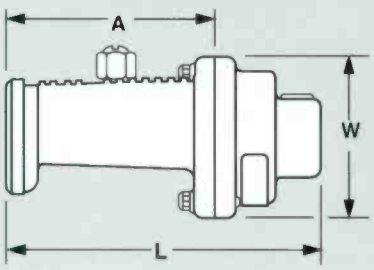
Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
5.3	2.16 (7.07)	2.92	57.9
5.5	1.99 (6.50)	3.18	61.9
5.7	1.86 (6.09)	3.39	65.2
5.9	1.76 (5.79)	3.57	68.1
6.1	1.69 (5.56)	3.72	70.6
6.3	1.64 (5.37)	3.85	72.8
6.5	1.59 (5.22)	3.96	74.7
6.7	1.55 (5.10)	4.05	76.4
6.9	1.52 (5.10)	4.14	78.0
7.1	1.49 (4.90)	4.21	79.4
7.125	1.49 (4.87)	4.24	79.5
7.25	1.48 (4.85)	4.26	80.3
7.3	1.47 (4.83)	4.38	80.6
7.5	1.45 (4.76)	4.34	81.7
7.7	1.43 (4.70)	4.39	82.8
7.75	1.43 (4.69)	4.41	83.0

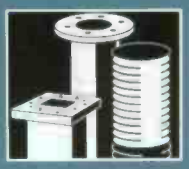
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
164DC, 164DCT, 164DCP		5.3 (135)	3.3 (84)	3.3 (84)	3.5 (1.6)
164DE, 164DET, 164DEP		5.3 (135)	3.3 (84)	3.3 (84)	3.4 (1.5)
264DE, 264DET, 264DEP		5.2 (132)	3.3 (84)	3.2 (81)	3.4 (1.5)
164SEM		5.5 (140)	3.3 (84)	3.4 (86)	3.5 (1.6)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Tunable	Connector† Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies							VSWR 1.06 (30.7)**
7.125–7.750	**EWP64-71**	UG-344/U†††	**164DCT**	**164DCP-1**		**55000A-137**	**F137PA0240BC**
		CPR137G	**164DET**	**164DEP-1**		**55001-137**	**F137PA0240CC**
		CPR112G	**264DET**	**264DEP-1**		**55001-112**	**F137PA0240CA**
		PDR70			**164SEM**	**223306-70**	**F137MH0600HC**
Standard Waveguide Assemblies			**Non-Tunable**				VSWR 1.15 (23.1)**
7.125–7.750	**EW64**	UG-344/U†††	**164DC**			**55000A-137**	**F137PA0240BC**
		CPR137G	**164DE**			**55001-137**	**F137PA0240CC**
		CPR112G	**264DE**			**55001-112**	**F137PA0240CA**
		PDR70			**164SEM**	**223306-70**	**F137MH0600HC**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	42396A-1
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	202358
Splice	164DZ
Grounding Kit with factory attached, one-hole lug	204989-3
Grounding Kit with factory attached, two-hole lug	241088-3
Grounding Kit with field attachable crimp-on, one-hole lug	204989-23
Grounding Kit with field attachable crimp-on, two-hole lug	241088-8
Grounding Kit with field attachable screw-on lug	204989-33
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	29961
Bending Tool Kit. One each E and H Plane tool	33586-2
Connector Reattachment Kit	33544-35
Wall-Roof Feed Thru	35849A-12
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	204679-64
5 in (127 mm) dia	48939-64

Feed-Thru Plate for Boots (above)

Openings	For 4 In Boots	For 5 In Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

Microwave Transmission Lines

Characteristics

Type Numbers	
Premium Waveguide, Standard Jacket	EWP77
Standard Waveguide, Standard Jacket	EW77
Premium Waveguide Type CATVP	222040-6
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	35409-22**

Electrical	
Max. Frequency Range, GHz*	6.1-8.5
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	4.72
Group Delay at 7.8 GHz, ns/100 ft (ns/100 m)	128 (419)
Peak Power Rating at 7.8 GHz, kW	63

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	7 (180)
H Plane	20 (510)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	9 (230)
H Plane	25 (635)
Maximum Twist, degrees/foot (m)	1 (3)
Dimensions over Jacket, in (mm)	1.72 x 1.00 (43.6 x 25.4)
Weight, pounds per foot (kg/m)	0.45 (0.67)

* Actual usable range is limited by the connecting rectangular waveguide.
** UL® listed Type CATVR.

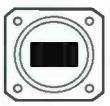
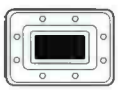
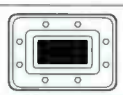
Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
6.1	2.36 (7.75)	2.52	63.3
6.3	2.22 (7.30)	2.68	66.2
6.5	2.12 (6.95)	2.81	68.7
6.7	2.04 (6.68)	2.93	71.0
6.9	1.97 (6.46)	3.03	72.9
7.1	1.91 (6.28)	3.11	74.7
7.125	1.91 (6.26)	3.12	75.0
7.3	1.87 (6.13)	3.19	76.3
7.5	1.83 (6.00)	3.26	77.7
7.7	1.79 (5.89)	3.32	79.0
7.725	1.79 (5.88)	3.33	79.2
7.75	1.79 (5.86)	3.33	79.3
8.15	1.74 (5.69)	3.43	81.5
8.275	1.72 (5.65)	3.46	82.1
7.9	1.77 (5.80)	3.37	80.2
8.1	1.74 (5.71)	3.42	81.2
8.3	1.72 (5.64)	3.47	82.2
8.5	1.70 (5.58)	3.51	83.1

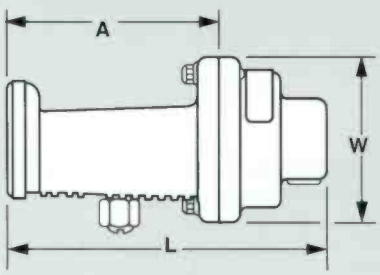
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Types EWP77 and EW77

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
177DC, 177DCT, 177DCP, 177DCM, 177DCMT		4.8 (122)	2.7 (69)	3.1 (78)	2.8 (1.3)
177DE, 177DET, 177DEP, 177DEMP, 177DEMT		4.8 (122)	2.7 (69)	3.1 (78)	2.8 (1.3)
277DEMT, 277DEMP		4.8 (122)	2.7 (69)	3.1 (78)	2.8 (1.3)

Connector Material: Brass



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned†	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						VSWR 1.06 (30.7)**
7.125–7.750	**EWP77-71**	UG-51/U†††	**177DCT**	**177DCP-1**	**55000A-112**	**F112PA0240BA**
		CPR112G	**177DET**	**177DEP-1**	**55001-112**	**F112PC0240CA**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KA**
		PDR84	**177DEMT**	**177DEMP-1**	**223306-84**	**F112MH0600HA**
		PDR70	**277DEMT**	**277DEMP-1**	**223306-70**	**F137MH0600HC**
7.725–8.500	**EWP77-77**	UG-51/U†††	**177DCT**	**177DCP-2**	**55000A-112**	**F112PA0240BB**
		CPR112G	**177DET**	**177DEP-2**	**55001-112**	**F112PC0240CB**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KB**
		PDR84	**177DEMT**	**177DEMP-2**	**223306-84**	**F112MH0600HB**
		PDR70	**277DEMT**	**277DEMP-2**	**223306-70**	**F137MH0600HF‡**
7.125–8.500	**EWP77-71W**	UG-51/U†††	**177DCT**		**55000A-112**	**F112PA0240BC**
		CPR112G	**177DET**	**177DEP-3**	**55001-112**	**F112PC0240CC**
		PBR84	**177DCMT**		**243495-84**	**F112MK0600KC**
		PDR84	**177DEMT**	**177DEMP-3**	**223306-84**	**F112MH0600HC**
***		PDR70	**277DEMT**	**277DEMP-4**	**223306-70**	**F137MH0600HE**
Standard Waveguide Assemblies			**Non-Tunable**			VSWR 1.15 (23.1)**
7.125–8.500	**EW77**	UG-51/U†††	**177DC**		**55000A-112**	**F112PA0240BC**
		PBR84	**177DCM**		**243495-84**	**F112MK0600KC**
		CPR112G	**177DE**		**55001-112**	**F112PC0240CC**
		PDR84	**177DEM**		**223306-84**	**F112MH0600HC**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.
*** 7.425 - 7.925 GHz
‡ 7.725 - 8.3 GHz ONLY

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-11**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

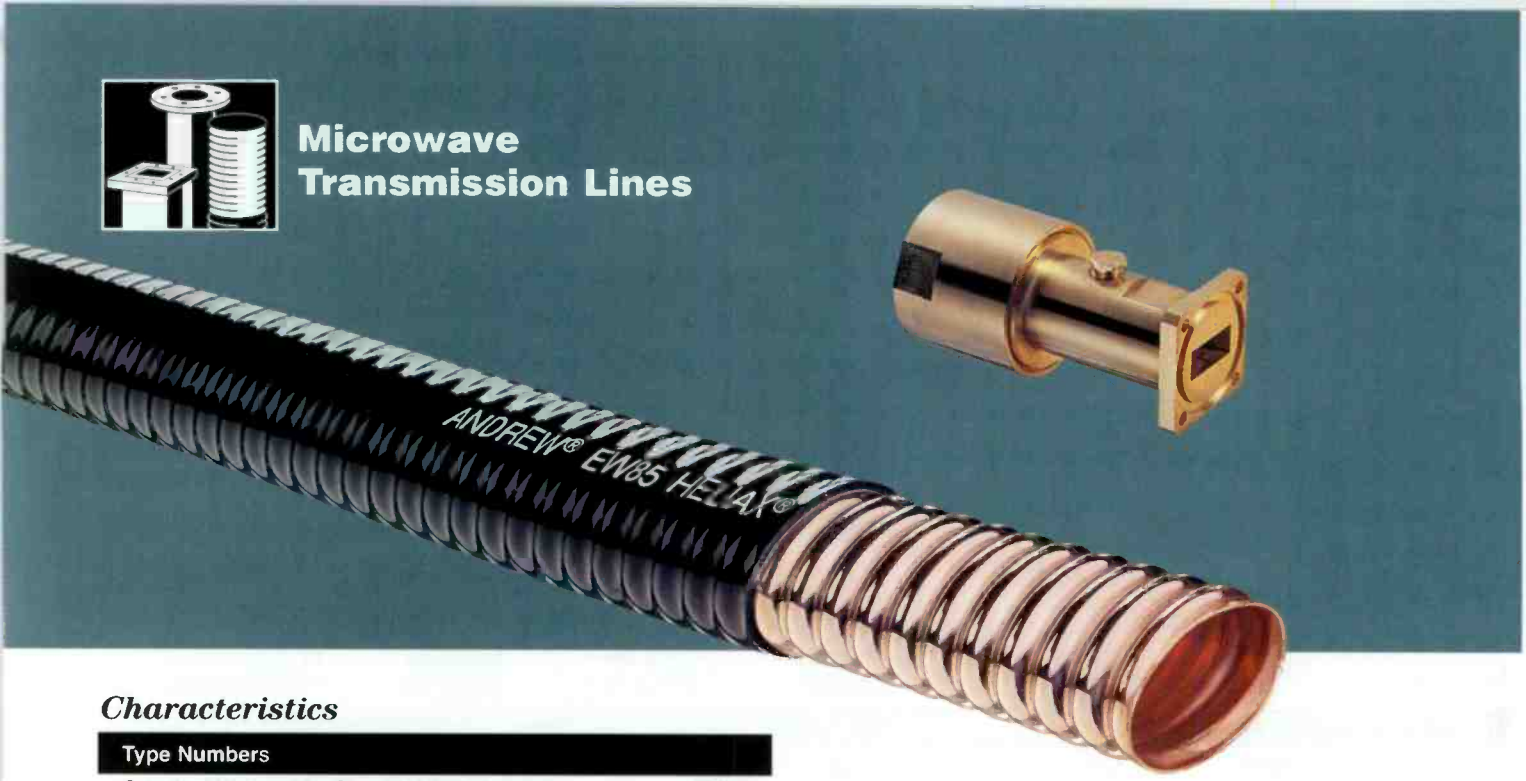
Description	Type No.
Other Accessories	
Flaring Tool Kit for connector attachment	**202421**
Splice	**177DZ**
Grounding Kit with factory attached, one-hole lug	**204989-3**
Grounding Kit with factory attached, two-hole lug	**241088-3**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-23**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-8**
Grounding Kit with field attachable screw-on lug	**204989-33**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**19256B**
Bending Tool Kit. One each E and H Plane tool	**33586-9**
Connector Reattachment Kit	**33544-34**
Wall-Roof Feed Thru	**35849A-16**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia.	**204679-77**
5 in (127 mm) dia	**48939-77**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	–
2	–	**48940-2**
3	–	**48940-3**
4	**204673-4**	**48940-4**
6	–	**48940-6**
8	**204673-8**	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Microwave Transmission Lines



Characteristics

Type Numbers	
Standard Waveguide, Standard Jacket	EW85
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	35409-17**

Type Numbers	
Max. Frequency Range, GHz*	7.7-9.8
${}_{e}TE_{11}$ Mode Cutoff Frequency, GHz	6.46
Group Delay at 9.2 GHz, ns/100 ft (ns/100 m)	142 (465)
Peak Power Rating at 9.2 GHz, kW	38.9

Type Numbers	
Minimum Bending Radii, without rebending, in (mm)	
E Plane	8 (200)
H Plane	19 (480)
Minimum Bending Radii, with rebending, in (mm)	
E Plane	8 (200)
H Plane	19 (480)
Maximum Twist, degrees/ft (degrees/m)	1 (3)
Dimensions over Jacket, in (mm)	1.32 x 0.90 (33.5 x 22.9)
Weight, lb/ft (kg/m)	0.33 (0.50)

* Actual usable range is limited by the connecting rectangular waveguide.
** UL® listed Type CATVR.

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
7.7	4.32 (14.20)	1.17	54.4
7.9	4.01 (13.10)	1.26	57.6
8.1	3.78 (12.40)	1.34	60.3
8.3	3.59 (11.80)	1.40	62.8
8.5	3.45 (11.31)	1.46	65.6
8.7	3.33 (10.92)	1.52	67.6
8.9	3.23 (10.59)	1.56	69.4
9.1	3.14 (10.31)	1.61	71.0
9.3	3.07 (10.07)	1.64	72.4
9.5	3.01 (9.86)	1.68	73.8
9.7	2.95 (9.68)	1.71	75.0
9.8	2.93 (9.60)	1.72	75.6

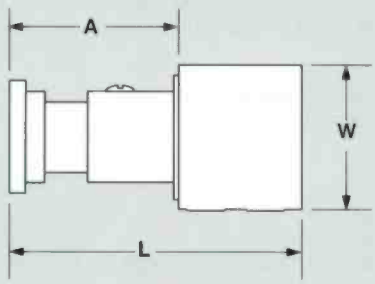
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

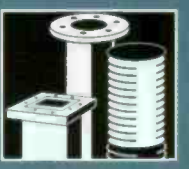
Type EW85

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
185BC		4.75 (121)	2.1 (52)	3.5 (89)	2.0 (0.9)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector Non-Tunable	Pressure Window	Flex-Twist 2 ft (0.6 m)
Standard Waveguide Assemblies					VSWR 1.17 (22.1)**
8.5-9.8	EW85	UG-39/U†††	185BC	55000A-90	F090PA0240BS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	42396A-5
Hardware Kit of 10, 3/8" bolts, lock washers and nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 In (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214

Description	Type No.
Other Accessories	
Splice	185AZ
Grounding Kit with factory attached, one-hole lug	204989-3
Grounding Kit with factory attached, two-hole lug	241088-2
Grounding Kit with field attachable crimp-on, one-hole lug	204989-22
Grounding Kit with field attachable crimp-on, two-hole lug	241088-7
Grounding Kit with field attachable screw-on lug	204989-32
Crimping Tool to field attach lug to Grounding Kit	207270
Wall/Roof Feed-Thru	35849A-3
Hoisting Grip	29958
Bending Tool Kit. One each E and H Plane tool	33586-1
Connector Reattachment Kit	33544-1

How to Order

To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX® elliptical waveguide, see pages 174-177.

Microwave Transmission Lines

Types EWP90S, EWP90 and EW90

Characteristics

Type Numbers	
Super Premium Waveguide, Standard Jacket	**EWP90S**
Premium Waveguide, Standard Jacket	**EWP90**
Standard Waveguide, Standard Jacket	**EW90**
Premium Waveguide, Fire Retardant, Non-Halogenated Jacket	**35409-16***
Premium Waveguide Type CATVP	**222040-2**

Electrical	
Max. Frequency Range, GHz	8.3-11.7
$_eTE_{11}$ Mode Cutoff Frequency, GHz	6.50
Group Delay at 11.2 GHz, ns/100 ft (ns/100 m)	125 (410)
Peak Power Rating at 11.2 GHz, kW	
with 190 series connectors	44.9
with 290 series connectors	30.8

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	6 (150)
H Plane	13 (330)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	7 (180)
H Plane	19 (480)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	1.32 x 0.80 (33.5 x 20.3)
Weight, pounds per foot (kg/m)	0.32 (0.48)

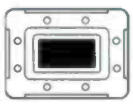
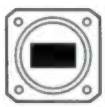
* UL® listed Type CATVR.

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
8.3	4.20 (13.8)	1.17	62.2
8.8	3.79 (12.4)	1.29	67.4
9.3	3.53 (11.6)	1.39	71.5
9.8	3.35 (11.0)	1.46	74.8
10.3	3.22 (10.6)	1.52	77.6
10.5	3.18 (10.44)	1.54	78.6
10.7	3.14 (10.31)	1.56	79.5
10.9	3.11 (10.20)	1.58	80.3
11.1	3.08 (10.10)	1.59	81.1
11.3	3.05 (10.00)	1.61	81.8
11.5	3.02 (9.92)	1.62	82.5
11.7	3.00 (9.84)	1.63	83.2

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L In (mm)	W in (mm)	A in (mm)	Weight lb (kg)
190DE, 190DET, 190DEP, 190DEM, 190DEMT, 190DEMP (Figure 1)		4.5 (117)	2.3 (58)	2.7 (67)	1.9 (0.9)
290SC (Figure 2)		3.6 (91)	2.3 (58)	1.8 (46)	1.9 (0.9)

Connector Material: Brass

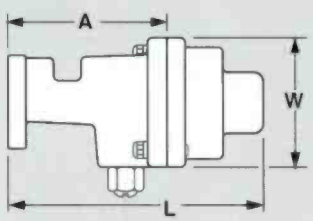


Figure 1

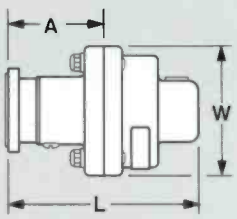
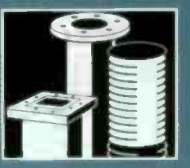


Figure 2



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Tunable	Connector† Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Super Premium Waveguide Assemblies							**VSWR 1.05 (32.3)****
10.7-11.7	**EWP90S**	CPR90G	**190DET**			**55001-90**	**F090PC0240CB**
		PDR100	**190DEMT**			**223306-100**	**F090MH0600HB**
Premium Waveguide Assemblies							**VSWR 1.06 (30.7)****
10.5-10.7	**EWP90-105**	CPR90G	**190DET**	**190DEP-2**		**55001-90**	**F090PC0240CA**
		PDR100	**190DEMT**	**190DEMP-2**		**223306-100**	**F090MH0600HA**
10.7-11.7	**EWP90-107**	CPR90	**190DET**	**190DEP-1**		**55001-90**	**F090PC0240CB**
		PDR100	**190DEMT**	**190DEMP-1**		**223306-100**	**F090MH0600HB**
							VSWR 1.09 (27.3)**
10.7-11.7		WR75†††			**290SC**	**55000A-75**	**F075PA0240BB**
Standard Waveguide Assemblies			**Non-Tunable**				**VSWR 1.15 (23.1)****
10.5-11.7	**EW90**	CPR90G	**190DE**			**55001-90**	**F090PC0240CS**
		PDR100	**190DEM**			**223306-100**	**F090MH0600HS**
		WR75†††			**290SC**	**55000A-75**	**F075PA0240BA**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable cover flange.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	42396A-5
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	204919
Splice	190DZ
Grounding Kit with factory attached, one-hole lug	204989-2
Grounding Kit with factory attached, two-hole lug	241088-2
Grounding Kit with field attachable crimp-on, one-hole lug	204989-22
Grounding Kit with field attachable crimp-on, two-hole lug	241088-7
Grounding Kit with field attachable screw-on lug	204989-32
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	29958
Bending Tool Kit. One each E and H Plane tool	33586-1
Connector Reattachment Kit	33544-37
Wall-Roof Feed Thru	35849A-15
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	204679-90
5 in (127) mm) dia	48939-90

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	–
2	–	48940-2
3	–	48940-3
4	204673-4	48940-4
6	–	48940-6
8	204673-8	–

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Microwave Transmission Lines

Types EWP127A and EW127A

Characteristics

Type Numbers	
Premium Waveguide, Standard Jacket	EWP127A
Standard Waveguide, Standard Jacket	EW127A
Premium Waveguide Type CATVP	222040-4
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	35409-15*

Electrical	
Max. Frequency Range, GHz	10.0-13.25
${}_{e}TE_{11}$ Mode Cutoff Frequency, GHz	7.67
Group Delay at 12.7 GHz, ns/100 ft (ns/100 m)	126 (414)
Peak Power Rating at 12.7 GHz, kW	34

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	5 (130)
H Plane	11 (280)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	6 (150)
H Plane	15 (380)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	1.11 x 0.67 (28.2 x 17.1)
Weight, pounds per foot (kg/m)	0.29 (0.43)

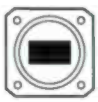
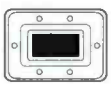
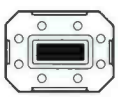
* UL® listed Type CATVR.

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
10.0	4.46 (14.60)	1.00	64.2
10.5	4.16 (13.60)	1.07	68.3
11.0	4.95 (13.00)	1.13	71.7
11.5	3.79 (12.40)	1.18	64.5
11.7	3.74 (12.28)	1.20	75.5
11.9	3.69 (12.12)	1.21	76.5
12.1	3.65 (11.98)	1.23	77.3
12.3	3.61 (11.86)	1.24	78.2
12.5	3.58 (11.74)	1.25	79.0
12.7	3.55 (11.64)	1.26	79.7
12.9	3.52 (11.54)	1.27	80.4
13.1	3.49 (11.45)	1.28	81.1
13.25	3.47 (11.38)	1.29	81.5

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
1127DC, 1127DCT, 1127DCP, 1127DCM, 1127DCMT, 1127DCMP (Figure 1)		3.8 (97)	2.3 (58)	1.9 (48)	1.8 (0.8)
1127DEM, 1127DEMT, 1127DEMP (Figure 1)		3.8 (97)	2.3 (58)	1.9 (48)	1.8 (0.8)
1127DK, 1127DKT (Figure 2)		5.0 (127)	2.3 (58)	3.1 (79)	1.8 (0.8)

Connector Material: Brass

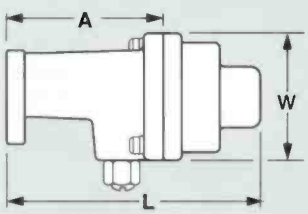


Figure 1

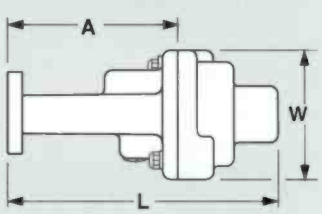


Figure 2

Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Connector† Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.08 (28.3)****
11.7-12.2	**EWP127A-117**	WR75†††	**1127DCT**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**		**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	1127DKT		***	***
12.2-12.7	**EWP127A-122**	WR75†††	**1127DCT**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**		**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**		**223306-120**	**F075MH0600HS**
12.7-13.25	**EWP127A-127**	WR75†††	**1127DCT**	**1127DCP-3**	**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCMT**	**1127DCMP-3**	**110088**	**F075MK0600KS**
		PDR120	**1127DEMT**	**1127DEMP-3**	**223306-120**	**F075MH0600HS**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
11.7-13.25	**EW127A**	WR75†††	**1127DC**		**55000A-75**	**F075PA0240BS**
		PBR120	**1127DCM**		**110088**	**F075MK0600KS**
		PDR120	**1127DEM**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	1127DK		***	***

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Not Available
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable Cover Flange

Accessories – Photos and detailed descriptions on pages 212-218.

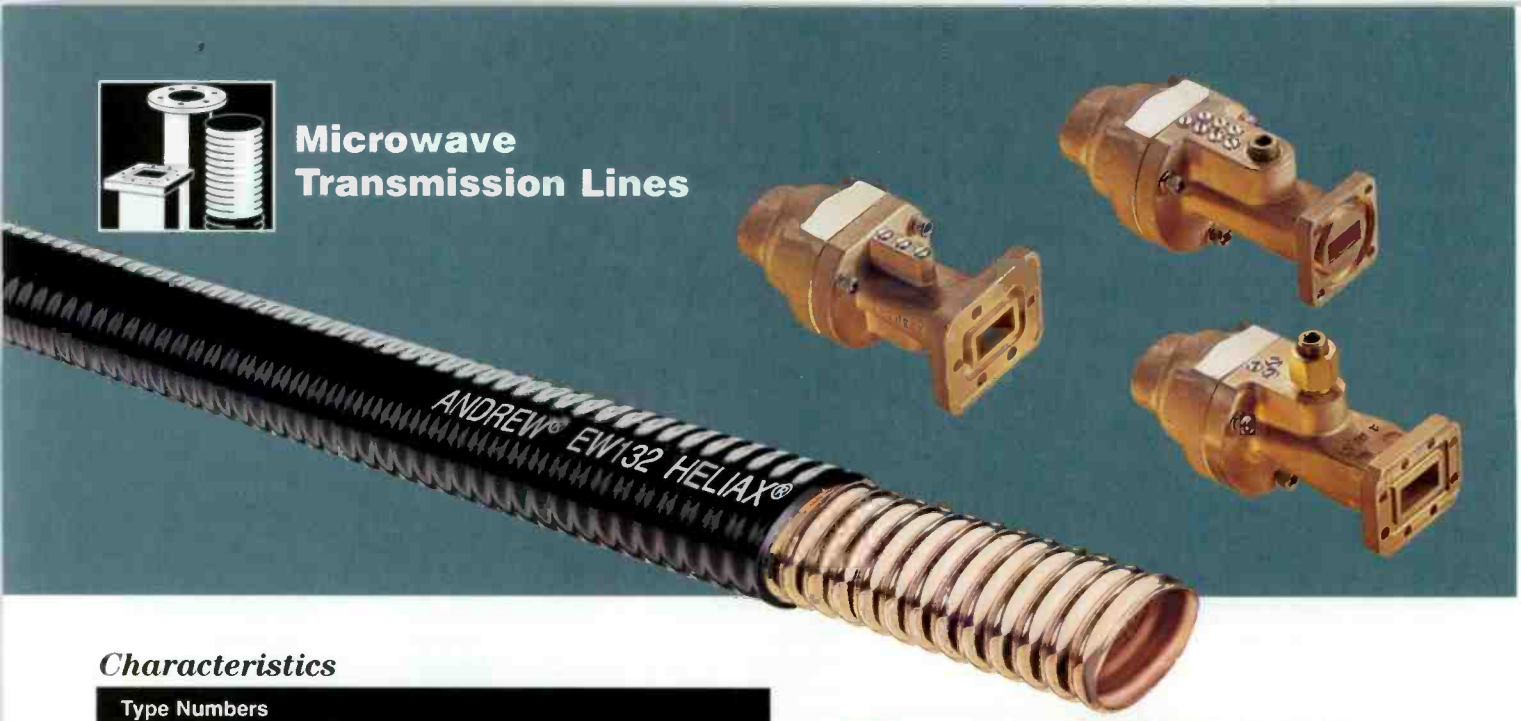
Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-9**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**204960**
Splice	**1127DZ**
Grounding Kit with factory attached, one-hole lug	**204989-2**
Grounding Kit with factory attached, two-hole lug	**241088-2**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-22**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-7**
Grounding Kit with field attachable screw-on lug	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**29958**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-41**
Wall-Roof Feed Thru	**35849A-1**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-122**
5 in (127) mm) dia	**48939-122**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.



Types EWP132 and EW132

Characteristics

Type Numbers	
Premium Waveguide, Standard Jacket	EWP132
Standard Waveguide, Standard Jacket	EW132
Premium Waveguide Type CATVP	222040-7
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	35409-14*

Electrical	
Max. Frequency Range, GHz	11.0-15.35
$_eTE_{11}$ Mode Cutoff Frequency, GHz	9.22
Group Delay at 14.7 GHz, ns/100 ft (ns/100 m)	130 (425)
Peak Power Rating at 14.7 GHz, kW	
with 1132 series connectors	22.8
with 2132 series connectors	36.6

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	5 (130)
H Plane	14 (360)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	5 (130)
H Plane	14 (360)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	0.96 x 0.61 (24.4 x 15.5)
Weight, pounds per foot (kg/m)	0.22 (0.33)

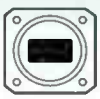
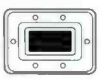
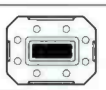
* UL® listed Type CATVR.

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
11.0	7.06 (23.20)	0.58	54.4
11.5	6.35 (20.80)	0.65	59.8
12.0	5.89 (19.30)	0.70	64.0
12.5	5.56 (18.30)	0.74	70.5
13.0	5.32 (17.40)	0.73	70.5
13.5	5.13 (16.80)	0.80	73.0
14.0	4.98 (16.34)	0.83	75.9
14.2	4.93 (16.17)	0.83	76.6
14.4	4.88 (16.02)	0.84	77.4
14.6	4.84 (15.87)	0.85	78.1
14.8	4.80 (15.74)	0.86	78.8
15.0	4.76 (15.62)	0.87	79.4
15.2	4.72 (15.50)	0.87	80.0
15.35	4.70 (15.42)	0.88	80.4

Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
1132DC, 1132DCT, 1132DCMT, 1132DCMP Figure 1		4.5 (114)	2.1 (53)	2.5 (64)	2.0 (0.9)
1132DEM, 1132DEMT, 1132DEMP Figure 1		4.4 (112)	2.1 (53)	2.5 (63)	1.5 (0.7)
2132DC, 2132DCT, 2132DCMT, 2132DCMP Figure 2		4.1 (104)	2.0 (51)	2.2 (56)	1.5 (0.7)
2132DE, 2132DET, 2132DEMT, 2132DEMP Figure 3		4.1 (104)	2.1 (53)	2.2 (56)	1.5 (0.7)
2132DK, 2132DKT Figure 1		4.6 (117)	2.1 (53)	2.7 (69)	1.6 (0.7)

Connector Materlal: Brass

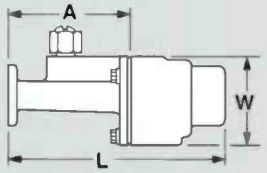


Figure 1

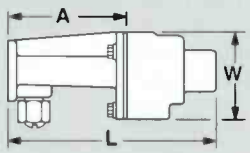


Figure 2

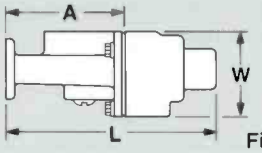


Figure 3

Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies						**VSWR 1.08 (28.3)****
14.0-14.5	**EWP132-140**	WR75†††	**2132DCT**	**2132DCP-1**	**55000A-75**	**F075PA0240BS**
		PBR120	**2132DCMT**	**2132DCMP-1**	**110088**	**F075MK0600KS**
		PBR140	**1132DCMT**		**110089**	**F062MK0600KS**
		PDR120	**2132DEMT**	**2132DEMP-1**	**223306-120**	**F075MH0600HS**
		PDR140	**1132DEMT**	**1132DEMP-1**	**223306-140**	**F062MH0600HS**
		Pressurizable Contact Flange	2132DKT		***	***
14.4-15.35	**EWP132-144**	UG-541/U††††	**1132DCT**		**55000-62**	**F062PA0240BS**
		PBR140	**1132DCMT**		**110089**	**F062MK0600KS**
		PDR140	**1132DEMT**	**1132DEMP-1**	**223306-140**	**F062MH0600HS**
Standard Waveguide Assemblies			**Non-Tunable**			**VSWR 1.15 (23.1)****
14.0-14.5	**EW132-140**	WR75†††	**2132DC**		**55000A-75**	**F075PA0240YS**
		PBR140	**1132DCM**		**110089**	**F062MK0600KS**
		PDR140	**1132DEM**		**223306-140**	**F062MH0600HS**
		PBR120	**2132DCM**		**110088**	**F075MK0600KS**
		PDR120	**2132DEM**		**223306-120**	**F075MH0600HS**
		Pressurizable Contact Flange	2132DK		***	***
14.4-15.35	**EW132-144**	UG-541/U††††	**1132DC**		**55000A-75**	**F075PA0240BS**
		PBR140	**1132DCM**		**110089**	**F062MK0600KS**
		PDR140	**1132DEM**		**223306-140**	**F062MH0600HS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
*** Not Available
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Pressurizable Cover Flange
†††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

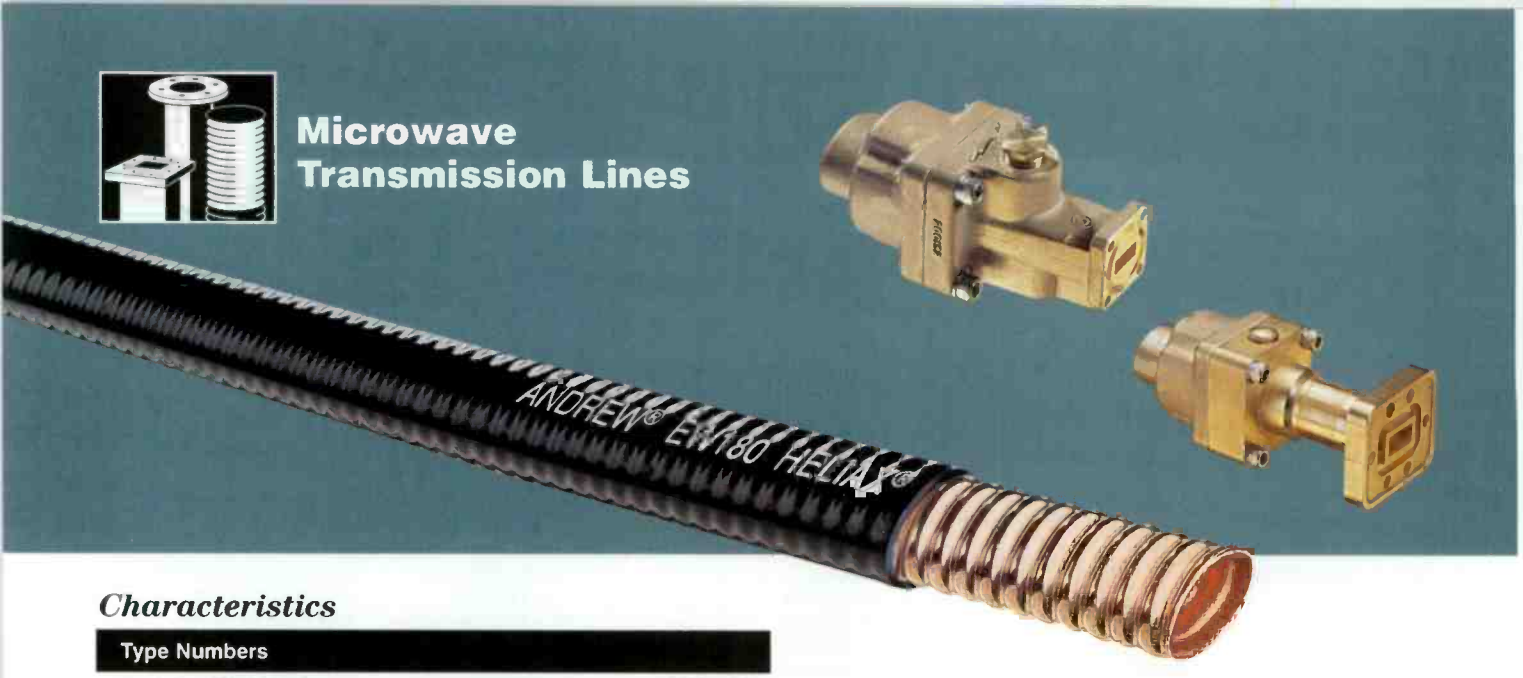
Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**42396A-9**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**42334**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**203809**
Splice	**1132DZ**
Grounding Kit with factory attached, one-hole lug	**204989-2**
Grounding Kit with factory attached, two-hole lug	**241088-2**
Grounding Kit with field attachable crimp-on, one-hole lug	**204989-22**
Grounding Kit with field attachable crimp-on, two-hole lug	**241088-7**
Grounding Kit with field attachable screw-on lug	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Hoisting Grip	**29958**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-39**
Wall-Roof Feed Thru	**35849A-11**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-132**
5 in (127 mm) dia	**48939-132**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.



Microwave Transmission Lines

Types EWP180 and EW180

Characteristics

Type Numbers	
Premium Waveguide	**EWP180**
Standard Waveguide	**EW180**
Standard Waveguide, Fire Retardant, Non-Halogenated Jacket	**35409-21**
Premium Waveguide Type CATVP	**222040-5**

Electrical	
Max. Frequency Range, GHz*	14.0-19.7
$_{e}TE_{11}$ Mode Cutoff Frequency, GHz	11.15
Group Delay at 18.7 GHz, ns/100 ft (ns/100 m)	127 (416)
Peak Power Rating at 18.7 GHz, kW	7.3

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	6 (150)
H Plane	15 (380)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	6 (150)
H Plane	11 (280)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	0.79 x 0.49 (20.1 x 12.4)
Weight, pounds per foot (kg/m)	0.15 (0.22)

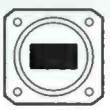
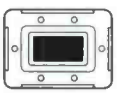
* Actual usable range is limited by the connecting rectangular waveguide.

Attenuation, Average Power, Group Velocity

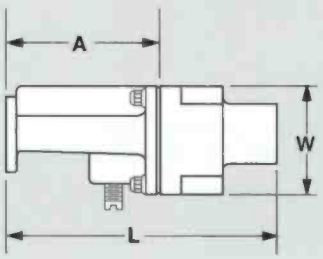
Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
14	8.42 (27.63)	0.39	60.5
14.5	7.79 (25.57)	0.42	63.9
15	7.34 (24.07)	0.45	66.9
15.5	6.99 (22.95)	0.47	89.5
16	6.72 (22.06)	0.49	71.7
16.5	6.51 (21.35)	0.51	73.7
17	6.33 (20.77)	0.52	75.5
17.5	6.18(20.28)	0.53	77.1
17.7	6.13 (20.11)	0.54	77.7
17.9	6.08 (19.95)	0.54	78.2
18.1	6.03 (19.80)	0.55	78.8
18.3	5.99 (19.66)	0.55	79.3
18.5	5.95 (19.52)	0.55	79.8
18.7	5.91 (19.40)	0.56	80.3
18.9	5.88 (19.28)	0.56	80.7
19.1	5.84 (19.17)	0.56	81.2
19.3	5.81 (19.06)	0.57	81.6
19.5	5.78 (18.96)	0.57	82.0
19.7	5.75 (18.86)	0.57	82.4

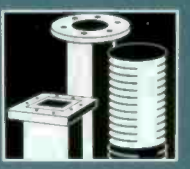
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%.Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
1180DCT, 1180DCP, 1180DCMT, 1180DCMP		3.4 (86)	1.5 (38)	1.9 (48)	0.9 (0.4)
2180SEM		4.0 (102)	1.5 (38)	1.9 (48)	0.9 (0.4)

Connector Material: Brass





Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Tunable	Pre-Tuned	Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Premium Waveguide Assemblies							VSWR 1.09 (27.3)**
17.7-19.7	EWP180-180	UG-595/U†††	1180DCT	1180DCP-1		55000A-42	F042PA0240BS
		PBR220	1180DCMT	1180DCMP-1		112588	F042MK0600KS
		PDR180			2180SEM	223306-180	F051MH0600HS
Standard Waveguide Assemblies							VSWR 1.15 (23.1)**
17.7-19.7	EW180-180	UG-595/U†††	1180DCT	1180DCP-1		55000A-42	F042PA0240BS
		PBR220	1180DCMT	1180DCMP-1		112588	F042MK0600KS
		PDR180			2180SEM	223306-180	F051MH0600HS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
† "Pre-tuned" connectors are for field attachment only. "Tunable" connectors ordered with factory assemblies are factory tuned.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

Description	Type No.
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 In (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

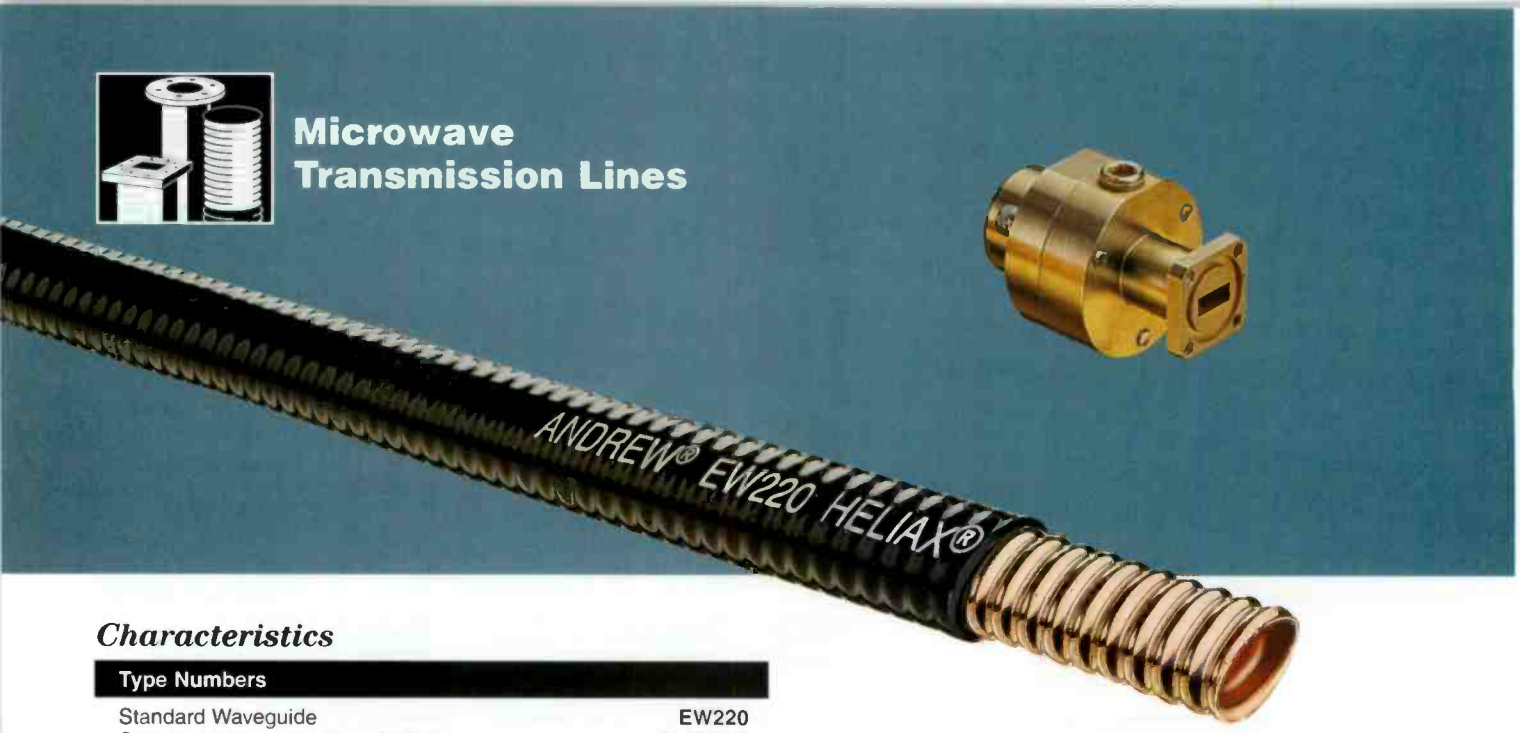
Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	201439
Splice	1180DZ
Grounding Kit with factory attached, one-hole lug	204989-1
Grounding Kit with factory attached, two-hole lug	241088-1
Grounding Kit with field attachable crimp-on, one-hole lug	204989-21
Grounding Kit with field attachable crimp-on, two-hole lug	241088-6
Grounding Kit with field attachable screw-on lug	204989-31
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	43094
Bending Tool Kit. One each E and H Plane tool	33586-1
Connector Reattachment Kit	33544-42
Wall-Roof Feed Thru	35849A-18
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	204679-180
5 in (127) mm) dia	48939-180

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	—
2	—	48940-2
3	—	48940-3
4	204673-4	48940-4
6	—	48940-6
8	204673-8	—

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Microwave Transmission Lines



Characteristics

Type Numbers	
Standard Waveguide	EW220
Standard Waveguide Type CATVP	222040-8

Electrical	
Max. Frequency Range, GHz*	17.0-23.6
$_eTE_{11}$ Mode Cutoff Frequency, GHz	13.34
Group Delay at 22.4 GHz, ns/100 ft (ns/100 m)	127 (415)
Peak Power Rating at 22.4 GHz, kW	8.6

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	4 (120)
H Plane	9 (230)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	4 (120)
H Plane	9 (230)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	0.70 x 0.44 (17.8 x 11.2)
Weight, pounds per foot (kg/m)	0.12 (0.18)

* Actual usable range is limited by the connecting rectangular waveguide.

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
21	8.86 (29.08)	0.38	77.2
21.2	8.82 (28.93)	0.39	77.7
21.4	8.78 (28.80)	0.39	78.2
21.6	8.74 (28.67)	0.39	78.6
21.8	8.70 (28.54)	0.39	79.1
22.0	8.66 (28.43)	0.39	79.5
22.2	8.63 (28.32)	0.39	79.9
22.4	8.60 (28.22)	0.40	80.3
22.6	8.57 (28.13)	0.40	80.7
22.8	8.55 (28.03)	0.40	81.1
23.0	8.52 (27.95)	0.40	81.5
23.2	8.50 (27.87)	0.40	81.8
23.4	8.47 (27.80)	0.40	82.2
23.6	8.45 (27.73)	0.40	82.5

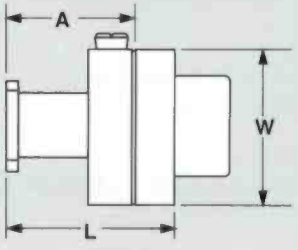
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Type EW220

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
1220ASC, 1220ASCM		2.4 (61)	1.57 (40)	1.3 (33)	0.7 (0.3)

Connector Material: Brass



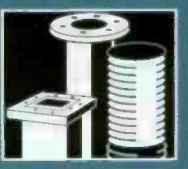
How to Order

To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX® elliptical waveguide, see pages 174-177.



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector† Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Standard Waveguide Assemblies					VSWR 1.15 (23.1)**
21.2-23.6	EW220	UG-595/U†††	1220ASC	55000A-42	F042PA0240BS
		PBR220	1220ASCM	112588	F042MK0600KS

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.
††† Modified cover flange with gasket groove. Mates with UG choke or cover flanges.

Accessories – Photos and detailed descriptions on pages 212-218.

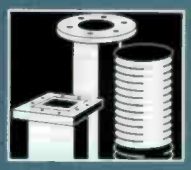
Description	Type No
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25 mm) long	31769-1
Angle Adapter Kit of 10. Stainless steel	31768A
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	242774
Metric Hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
45° Adapter Kit of 10. Galvanized steel	42334
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-75)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	205127
Splice	1220DZ
Grounding Kit with factory attached, one-hole lug	204989-1
Grounding Kit with factory attached, two-hole lug	241088-1
Grounding Kit with field attachable crimp-on, one-hole lug	204989-21
Grounding Kit with field attachable crimp-on, two-hole lug	241088-6
Grounding Kit with field attachable screw-on lug	204989-31
Crimping Tool to field attach lug to Grounding Kit	207270
Hoisting Grip	43094
Bending Tool Kit. One each E and H Plane tool	33586-1
Connector Reattachment Kit	33544-44A
Wall-Roof Feed Thru	35849A-19
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	204679-220
5 in (127 mm) dia	48939-220

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	—
2	—	48940-2
3	—	48940-3
4	204673-4	48940-4
6	—	48940-6
8	204673-8	—



Microwave Transmission Lines

Characteristics

Type Numbers	
Standard Waveguide	EW240

Electrical	
Max. Frequency Range, GHz*	18.0-26.5
$_eTE_{11}$ Mode Cutoff Frequency, GHz	15.2
Group Delay at 22.4 GHz, ns/100 ft (ns/100 m)	417 (127)
Peak Power Rating at 22.4 GHz, kW	8.6

Mechanical	
Minimum Bending Radii, without rebending, inches (mm)	
E Plane	120 (4)
H Plane	230 (9)
Minimum Bending Radii, with rebending, inches (mm)	
E Plane	120 (4)
H Plane	230 (9)
Maximum Twist, degrees/foot (m)	2 (6)
Dimensions over Jacket, in (mm)	0.60 x 0.38 (15.2 x 9.65
Weight, pounds per foot (kg/m)	0.11 (0.16)

Attenuation, Average Power, Group Velocity

Frequency GHz	Attenuation dB/100 ft (dB/100 m)	Average Power Rating, kW	Group Velocity of Propagation, %
22.000	11.456 (37.586)	0.281	72.3
22.500	11.186 (36.699)	0.287	73.8
23.000	10.952 (35.932)	0.294	75.1
23.500	10.748 (35.264)	0.299	76.3
24.000	10.570 (34.677)	0.304	77.4
24.200	10.504 (34.462)	0.306	77.8
24.250	10.488 (34.410)	0.307	78.0
24.400	10.441 (34.257)	0.308	78.3
24.600	10.382 (34.061)	0.310	78.7
24.800	10.325 (33.874)	0.311	79.0
25.000	10.271 (33.696)	0.313	79.4
25.200	10.219 (33.525)	0.315	79.8
25.250	10.206 (33.484)	0.315	79.9
25.500	10.145 (33.283)	0.317	80.3
26.000	10.032 (32.912)	0.320	81.2
26.500	9.930 (32.578)	0.324	81.9

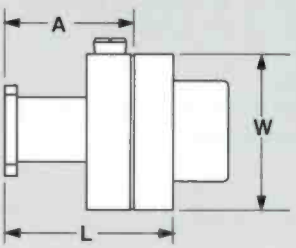
Attenuation values based on VSWR 1.0, ambient temperature 24°C (75°F) and are guaranteed within ±5%. Average power ratings based on VSWR 1.0 and 42°C (76°F) temperature rise over 40°C (104°F) ambient.

Type EW240

Connectors – Flange dimensions on pages 235-236.

Type No.		L in (mm)	W in (mm)	A in (mm)	Weight lb (kg)
1240SCM		2.4 (61)	1.57 (40)	1.3 (33)	0.7 (0.3)

Connector Material: Brass



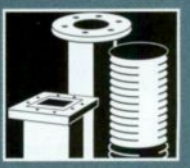
How to Order

To Order:

- A sample order is shown on page 438.
- Specify complete waveguide Type Number, including frequency band code, where listed, and length in feet or meters. See "Waveguide Assemblies" table.
- Specify connector Type Numbers and "attached" or "unattached". See "Waveguide Assemblies" table. When attached connectors on an assembly are different, specify which is "first off" the reel.

Further Information:

- For general information on HELIAX® elliptical waveguide, see pages 174-177.



Ordering Information for Waveguide Assemblies

Frequency* GHz	Waveguide Type	Flange Type††	Connector Fixed-Tuned	Pressure Window	Flex-Twist 2 ft (0.6 m)
Standard Waveguide Assemblies					**VSWR 1.15 (23.1)****
24.0-26.5	**EW240**	PBR220	**1240SCM**	**112588**	**F042MK0600KS**

* Contact Andrew for information on other frequency bands.
** VSWR max., (R.L., dB). Up to 300 ft (90 m). The indicated maximum VSWR characteristics are guaranteed for factory assemblies and are typical for field assemblies.
†† For detailed information on mating flanges, refer to pages 234-237.

Accessories – Photos and detailed descriptions on pages 212-218.

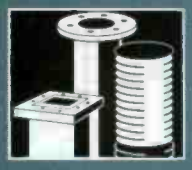
Description	Type No
Hangers and Adapters	
Hanger Kit of 10, Recommended maximum spacing for outdoor installation is 3 ft (0.91 m)*	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Angle Adapter Kit of 10. Stainless steel	**31768A**
Angle Adapter Kit of 10. Galvanized	
3/8" Hardware	**242774**
Metric Hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
45° Adapter Kit of 10. Galvanized steel	**242774**
Threaded Rod Support, 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
Tower Standoff Kit of 10. 1 in (25 mm) standoff	
Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-75)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff	
Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

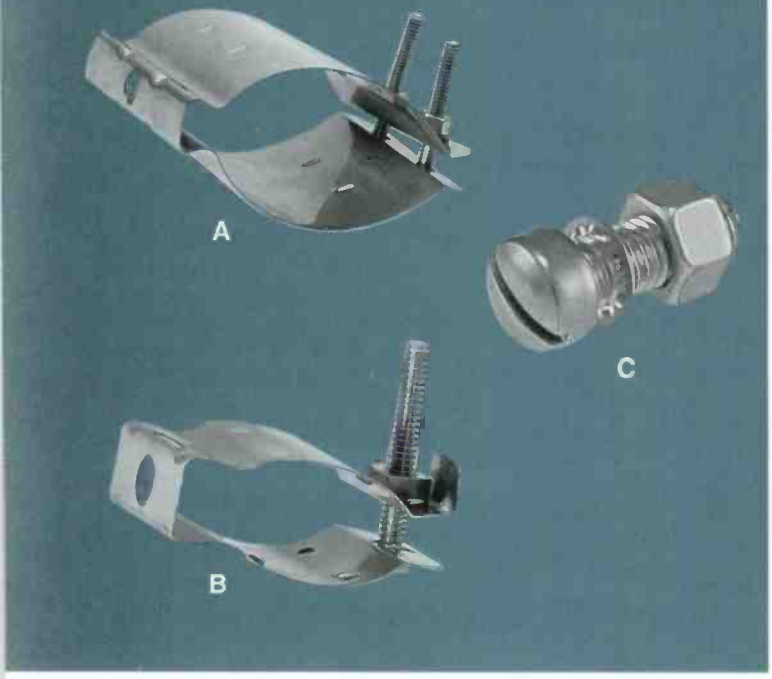
* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

Description	Type No.
Other Accessories	
Flaring Tool for Connector Attachment	**205127**
Splice	**1240DZ**
Grounding Kit with factory attached, one-hole lug	**223158**
Hoisting Grip	**43094**
Bending Tool Kit. One each E and H Plane tool	**33586-1**
Connector Reattachment Kit	**33544-47**
Wall-Roof Feed Thru	**35849A-21**
Waveguide Boot for Plates (below),	
4 in (102 mm) dia	**204679-240**
5 in (127 mm) dia	**48939-240**

Feed-Thru Plate for Boots (above)

Openings	For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	—
2	—	**48940-2**
3	—	**48940-3**
4	**204673-4**	**48940-4**
6	—	**48940-6**
8	**204673-8**	—





Elliptical Waveguide Hangers

Heavy Gauge Stainless Steel Construction

High strength and excellent corrosion resistance for long-term reliability.

HELIAX® hangers are designed for easy installation. The clamp locking bolt and nut are preassembled and captivated to minimize installation labor. Proper tension is easy to determine. The hanger is simply tightened until there is a gap of approximately 5/16" (8 mm) between the clamp legs. The pre-drilled hole for 3/8" or 1/2" mounting hardware and slots for round member adapter clamps further simplify installation. Many accessories are available to adapt these hangers to most tower configurations.

42396A Series

Gripping Tabs

Prevent waveguide slippage without the need for a hoisting grip.

Pre-Assembled and Captivated Hardware

Eliminates the need for field assembly.

Springlike Flexibility

Makes it easy to form the hanger around the waveguide and dampens vibration for long life.

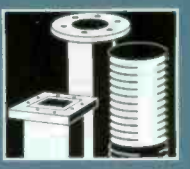
Waveguide Hanger Kit of 10 stainless steel hangers. Mount with 3/8" hardware or adapters.

For Waveguide Type Numbers	Waveguide Hanger Kit	Photo Ref.	Recommended Maximum Hanger Spacing* ft (m)
EW17, EWP17	**31766A-9**	A	6 (1.83)
EW20	**31766A-10**	A	5.5 (1.68)
EW28	**31766A-11**	A	5 (1.52)
EW34, EWP34	**42396A-15**	B	4.5 (1.37)
EW37, EWP37, EWP37S	**42396A-4**	B	4.5(1.37)
EW43, EWP43	**42396A-16**	B	4 (1.22)
EW52, EWP52, EWP52S	**42396A-8**	B	3.5 (1.07)
EW63, EWP63, EWP63S	**42396A-7**	B	3 (0.91)
EW64, EWP64	**42396A-1**	B	3 (0.91)
EW77, EWP77	**42396A-11**	B	3 (0.91)
EW85	**42396A-5**	B	3 (0.91)
EW90, EWP90, EWP90S	**42396A-5**	B	3 (0.91)
EW127A, EWP127A	**42396A-9**	B	3 (0.91)
EW132, EWP132	**42396A-9**	B	3 (0.91)
EW180, EWP180	**43211A**	B	3 (0.91)
EW220	**43211A**	B	3 (0.91)
EW240	**43211A**	B	3 (0.91)

* Standard conditions: 125 mph (200 km/h) survival wind velocity, 0.5 in (13 mm) radial ice. For other conditions see page 214.

C Hardware Kit of 10 stainless steel fillister-head bolts, 3/8 inch lockwashers, and nuts for attachment of hangers to drilled tower members.
3/4 in (19 mm) long .....Type **31769-5**
1 in (25 mm) long .....Type **31769-1**

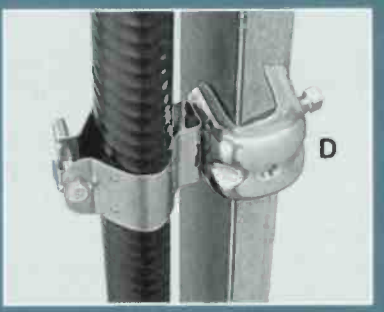
Standard Hanger Accessories



D Angle Adapter Kit of 10 stainless steel clamps to mount waveguide hangers to angle members up to 7/8" (22 mm) thick .....Type **31768A**

Angle Adapter, Galvanized, kit of 10. For mounting cable 1/2" to 2-1/4" cable hangers to angle tower members up to 3/4" (19mm) thick. Includes hanger attachment hardware.
3/8" Hardware .....Type **242774**
Metric Hardware .....Type **242774-M**

D

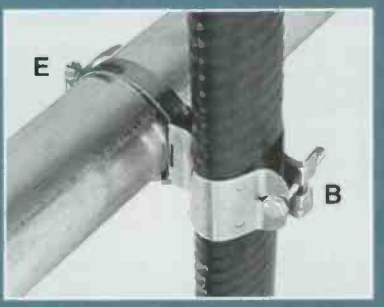


Hanger/Angle Adapter

E Round Member Adapter Kit of 10 stainless steel clamps to mount hangers to round support members. Two kits are required for use with each EW17 and EW20 hanger kit. One kit is required for all other sizes.

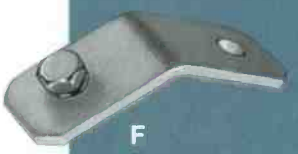
Member Diameter, in (mm)	Type Number
1 - 2 (25 - 50)	**31670-1**
2 - 3 (50 - 75)	**31670-2**
3 - 4 (75 - 100)	**31670-3**
4 - 5 (100 - 125)	**31670-4**
5 - 6 (125 - 150)	**31670-5**

E



Hanger/Round Member Adapter

F 45° Adapter Kit of 10. Use with angle adapter and threaded rod support kit to place a hanger at a waveguide bend. Galvanized steel .....Type **42334**

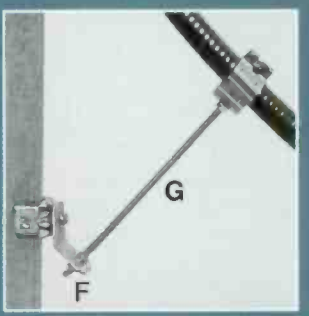


F

G Threaded Rod Support Kit. Stainless steel. Use to mount hangers away from supporting structure, under waveguide bridge, inside equipment room and to restrain waveguide bends. Includes 3/8 inch diameter threaded rod, nuts and washers. Attach to ceiling using included ceiling mounting bracket. Attach to angle tower members with 31768A angle adapters. Attach to round tower members with 30848 series tower standoffs.

	Kit of 1	Kit of 5
12 inch (305 mm) rod	**31771**	**31771-4**
24 inch (610 mm) rod	**31771-9**	**31771-6**

G



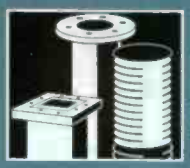
Hanger/45° Adapter Threaded Rod Support Kit

H Tower Standoff Kit of 10 adapters with round member clamps and 3/8 inch hardware. Provides clearance for tower leg flanges.

Member Diameter in (mm)	1 in (25 mm) Standoff	2.5 in (60 mm) Standoff
0.75 - 1.5 (20 - 40)	**30848-5**	–
1.5 - 3.0 (40 - 75)	**30848-4**	–
3 - 4 (75 - 100)	**30848-1**	**41108A-1**
4 - 5 (100 - 125)	**30848-2**	**41108A-2**
5 - 6 (125 - 150)	**30848-3**	**41108A-3**

H

Hanger/Threaded Rod Support Kit



Hanger Spacing *for HELIAX® Elliptical Waveguide*

Recommended maximum hanger spacings are tabulated below for various wind speed and ice conditions. The recommendations are based on guidelines stated in EIA Standard RS-222 and new wind tunnel and vibration tests. They supersede those in previous Andrew catalogs.

Installations in Typical Climates. Use the 125 mph (200 km/h), 1/2" ice conditions, highlighted in red in the table.

Severe or Mild Climates. Use the wind speed and ice conditions that most closely approximate the expected worst case conditions for the local climate.

Recommended Maximum Hanger Spacing - Standard Hangers, Outdoors for Various Wind Speed and Ice Conditions

Waveguide Type Number		Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:			85 mph (137 km/h)			100 mph (160 km/h)		
Radial Ice:			No Ice	1/2 In (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
EW17,	EWP17	31766A-9	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
EW20		31766A-10	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
EW28		31766A-11	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
EW34,	EWP34	42396A-15	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)
EW37,	EWP37	42396A-4	6 (1.83)	6 (1.83)	5.5 (1.68)	5.5 (1.68)	5.5 (1.68)	5 (1.52)
EW43,	EWP43	42396A-16	6 (1.83)	6 (1.83)	5.5 (1.68)	5 (1.52)	5 (1.52)	4.5 (1.37)
EW52,	EWP52	42396A-8	5.5 (1.68)	5 (1.52)	4.5 (1.37)	4.5 (1.37)	4.5 (1.37)	4 (1.22)
EW63,	EWP63	42396A-7	5 (1.52)	4.5 (1.37)	4 (1.22)	4 (1.22)	4 (1.22)	3.5 (1.07)
EW64,	EWP64	42396A-11	5 (1.52)	5 (1.52)	4 (1.22)	4.5 (1.37)	4 (1.22)	3.5 (1.07)
EW77,	EWP77	42396A-1	5 (1.52)	5 (1.52)	4 (1.22)	4.5 (1.37)	4 (1.22)	3.5 (1.07)
EW85		42396A-5	5.5 (1.68)	5 (1.52)	4 (1.22)	4.5 (1.37)	4 (1.22)	3.5 (1.07)
EW90,	EWP90	42396A-5	5.5 (1.68)	4.5 (1.37)	4 (1.22)	4.5 (1.37)	4 (1.22)	3 (0.91)
EW127A,	EWP127A	42396A-9	5.5 (1.68)	4.5 (1.37)	3.5 (1.07)	4.5 (1.37)	4 (1.22)	3 (0.91)
EW132,	EWP132	42396A-9	5.5 (1.68)	4.5 (1.37)	3.5 (1.07)	5 (1.52)	4 (1.22)	3 (0.91)
EW180,	EWP180	43211A	6 (1.83)	4.5 (1.37)	3.5 (1.07)	5 (1.52)	4 (1.22)	3 (0.91)
EW220		43211A	6 (1.83)	4.5 (1.37)	3.5 (1.07)	5 (1.52)	4 (1.22)	3 (0.91)
EW240		43211A	6 (1.83)	4.5 (1.37)	3.5 (1.07)	5 (1.52)	4 (1.22)	3 (0.91)
Wind Speed:			125 mph (200 km/h)			150 mph (240 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
EW17,	EWP17	31766A-9	6 (1.83)	6 (1.83)	5.5 (1.68)	5 (1.52)	5 (1.52)	4.5 (1.37)
EW20		31766A-10	5.5 (1.68)	5.5 (1.68)	5 (1.52)	4.5 (1.37)	4.5 (1.37)	4 (1.22)
EW28		31766A-11	5 (1.52)	5 (1.52)	4.5 (1.37)	4 (1.22)	4 (1.22)	3.5 (1.07)
EW34,	EWP34	42396A-15	4.5 (1.37)	4.5 (1.37)	4 (1.22)	4 (1.22)	3.5 (1.07)	4 (1.22)
EW37,	EWP37	42396A-4	4.5 (1.37)	4.5 (1.37)	4 (1.22)	3.5 (1.07)	3.5 (1.07)	3 (0.91)
EW43,	EWP43	42396A-16	4 (1.22)	4 (1.22)	3.5 (1.07)	3.5 (1.07)	3.5 (1.07)	3 (0.91)
EW52,	EWP52	42396A-8	3.5 (1.07)	3.5 (1.07)	3 (0.91)	3 (0.91)	3 (0.91)	2.5 (0.76)
EW63,	EWP63	42396A-7	3.5 (1.07)	3 (0.91)	2.5 (0.76)	2.5 (0.76)	2.5 (0.76)	2 (0.61)
EW64,	EWP64	42396A-11	3.5 (1.07)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW77,	EWP77	42396A-1	3.5 (1.07)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW85		42396A-5	3.5 (1.07)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW90,	EWP90	42396A-5	3.5 (1.07)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW127A,	EWP127A	42396A-9	3.5 (1.07)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW132,	EWP132	42396A-9	4 (1.22)	3 (0.91)	2.5 (0.76)	3 (0.91)	2.5 (0.76)	2 (0.61)
EW180,	EWP180	43211A	4 (1.22)	3 (0.91)	2.5 (0.76)	3.5 (1.07)	2.5 (0.76)	2 (0.61)
EW220		43211A	4 (1.22)	3 (0.91)	2.5 (0.76)	3.5 (1.07)	2.5 (0.76)	2 (0.61)
EW240		43211A	4 (1.22)	3 (0.91)	2.5 (0.76)	3.5 (1.07)	2.5 (0.76)	2 (0.61)

Definitions and Assumptions

1. Per EIA-222 Standard:
   - Coefficient of drag for elliptical waveguide is 1.6 (average of 1.2 for cylindrical and 2.0 for flat members).
   - Ice forms completely around member (360 degrees).
   - Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simultaneously.
2. Wind speeds are maximum, which includes gust factors and exposure factors.

Grounding Kits

A well designed system uses grounding kits to provide a bond between the elliptical waveguide and the tower/earth ground system. One grounding kit is recommended at tower top, tower bottom, at 200 ft (60 m) intervals (where applicable), and at the entrance to the equipment shelter.

- *Solid copper construction for high current handling capability, compatibility with copper cable outer conductors, and long life.*
- *Meet military standards at commercial prices.*
- *Provide certainty of continued operation.*

Andrew 204989 and 241088 series solid copper grounding kits have passed United States Air Force lightning simulation tests and meet MIL-STD-188-124A. The non-braided solid copper construction of all Andrew grounding kits eliminates corrosion caused by moisture retention and "wicking". A heat shrink tube, either factory or field installed, protects the cable terminal connection.

Easy Installation

Standard Grounding Kits (204989 and 241088 series) require few steps to install and include easy to follow instructions. Proper tensioning is ensured by an expansion section which provides visual indication that the strap is secured.

Grounding Cable Length Options. The kit with factory attached lug includes a 24 inch (610 mm) grounding cable. Two optional versions are offered with 36 inch (915 mm) grounding cables, field attachable grounding lugs and shrink jackets for custom fitting. One has a screw-on lug; the other has a crimp-on lug.

Grounding Lugs. Grounding Kits are now available with two grounding lug configurations. The 204989 series feature a one hole lug. The 241088 series feature a two hole lug. The hole spacing on the two hole lug is 0.815 in (20.7 mm). All Andrew bus bars will accept both types of lugs.

Continued on next Page

Grounding Kit Type Numbers

For Waveguide	With Factory Attached One Hole Lug	With Factory Attached Two Hole Lug	With Field Attachable One Hole Crimp-On Lug	With Field Attachable Two Hole Crimp-On Lug	With Field Attachable Screw-on Lug
Grounding Wire Length	24"	24"	36"	36"	36"
EW17, EWP17	204989-6	–	204989-26	–	204989-36
EW20	204989-6	–	204989-26	–	204989-36
EW28	204989-5	241088-5	204989-25	241088-10	204989-35
EW34, EWP34	204989-5	241088-5	204989-25	241088-10	204989-35
EW37, EWP37, EWP37S	204989-5	241088-5	204989-25	241088-10	204989-35
EW43, EWP43	204989-10	–	204989-28	–	204989-34
EW52, EWP52, EWP52S	204989-4	241088-4	204989-24	241088-9	204989-34
EW63, EWP63, EWP63S	204989-4	241088-4	204989-24	241088-9	204989-34
EW64, EWP64	204989-3	241088-3	204989-23	241088-8	204989-33
EW77, EWP77	204989-3	241088-3	204989-23	241088-8	204989-33
EW85	204989-2	241088-2	204989-22	241088-7	204989-32
EW90, EWP90, EWP90S	204989-2	241088-2	204989-22	241088-7	204989-32
EW127A, EWP127A	204989-2	241088-2	204989-22	241088-7	204989-32
EW132, EWP132	204989-2	241088-2	204989-22	241088-7	204989-32
EW180, EWP180	204989-1	241088-1	204989-21	241088-6	204989-31
EW220	204989-1	241088-1	204989-21	241088-6	204989-31
EW240	223158	-	-	-	-

Kits Include

Standard Grounding Kits for 1/2" and Larger Waveguide. Series 204989 and 241088 kits include a solid copper strap riveted to the grounding wire, a coil tool for proper tightening, tower attachment hardware, and a two-part tape weatherproofing system. Field attachable, crimp-on grounding lugs require the use of a crimping tool (not included, described below).

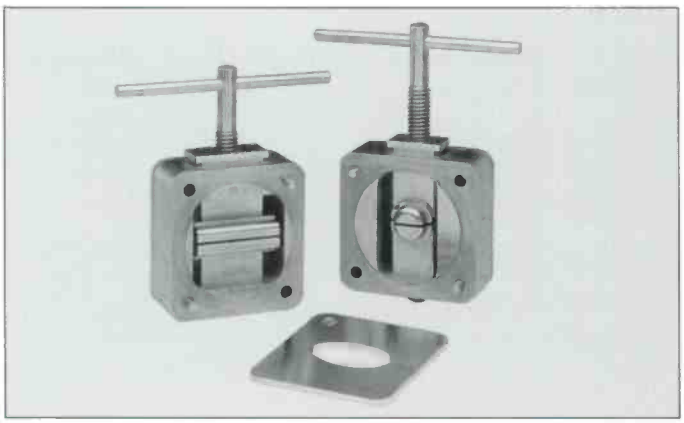
Standard Grounding Kits for 1/4" and 3/8" Waveguide. Includes a solid copper strap, connection hardware, tower attachment hardware, and a two-part tape weatherproofing system .....Type **223158**

Lug and Wire Length Options for Standard Grounding Kits

Kits are available with either factory attached lugs or field attachable lugs. Field attachable lugs are either crimp-on or screw-on. One or two-hole lugs are available as indicated in the table.

Grounding wire length is 36 in (915 mm) for field attachable lugs and 24 or 36 in (610 or 915 mm) for factory attached lugs, as indicated in the table.

Crimping Tool. Used to attach crimp-on lugs for standard grounding kits. Not required for kits having factory-attached lugs or field-attachable screw-on lugs .....Type **207270**



Flaring Tool Kits*

New 2-in-1 Design

Kits for EW43, EW52, and EW63. Major and minor axis flaring tool combined into one unit.

Fast and Accurate Connector Attachment Compact Design

Small, lightweight and easy to use in crowded areas above radio bays. Can be easily carried to top of tower.

Reliable, Low VSWR Waveguide Flares Easy to Use

Consistent results with no special training. No tab flares to cut.

Saw Guide Included

Ensures proper cut-off length for flare.

Andrew flaring tool kits for HELIAX elliptical waveguide consistently produce high accuracy waveguide flares for connector and splice installation.

The kits include one major and one minor axis flaring tool, a saw guide and a rugged carrying case.

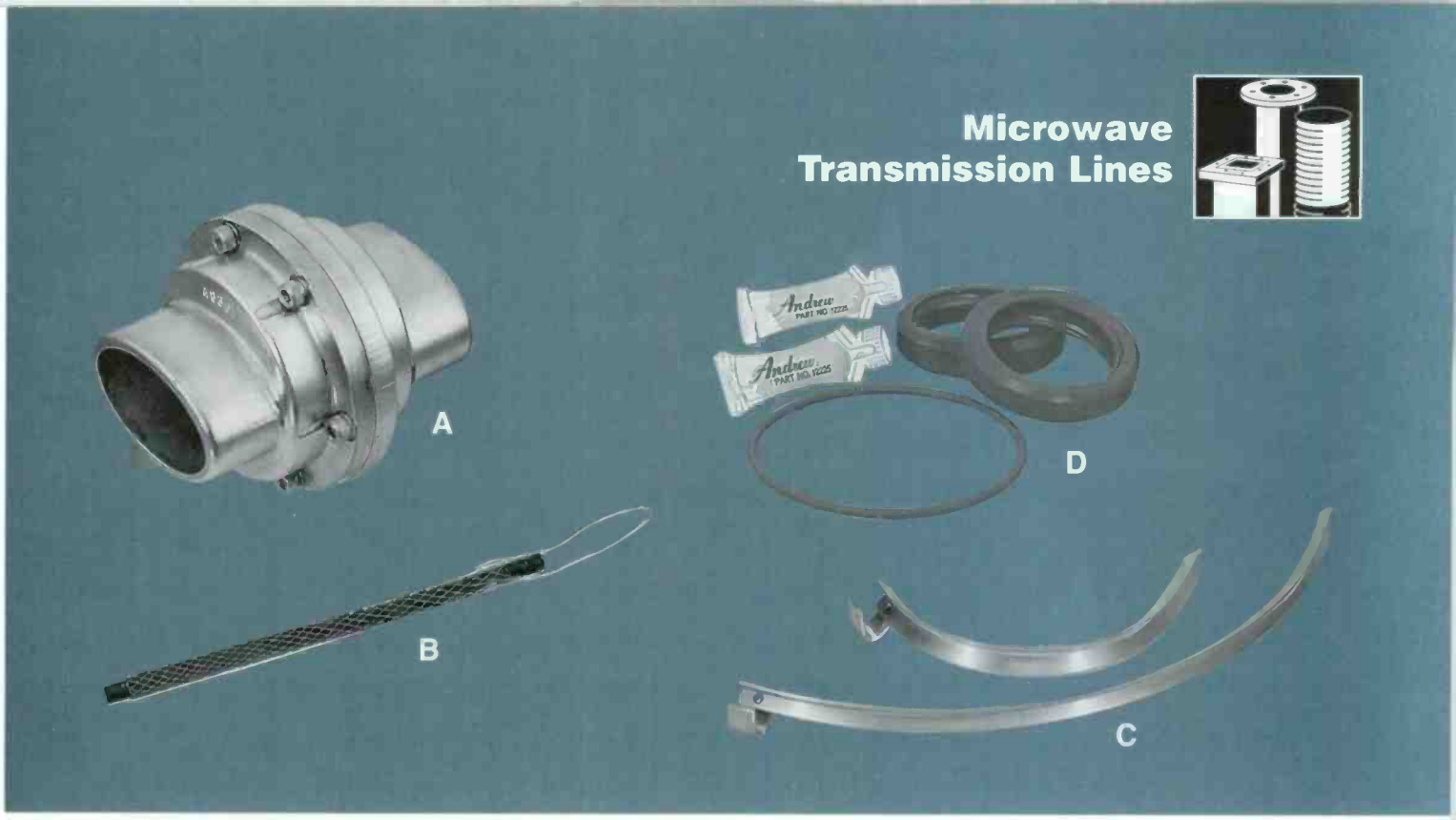
Flaring tools are especially recommended for field installation of pre-tuned connectors on premium waveguide. They are required to achieve the stated VSWR specifications when using pre-tuned or fixed-tuned connectors on EWP90 and smaller premium waveguides.

The fast, two-step flaring tecnnique forms the waveguide accurately every time. The tools are attached and the flare made without disturbing the connector assembly. The waveguide can be trimmed and the flare completed in three to five minutes.

Each tool makes contact with the waveguide just once. The precision with which the tools form the flare ensures a contact face that has not been shaved, compressed or work hardened.

*Patented United States 4,590,785

For Waveguide Types	Type Number
EW37, EWP37, EWP37S	**205869**
EW43, EWP43	**EWFTK-43**
EW52, EWP52, EWP52S	**EWFTK-52**
EW63, EWP63, EWP63S	**EWFTK-63**
EW64, EWP64	**202358**
EW77, EWP77	**202421**
EW90, EWP90, EWP90S	**204919**
EW127A, EWP127A	**204960**
EW132, EWP132	**203809**
EW180, EWP180	**201439**
EW220, EW240	**205127**



Accessories

A Splice.

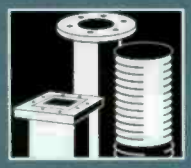
B Hoisting Grip used at 200 ft (60 m) intervals to raise waveguide on tower.

C Bending Tool Kit for elliptical waveguide installation. One each E- and H-plane form included.

D Connector Reattachment Kit includes rubber gasket parts (except flange gaskets) which may need replacing during removal and subsequent reattachment of connectors.

Accessories

For Waveguide Type Numbers	Splice	Hoisting Grip	Bending Tool Kit	Connector Reattachment Kit
EW17, EWP17	117Z	34759	33586-4	33544-10
EW20	120Z	34759	33586-4	33544-11
EW28	128AZ	26985A	33586-5	–
EW34, EWP34	134DZ	26985A	33586-11	33544-43
EW37, EWP37, EWP37S	137DZ	31535	33586-3	33544-24
EW43, EWP43	143Z	31535	33586-3	33544-45
EW52, EWP52, EWP52S	152DZ	24312A	33586-7	33544-38
EW63, EWP63, EWP63S	163DZ	24312A	33586-8	33544-33
EW64, EWP64	164DZ	29961	33586-2	33544-35
EW77, EWP77	177DZ	19256B	33586-9	33544-34
EW85	185AZ	29958	33586-1	33544-17
EW90, EWP90, EWP90S	190DZ	29958	33586-1	33544-37
EW127A, EWP127A	1127DZ	29958	33586-1	33544-41
EW132, EWP132	1132DZ	29958	33586-1	33544-39
EW180, EWP180	1180DZ	43094	33586-1	33544-42
EW220	1220DZ	43094	33586-1	33544-44A
EW240	1240DZ	43094	33586-1	33544-47



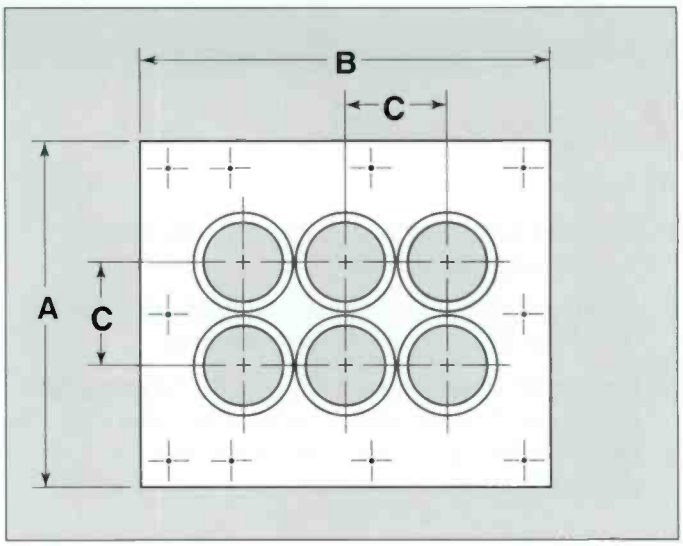
Microwave Transmission Lines

Accessories

A Single Entrance Wall/Roof Feed-Thru Assembly. Includes rubber boot, clamp, and galvanized steel plate. Order from table.

B Waveguide Boot for use with multiple entrance wall/roof feed-thru plate (Item G). Boot diameter of 4 in or 5 in (102 or 127 mm) is available to match plate. Order individually from table.

C Multiple Entrance Wall/Roof Feed-thru Plate. (Aluminum) Use with waveguide boots (Item B). Order from table.



Multiple Entrance Wall/Roof Feed-Thru Plate

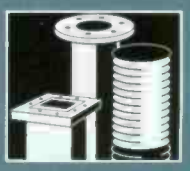
Type	Number of Openings	Dimen. A in (mm)	Dimen. B in (mm)	Dimen. C in (mm)
4 in (102 mm) Diameter Entry Opening				
204673-1	1	7 (178)	7 (178)	–
204673-2	1	5 (127)	5 (127)	–
204673-4	4	9.5 (241)	25.5 (648)	5.5 (140)
204673-8	8	17.5 (444)	25.5 (648)	5.5 (140)
5 in (127 mm) Diameter Entry Opening				
48940-1	1	9.5 (241)	9.5 (241)	–
48940-2	2	9.5 (241)	17.5 (444)	7 (178)
48940-3	3	9.5 (241)	25.5 (648)	7 (178)
48940-4	4	17.5 (444)	17.5 (444)	7 (178)
48940-6	6	17.5 (444)	25.5 (648)	7 (178)

Waveguide Boots

For Waveguide Type Numbers	Waveguide Boots 4 in (102 mm) Diameter	Waveguide Boots 5 in (127 mm) Diameter
EW17, EWP17	–	–
EW20	–	–
EW28	–	–
EW34, EWP34	204679-34	48939-34
EW37, EWP37, EWP37S	204679-37	48939-37
EW43, EWP43	204679-43	–
EW52, EWP52, EWP52S	204679-52	48939-52
EW63, EWP63, EWP63S	204679-63	48939-63
EW64, EWP64	204679-64	48939-64
EW77, EWP77	204679-77	48939-77
EW85	–	–
EW90, EWP90, EWP90S	204679-90	48939-90
EW127A, EWP127A	204679-127	48939-122
EW132, EWP132	204679-132	48939-132
EW180, EWP180	204679-180	48939-180
EW220	204679-220	48939-220
EW240	204679-240	48939-240

Single Wall/Roof Feed-Thru Assemblies

For Waveguide Type Numbers	Single Entrance Wall/Roof Feed-Thru Assembly
EW17, EWP17	35849A-10
EW20	35849A-9
EW28	35849A-13
EW34, EWP34	35849A-17
EW37, EWP37, EWP37S	35849A-8
EW43, EWP43	35849A-7
EW52, EWP52, EWP52S	35849A-14
EW63, EWP63, EWP63S	35849A-6
EW64, EWP64	35849A-12
EW77, EWP77	35849A-16
EW85	35849A-3
EW90, EWP90, EWP90S	35849A-15
EW127A, EWP127A	35849A-1
EW132, EWP132	35849A-11
EW180, EWP180	35849A-18
EW220	35849A-19
EW240	35849A-21



Hybrid T Reflectometer

The Andrew hybrid T reflectometer is a unique and highly directive test component useful for measuring return loss or VSWR in waveguide systems. The reflectometer utilizes a precision hybrid T junction to separate the incident and reflected waves at the input of the system under test.

In addition to the reflectometer, a signal generator and equipment to detect and display return loss or VSWR are necessary. For information on operation of the Andrew hybrid T reflectometer, request Bulletin 37260.

To Order, specify Type Number from the table. A calibration load, a termination load and carrying case are included.

Elliptical Waveguide Sliding Load. Spear type termination load used at far end of bulk reels to terminate waveguide without attaching a connector and calibration load.

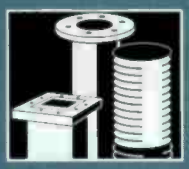
Elliptical Waveguide Sliding Loads

Waveguide Type	Type No.	Frequency Band, GHz	VSWR, Max. (R.L., dB)
EW37	**40502-37**	3.4-4.2	1.052 (32)
EW44	**40502-44**	4.4-5.0	1.02 (40)
EW52	**40502-52**	5.925-6.425	1.02 (40)
EW63	**40502-63**	6.425-7.125	1.02 (40)
EW90	**40502-90**	10.5-11.7)	1.02 (40)

Ordering Information - Hybrid T Reflectometers

Frequency Band GHz	Waveguide Size EIA	Waveguide Size IEC	Type Number	Directivity Min., dB	Mates with Flange Types EIA*	Mates with Flange Types U.S. MIL	Mates with Flange Types IEC
1.7-2.110	WR430	R22	**49000-430A-1**	50	CPR430G	–	PDR22
1.9-2.3	WR430	R22	**49000-430B-1**	50	CPR430G	–	PDR22
2.45-2.75	WR340	R26	**49000-340C-1**	60	CPR340G	–	PDR26
2.9-3.5	WR284	R32	**49000-284D-1**	60	CPR284G	–	PDR32
3.4-4.2	WR229	R40	**49000-229E-1**	55	CPR229G	–	PDR40
3.7-4.2	WR229	R40	**49000-229F-1**	60	CPR229G	–	PDR40
4.4-5.0	WR187	R48	**49000-187G-1**	60	CPR187G	UG-148C/U UG-149A/U	CAR48, UAR48 PAR48, PDR48
5.925-6.425	WR159	R58	**49000-159H-1**	60	CPR159G	–	PDR58
5.925-6.425	WR137	R70	**49000-137H-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
5.925-7.125	WR137	R70	**49000-137J-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
5.925-7.750	WR137	R70	**49000-137K-1**	60	CPR137G	UG-343B/U UG-344/U	CAR70, UAR70 PAR70, PDR70
7.125-8.5	WR112	R84	**49000-112L-1**	60	CPR112G	UG-52B/U UG-51/U	CBR84, UBR84 PBR84, PDR84
10.5-11.7	WR90	R100	**49000-90M-1**	60	CPR90G	UG-40B/U UG-39/U	CBR100, UBR100 PBR100, PDR100
12.2-13.25	WR75	R120	**49000-75N-1**	60	–	WR75 choke and cover	CBR120, UBR120 PBR120
12.2-13.25	WR75	R120	**205594-75-1**	60	–	–	PDR120
14.4-15.35	WR62	R140	**49000-62P-1**	60	–	UG-541A/U UG-419/U	CBR140, UBR140 PBR140
17.7-19.7	WR42	R220	**207191-1**	60	–	UG-596A/U UG-595/U	CBR220, PBR220 UBR220
21.2-23.6	WR42	R220	**207191-4**	60	–	UG-596A/U UG-595/U	CBR220, PBR220 UBR220

*Also mates with "F" Suffix.



Microwave Transmission Lines

Rectangular Waveguide Components

Long Life, Maximum Performance

High conductivity copper or 90/10 bronze construction, chemically cleaned and coated to prevent corrosion.

Wide Selection

Broad range of components and flanges simplifies system planning. All elements are designed to work together, maximizing system performance.

Standard and Custom Components

Type numbers for ordering standard components are presented on pages 225 to 233.

Custom components are also available for quick delivery. To order these components you can:

- *Use the information on pages 221 to 223 to construct a type number for ordering*
- *Use our new ezGuide™ software to construct a type number for ordering*
- *Call Andrew and describe your requirements*

Andrew custom components can accommodate almost any flange and length combination. However, when your application requires immediate availability, you may want to consider ordering a combination of standard components, which are typically manufactured within one working day.

Finish. All Andrew stocked rigid rectangular components are now supplied unpainted (natural), painted components are available as an option. Every component is chemically cleaned and coated for corrosion resistance.

Standard and Low VSWR Waveguides. Andrew offers rectangular waveguides for standard and low VSWR applications. Standard waveguide components cover the entire recommended frequency ranges, while low VSWR components are generally only available over narrow frequency ranges.The Size and Frequency Codes table on page 222 gives details of standard frequency ranges, and commonly requested low VSWR details. Other low VSWR frequency ranges are available on request. Attenuation curves for rectangular waveguide are presented on pages 248 and 249.

New ezGuide™ Software

For Rectangular Waveguide Components

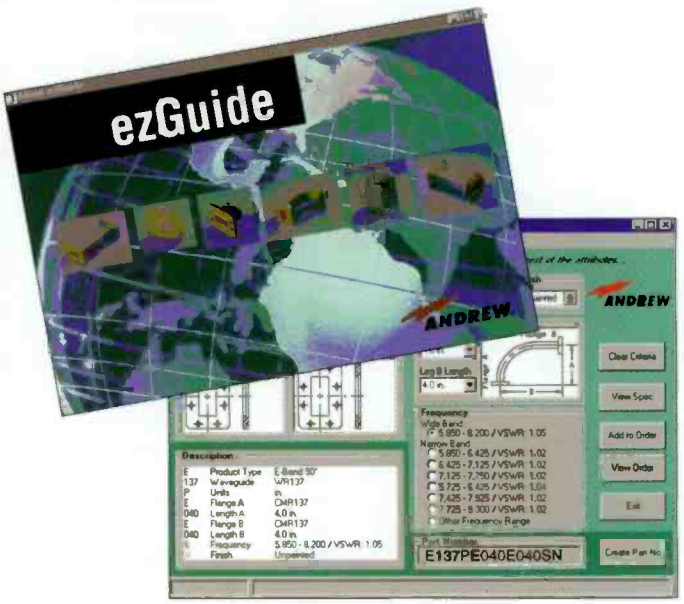
Rectangular waveguide components are an integral part of any transmission line system for private microwave, cellular, and PCS/PCN installations.

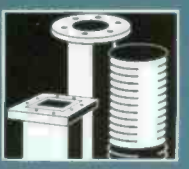
Andrew now offers new self-directed ezGuide software which simplifies the designing and ordering of rectangular waveguide components to meet the requirements of a transmission line system.

This new functional type numbering system uses Windows®-based software which guides the design and ordering process. The exact component type, waveguide size, flange types, component dimensions, operating frequency band, and finish can be specified with point-and-click options. Each product is pictured on your screen and diagrammed for your reference.

Each rectangular waveguide component and its flanges are identified by a type number that is automatically created as you specify how each section should be configured.

Windows is a registered trademark of Microsoft Corporation.





Custom Component Ordering Information

The SMART Numbering System identifies each custom component with alphanumeric codes that provide detailed ordering information for that component. The type number describes the component, waveguide size, flanges, and where applicable, the units of measure used, dimensions, frequency, and finish.

SMART Numbering System Example:

R	062	P	A	0240	B	S	N
1	2	3	4	5	6	7	8

1 **Component Code**. A one letter code that identifies the component type. See Table 1.

2 **Waveguide Size Code**. A three number code that identifies the waveguide size. Use Table 2 (page 222) to identify the code for your waveguide size. For taper transition sections, refer to the Taper Transition Size Codes table (page 224) for the waveguide-to-waveguide size code.

3 **Units of Measure**. A one letter code that identifies the units of measure used. Use P for imperial (inches) or M for metric (millimeters).

4 **Flange Code 1**. A one letter code that identifies the first flange. Flange Code 1 and Flange Code 2 must be sequenced alphabetically (except for taper transition sections, see below). Use Table 3 (page 222) to determine the appropriate flange code for your application.

5 **Dimension 1**. A customer-specified numeric code that indicates the length of the component in the unit of measure specified previously (imperial or metric). Bends require three numbers, flex-twist and straight sections require four numbers. See page 222.

6 **Flange Code 2**. A one letter code that identifies the second flange. Flange Code 1 and Flange Code 2 must be sequenced alphabetically (except for tapered transition sections, see below). Use Table 3 (page 222) to determine the appropriate flange code for your application.

7 **Frequency Code**. A one letter code that identifies the frequency specification. See Table 2 (page 222).

8 **Finish**. A one letter code that indicates the finish choice. Use N for unpainted or G for gray.

In the example left, **R062PA0240BSN** is:

1 *a straight section*

2 *waveguide size WR62*

3 *imperial measurement (inches)*

4 *UG-Choke flange on one end*

5 *24 inches long*

6 *UG-Cover flange on other end*

7 *12.40 - 18.0 GHz band*

8 *unpainted finish*

Table 1
Overview of SMART Numbering System Codes

Component Name	Component Code (1 alpha)	Waveguide Size Code (3 numeric)	Units of Measure (1 alpha)	Flange 1 Code (1 alpha)	Dimension 1 Code (3 or 4 numeric)*	Flange 2 Code (1 alpha)	Dimension 2 Code (3 or 4 numeric)*	Frequency Code (1 alpha)	Finish Code (1 alpha)	Required Characters
Straight Section	R	Table 2	P or M	Table 3	Customer specified	Table 3	–	Table 2	N or G	13
90° E Plane Swept Bend	E	Table 2	P or M	Table 3	Customer specified	Table 3	Customer specified	Table 2	N or G	15
90° H Plane Swept Bend	H	Table 2	P or M	Table 3	Customer specified	Table 3	Customer specified	Table 2	N or G	15
90° H Plane Miter Bend	M	Table 2	P or M	Table 3	Customer specified	Table 3	Customer specified	Table 2	N or G	15
90° E Plane Miter Bend	N	Table 2	P or M	Table 3	Customer specified	Table 3	Customer specified	Table 2	N or G	15
Flexible Twist	F	Table 2	P or M	Table 3	Customer specified	Table 3	–	Table 2	–	12
90° Rigid Twist	D	Table 2	–	Table 3	–	Table 3	–	Table 2	N or G	8
Taper Transition	T	page 224	–	Table 3	–	Table 3	–	–	N or G	7
Flange Adapter	A	Table 2	–	Table 3	–	Table 3	–	–	N or G	7
Waveguide/Coax Transition	C	Table 2	–	Table 3	–	S or N**	–	Table 2	G only	8

* Bends require 3 numbers, flex-twist and straight sections require 4 numbers. See page 222.
** Use S for SMA female or N for N-type female.

Microwave Transmission Lines

Flange Codes

For straight sections, flex-twists, E and H-plane bends, twists, and flange adapters, enter the flange codes in alphabetical order (for example, F042P**A**0240**B**).

For taper transitions, the flange code sequence is not entered alphabetically. The first flange following the waveguide size code is the smaller of the two waveguide sizes.

For asymmetric bends, specify the correct leg length/flange combination. The flange specified first (flange 1) is attached to the leg length specified first (dimension 1).

Dimensions

Straight sections and flex-twists require four characters. All four characters must be used, including leading zeros, if necessary. For imperial (inch) dimensions, the code is made up of three characters to the left of the decimal point and one character to the right. 24 inches is denoted 0240. Flex-twist sections are only available in whole inch increments. For metric dimensions, enter the length in millimeters. 600 millimeters is denoted 0600.

Bends require three characters. All three characters must be used, including leading zeroes, if necessary. For imperial (inch) dimensions, the code is made up of two characters to the left of the decimal point and one character to the right. 5.0 inches is denoted 050. For metric dimensions, enter the length in millimeters. 75 millimeters is denoted 075.

Table 2
Size and Frequency Codes

Waveguide					
EIA	RCSC	IEC	Size Code	Frequency Code	Frequency (GHz)
WR28	WG22	R320	028	S	26.50 - 40.00
				A	37.00 - 40.00
WR42	WG20	R220	042	S	17.70 - 26.50
WR51	WG19	R180	051	S	15.00 - 22.00
WR62	WG18	R140	062	S	12.40 - 18.00
WR75	WG17	R120	075	S	10.00 - 15.00
WR90	WG16	R100	090	S	8.20 - 12.4
				A	10.2 - 10.7
				B	10.7 - 11.7
WR112	WG15	R84	112	S	7.050 - 10.00
				A	7.125 - 7.750
				B	7.750 - 8.500
				C	7.125 - 8.500
WR137	WG14	R70	137	S	5.850 - 8.200
				A	5.850 - 6.425
				B	6.425 - 7.125
				C	7.125 - 7.750
				D	5.725 - 6.425
				E	7.425 - 7.925
WR159	WG13	R58	159	S	4.900 - 7.050
				A	5.725 - 6.425
WR187	WG12	R48	187	S	3.95 - 5.85
				A	4.40 - 5.00
WR229	WG11	R40	229	S	3.30 - 4.90
				A	3.54 - 4.20

Table 3
Flange Codes, Descriptions and Availability

Code	Flange Type *	Description	Available for Waveguide Size Codes
A	UG-Choke	Tapped Holes, Gasket Groove, Choke Groove, Square Flange	028, 042, 062, 075, 090, 112
A	UG-Choke	Tapped Holes, Gasket Groove, Choke Groove, Circular Flange	137, 187
B	UG-Cover	Through Holes, No Gasket or Choke Grooves, Square Flange	028, 042, 062, 075, 090, 112
B	UG-Cover	Through Holes, No Gasket or Choke Grooves, Circular Flange	137, 187
C	CPR( )G	Through Holes, Gasket Groove, Rectangular Flange	090, 112, 137, 159, 187, 229
D	CPR( )F	Through Holes, No Gasket Groove, Rectangular Flange	090, 112, 137, 159, 187, 229
E	CMR	Alternate Tapped Holes, No Gasket Groove, Rectangular Flange	090, 112, 137, 159 , 187
F	CMR Through	All Through Holes, No gasket groove, Rectangular Flange	137
G	CMR Tapped	All Tapped Holes, No gasket Groove, Rectangular Flange	137
H	PDR	Through Holes, Gasket Groove, Rectangular Flange	051, 062, 075, 090, 112, 137, 187, 229
K	PBR	Through Holes, Gasket Groove, No Choke, Square Flange	028, 042, 051, 062, 075, 090, 112
L	UDR	Through Holes, No Gasket Groove, Rectangular Flange	062, 075, 090, 112, 187
M	UBR	Through Holes, No Gasket Groove, No Choke, Square Flange	028, 042, 062, 075, 112
P	PAR	Through Holes, Gasket Groove, No Choke, Circular Flange	137, 187
–	CBR	Through Holes, Gasket Groove, Choke Groove, Square Flange	On Request
–	BRJ		On Request
T	UER	Through Holes, No Gasket Groove, Rectangular Flange	137
–	UAR	Through Holes, No Gasket Groove, Circular Flange	On Request
Y	UG Cover/Gasket	Through Holes, Gasket Groove, No Choke, Square Flange	028, 042, 062, 075, 090, 112, 137, 187

* All other flange options on request, if you have a requirement, not listed, please contact your Andrew representative.

Creating Type Numbers for Custom Components

The examples below describe SMART Numbering for each custom component:

Straight Section: R229MH1200HAG (13 characters)
Description: Straight section, waveguide size R40, metric, PDR flange, 1200 mm in length, PDR flange, 3.54-4.2 GHz band, gray.

R	229	M	H	1200	H	A	G
Component code-see Table 1	Waveguide size code-see Table 2	Units-metric (M) or Imperial (P)	Flange 1 code-see Table 3	Customer specified length in mm	Flange 2 code-see Table 3	Frequency code-see Table 2	Finish-unpainted (N) or gray (G)

90° Swept and Miter Bend: E028MK051M120AN (15 characters)
Description: 90° E-Plane, waveguide size R320, metric, PBR flange- 51mm leg, UBR flange-120mm leg, 37- 40 GHz band, unpainted.
Note: E and H plane swept bends, and E and H plane miter bends use the same part numbering system. For more information about swept and miter bend leg length measurements, see pages 224-225.

E	028	M	K	051	M	120	A	N
Component code-see Table 1	Waveguide size code-see Table 2	Units-metric (M) or Imperial (P)	Flange 1 code-see Table 3	Customer specified length in mm	Flange 2 code-see Table 3	Customer specified length in mm	Frequency code-see Table 2	Finish-unpainted (N) or gray (G)

Flex-twist Section: F042PA0240BS (12 characters)
Description: Flex-twist section, waveguide size WR42, imperial, UG Choke flange, 24 inches in length, UG Cover flange, full band.

F	042	P	A	0240	B	S
Component code-see Table 1	Waveguide size code-see Table 2	Units-metric (M) or Imperial (P)	Flange 1 code-see Table 3	Customer specified length in inches	Flange 2 code-see Table 3	Frequency code-see Table 2

90° Rigid Twist Section: D159CEAG (8 characters)
Description: 90° rigid twist section, waveguide size WR159, CPR159G flange, CMR159 flange, 5.725-6.425 GHz band, gray.

D	159	C	E	A	G
Component code-see Table 1	Waveguide size code-see Table 2	Flange 1 code-see Table 3	Flange 2 code-see Table 3	Frequency code-see Table 2	Finish-unpainted (N) or gray (G)

Taper Transition Section: T137DCN (7 characters)
Description: Tapered transition section, transitioning from waveguide size WR137 to waveguide size WR159*, CPR137F flange on the smaller of the two waveguide sizes, CPR159G on the other end, unpainted.

T	137	D	C	N
Component code-see Table 1	Waveguide size code-see page 224	Flange 1 code-see Table 3	Flange 2 code-see Table 3	Finish-unpainted (N) or gray (G)

* Refer to the Taper Transition Size Codes table (page 224) for the waveguide-to-waveguide size code. For tapered transition sections only, the flange code sequence is not listed alphabetically; the first flange following the waveguide size code is always for the smaller of the two waveguide sizes. In this example, flange code D, is a CPR137F, while flange code C is a CPR159G.

Flange Adapter: A075AHN (7 characters)
Description: Flange adapter, waveguide size WR75, adapting UG Choke flange to PDR flange, unpainted.

A	075	A	M	N
Component code-see Table 1	Waveguide size code-see Table 2	Flange 1 code-see Table 3	Flange 2 code-see Table 3	Finish-unpainted (N) or gray (G)

Waveguide to Coax Transition Section: C187HNAG (8 characters)
Description: Waveguide to coax transition section, waveguide size WR187, PDR flange, N-Female flange*, 4.4-5.0 GHz band, gray.

C	062	H	S	S	G
Component code-see Table 1	Waveguide size code-see Table 2	Flange 1 code-see Table 3	Flange 2 code-see Table 3	Frequency-see Table 2	Finish-gray (G) only

* Enter either code S for SMA female, or N for Type N female.

Microwave Transmission Lines

Component Descriptions

Straight Sections are offered in lengths up to 12 feet (3.6 meters) and up to 20 feet (6 meters) on special order.

90° E Bends, 90° H Bends , and Rigid Twist Sections are available with standard leg lengths and the following flange combinations: CPR( )G/CPR( )G, UG Choke/UG Cover, PDR/PDR, and PBR/PBR. See pages 228-231.

Taper Transitions have VSWR 1.05 and fixed length of 6" (152 mm).

Flex-twist Sections include brass flanges chemically cleaned and coated for corrosion resistance. Each section is jacketed with rugged black Neoprene, UV stabilized for outdoor use. The silver plated wound brass core assures highest flexibility and low attenuation.

Straight Sections, H and E Plane Bends and Twists

EIA	RCSC	IEC	Operating Frequency (GHz)	Twists Length	Twists VSWR	Straight Sections VSWR	Swept H and E Plane Bends Std Leg Length	Swept H and E Plane Bends Min Leg Length	Swept H and E Plane Bends Radius E	Swept H and E Plane Bends Radius H	VSWR Swept Bends/ Miter Bends	Miter E and H-Plane Bends Min Leg Lengths** E-Plane	Miter E and H-Plane Bends Min Leg Lengths** H-Plane
WR28	WG22	R320	26.50 - 40.00 37.00 - 40.00	4.00 (102)	1.30 1.12	1.30 1.12	2.0 (51)	1.6 (41)	0.75 (19)	0.75 (19)	1.30 1.12	* *	* *
WR42	WG20	R220	17.70 - 26.50	3.00 (76)	1.05	1.05	2.3 (58)	2.3 (58)	1.0 (25)	1.0 (25)	1.05	*	*
WR51	WG19	R180	15.00 - 22.00	†	–	–	†	†	†	†	–	*	*
WR62	WG18	R140	12.40 - 18.00	5.00 (127)	1.05	1.05	2.6 (66)	2.5 (65)	1.50 (38)	1.50 (38)	1.05	1.1 (28)	1.4 (36)
WR75	WG17	R120	10.00 - 15.00	6.00 (152)	1.05	1.05	3.6 (91)	2.8 (71)	1.75 (44)	1.75 (44)	1.05	1.5 (38)	1.6 (41)
WR90	WG16	R100	8.20 - 12.4 10.2 - 10.7 10.7 - 11.7	8.00 (203)	1.05 1.02 1.02	1.05 1.02 1.02	3.6 (91)	2.9 (74)	1.75 (44)	1.75 (44)	1.05 1.02 1.02	1.5 (38)	1.8 (46)
WR112	WG15	R84	7.050 - 10.00 7.125 - 7.750 7.750 - 8.500 7.125 - 8.500	10.00 (254)	1.05 1.02 1.02 1.02	1.05 1.02 1.02 1.02	4.0 (102)	3.9 (99)	2.68 (68)	2.68 (68)	1.05 1.02 1.02 1.02	1.6 (41)	2.00 (52)
WR137	WG14	R70	5.850 - 8.200 5.850 - 6.425 6.425 - 7.125 7.125 - 7.750 5.725 - 6.425 7.425 - 7.925	12.00 (305)	1.05 1.02 1.02 1.02 1.02 1.02	1.05 1.02 1.02 1.02 1.02 1.02	4.0 (102)	4.0 (102)	2.62 (67)	2.62 (67)	1.05 1.02 1.02 1.02 1.02 1.02	1.8 (46)	2.3 (58)
WR159	WG13	R58	4.900 - 7.050 5.725 - 6.425	12.00 (305)	1.05 1.02	1.05 1.02	7.0 (178)	4.7 (119)	3.25 (83)	3.25 (83)	1.05 1.02	2.0 (52)	2.5 (64)
WR187	WG12	R48	3.95 - 5.85 4.40 - 5.00	12.00 (305)	1.05 1.02	1.05 1.02	7.0 (178)	6.6 (168)	5.0 (127)	5.0 (127)	1.05 1.02	2.3 (58)	2.6 (67)
WR229	WG11	R40	3.30 - 4.90 3.54 - 4.20	18.00 (457)	1.05 1.02	1.05 1.02	7.8(198)	7.8(198)	6.0 (152)	6.0 (152)	1.05 1.02	2.5 (64)	3.0 (76)

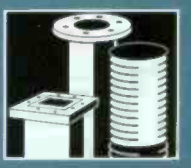
* Not available. ** Maximum Leg Length 24" (610mm) for all waveguide sizes, for either Swept or Miter bends. † Available on request.

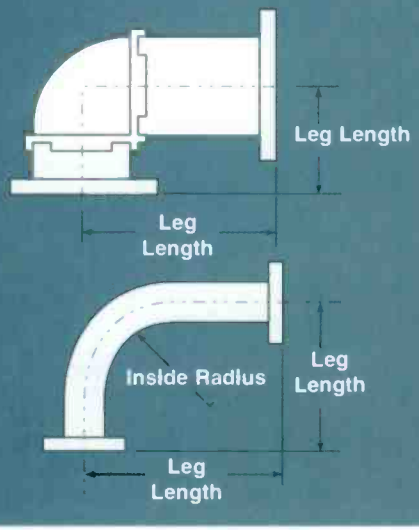
Taper Transition Size Codes

EIA	RCSC	IEC	Size Code	Frequency (GHz)	Type Number*
WR42 to WR51	WG20 to WG19	R220 to R180	042	17.70 - 20.00	T042 (WR42 flange)(WR51 flange)(Finish)
WR51 to WR62	WG19 to WG18	R180 to R140	051	15.00 - 18.00	T051 (WR51 flange)(WR62 flange)(Finish)
WR62 to WR75	WG18 to WG17	R140 to R120	062	12.40 - 15.00	T062 (WR62 flange)(WR75 flange)(Finish)
WR75 to WR90	WG17 to WG16	R120 to R100	075	10.00 - 12.40	T075 (WR75 flange)(WR90 flange)(Finish)
WR90 to WR112	WG16 to WG15	R100 to R84	090	8.20 - 10.00	T090 (WR90 flange)(WR112 flange)(Finish)
WR112 to WR137	WG15 to WG14	R84 to R70	112	7.05 - 8.20	T112 (WR112 flange)(WR137 flange)(Finish)
WR137 to WR159	WG14 to WG13	R70 to R58	137	5.85 - 7.05	T137 (WR137 flange)(WR159 flange)(Finish)
WR159 to WR187	WG13 to WG12	R58 to R48	159	4.90 - 5.85	T159 (WR159 flange)(WR187flange)(Finish)
WR187 to WR229	WG12 to WG11	R48 to R40	187	3.95 - 4.90	T187 (WR187 flange)(WR229 flange)(Finish)

* Insert flange code from Table 3, page 222.

Microwave Transmission Lines





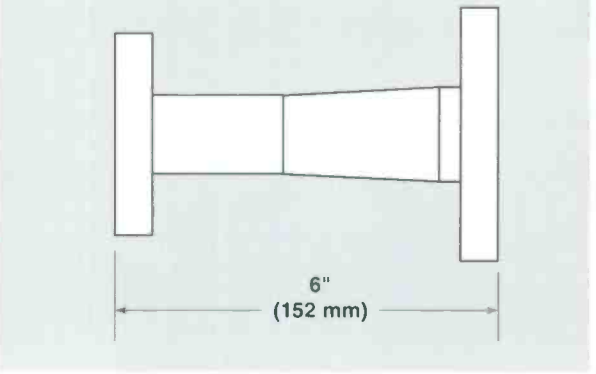
CPR137G Flanges Shown

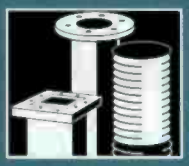
Flex-Twist Sections

EIA	RCSC	IEC	Frequency (GHz)	VSWR 12-36" (300-915mm)	VSWR 36-79" (915-2000mm)	Attenuation dB/ft (dB/m)	Average Power Watts	Peak Power kW	Max Twist deg/ft (deg/m)	Min E-Bend Radius in (mm)	Min H-Bend Radius in (mm)	Pressure lb/in² (kPa)
WR28	WG22	R320	26.50 - 40.00	On Request	On Request	1.00 (3.28)	75	20	155 (510)	1.5 (38)	3.0 (76)	45 (310)
			37.00 - 40.00	1.15	1.20	1.00 (3.28)	75	20	155 (510)	1.5 (38)	3.0 (76)	45 (310)
WR42	WG20	R220	17.70 - 26.50	1.25	1.35	0.80 (2.62)	100	39	155 (510)	1.5 (38)	3.0 (76)	45 (310)
WR51	WG19	R180	15.00 - 22.00	1.20	1.20	0.55 (1.80)	140	60	135 (445)	1.5 (38)	3.0 (76)	45 (310)
WR62	WG18	R140	12.40 - 18.00	1.10	1.20	0.30 (0.99)	400	100	135 (445)	2.0 (52)	4.0 (102)	45 (310)
WR75	WG17	R120	10.00 - 15.00	1.10	1.13	0.18 (0.59)	750	140	110 (360)	2.5 (64)	4.5 (115)	45 (310)
WR90	WG16	R100	8.20 - 12.4	1.10	1.13	0.13 (0.43)	960	180	95 (310)	2.5 (64)	5.0 (127)	45 (310)
			10.2 - 10.7	1.03	1.05	–	–	–	–	–	–	–
			10.7 - 11.7	1.03	1.05	–	–	–	–	–	–	–
WR112	WG15	R84	7.050 - 10.00	1.10	1.13	0.12 (0.40)	1,260	315	80 (264)	3.0 (76)	6.0 (152)	35 (240)
			7.125 - 7.750	1.03	1.05	–	–	–	–	–	–	–
			7.750 - 8.500	1.03	1.05	–	–	–	–	–	–	–
			7.125 - 8.500	1.04	1.05	–	–	–	–	–	–	–
WR137	WG14	R70	5.850 - 8.200	1.10	1.10	0.09 (0.30)	2,000	500	65 (214)	4.0 (102)	8.0 (204)	30 (205)
			5.850 - 6.425	1.03	1.05	–	–	–	–	–	–	–
			6.425 - 7.125	1.03	1.05	–	–	–	–	–	–	–
			7.125 - 7.750	1.03	1.05	–	–	–	–	–	–	–
			5.725 - 6.425	1.03	1.05	–	–	–	–	–	–	–
			7.425 - 7.925	1.03	1.05	–	–	–	–	–	–	–
WR159	WG13	R58	4.900 - 7.050	1.10	1.10	0.08 (2.63)	2,500	1,100	55 (180)	5.0 (127)	10.0 (254)	30 (205)
			5.725 - 6.425	1.03	1.05	–	–	–	–	–	–	–
WR187	WG12	R48	3.95 - 5.85	1.10	1.10	0.05 (0.17)	3,000	1,250	50 (165)	6.5 (165)	13.0 (330)	30 (205)
			4.40 - 5.00	1.03	1.05	–	–	–	–	–	–	–
WR229	WG11	R40	3.30 - 4.90	1.10	1.10	0.04 (0.13)	4,000	1,550	40 (132)	6.5 (165)	13.0 (330)	30 (205)
			3.54 - 4.20	1.03	1.05	–	–	–	–	–	–	–

Taper Transitions

Flange	Flange	Type Number
CPR159G	CPR137G	**T137CCN**
CPR159G	UG Cover/Gasket (WR137)	**T137YCN**
CMR159	CMR137	**T137EEN**
CMR159	CPR137G	**T137CEN**
CPR137G	CPR112G	**T112CCN**
CPR137G	UG Cover/Gasket (WR112)	**T112YCN**
UG Cover/Gasket (WR137)	UG Cover/Gasket (WR112)	**T112YYN**
UG Cover/Gasket (WR112)	UG Cover/Gasket (WR90)	**T090YYN**
CPR90G	UG Cover/Gasket (WR75)	**T075YCN**
UG Cover/Gasket (WR90)	UG Cover/Gasket (WR75)	**T075YYN**





Microwave Transmission Lines

Transition to Type N Female

Flange Adapters are available in many commonly used configurations, and when used with standard components, provide a quick solution to almost any interconnection requirement. All Andrew standard flange adapters are 4 inches (102 mm) in length.

Waveguide to Coaxial Adapters. Ordering information for standard waveguide to coaxial adapters is included in the tables on pages 228 to 231.

Common Flange Adapters

Flange Type	FlangeType	Adapter Type Number
UG-51/U	CPR112G	**A112BCN**
UG-52B/U	CPR112G	**A112ACN**
UG Cover / Gasket	CPR137G	**A137CYN**
CMR90	CPR90G	**A090CEN**
CMR112	CPR112G	**A112CEN**
CMR137	CPR137G	**A137CEN**
CMR159	CPR159G	**A159CEN**
CMR187	CPR187G	**A187CEN**
CMR229	CPR229G	**A229CEN**

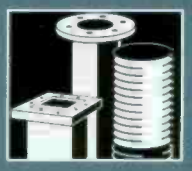
All above flange adapters have VSWR 1.05 (32.3dB)

Other coaxial interfaces (for example, N-type male) are available. Where immediate availability is a consideration, you may choose to order the standard product and use a coaxial adapter to convert the interface. Other waveguide flange options are available on request.

Waveguide to Coaxial Adapters

EIA	RCSC	IEC	Size Code	Frequency Code	Frequency (GHz)	Waveguide to Coax Adapters N-type VSWR	SMA VSWR
WR28	WG22	R320	028	S	26.50 - 40.00	**	**
				A	37.00 - 40.00	**	**
WR42	WG20	R220	042	S	17.70 - 26.50	**	1.35
WR51	WG19	R180	051	S	15.00 - 20.00	**	1.05
WR62	WG18	R140	062	S	12.40 - 18.00	1.25	1.25
WR75	WG17	R120	075	S	10.00 - 15.00	1.20	1.25
WR90	WG16	R100	090	S	8.20 - 12.4	1.20	On Request
				A	10.2 - 10.7	1.10	On Request
				B	10.7 - 11.7	1.10	On Request
WR112	WG15	R84	112	S	7.050 - 10.00	1.20	On Request
				A	7.125 - 7.750	1.10	On Request
				B	7.750 - 8.500	1.10	On Request
				C	7.125 - 8.500	1.15	On Request
WR137	WG14	R70	137	S	5.850 - 8.200	1.15	On Request
				A	5.850 - 6.425	1.10	On Request
				B	6.425 - 7.125	1.10	On Request
				C	7.125 - 7.750	1.10	On Request
				D	5.725 - 6.425	1.10	On Request
				E	7.425 - 7.925	1.10	On Request
WR159	WG13	R58	159	S	4.900 - 7.050	1.15	On Request
				A	5.725 - 6.425	1.10	On Request
WR187	WG12	R48	187	S	3.95 - 5.85	1.20	On Request
				A	4.40 - 5.00	1.10	On Request
WR229	WG11	R40	229	S	3.30 - 4.90	1.10	On Request

** The frequency range for these components is too high for normal operation of N-type or SMA coaxial interfaces.
Coaxial Interface Codes: N-type Female (N), SMA Female (S).



Pressure Inlet is 0.62-1.00 inches (16-25 mm) thick, depending on waveguide size, machined brass section with 1/8" female pipe thread and plug. Unit does not have a pressure window.

Pressure Window. Maximum pressure for window is 10 lb/in² (70 kPa). Unit does not have a pressure inlet. High power versions for earth station applications are presented on page 232.

Thickness of standard pressure windows:

All except 55000A-42, -75, -137, -187, 112587, 110088.....0.06 in (1.5 mm)

55000A-75, -137, -187, 110088:.....0.229 in (5.8 mm)

55000A-42, 112587:.....0.375 in (9.5 mm)

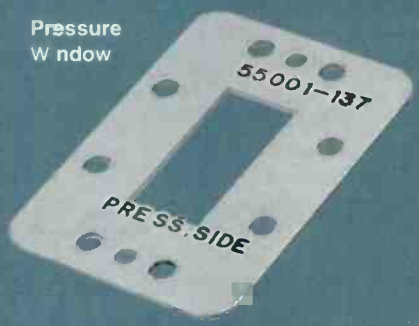
Pressure Window/Inlet. Combination of above pressure window and pressure inlet.

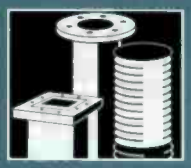
Field Flanges are for field fabrication of waveguide sections for use on interior waveguide runs. Flange hardware and pressure gasket are included. Use soft solder to attach.

Silver Solder Flanges are manufactured to EIA or MIL specifications. The flanges are not intended for field installation. Hardware is not included. Material is brass.

Flange Gaskets and Hardware. Andrew waveguide components are supplied with hardware and flange sealing gasket. Waveguide components with identical or compatible flange (for example, choke and cover), are supplied with one flange hardware kit. If the flanges differ or are incompatible (for example, PDR and PBR), one hardware kit for each flange is supplied.

Andrew IEC hardware kits do not include shouldered bolts (according to IEC154-2), however the set screws provided allow these kits to be cost effective while minimizing flange misalignment VSWR. The quoted VSWR for all IEC flanged components for all Andrew waveguide components are achievable using the hardware kits supplied.

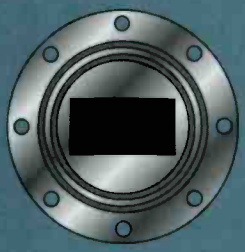




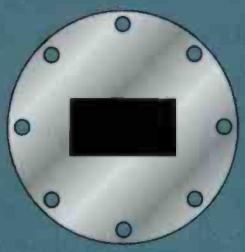
Microwave Transmission Lines

Flanges for Standard Components

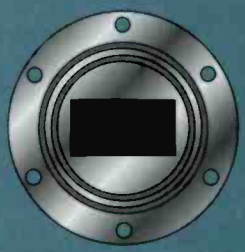
For detailed information on flanges, see pages 234-236.



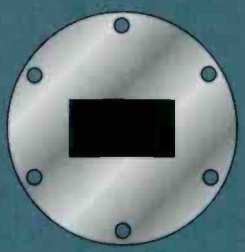
UG-148C/U
UG-54B/U



UG-149A/U
UG-53/U*

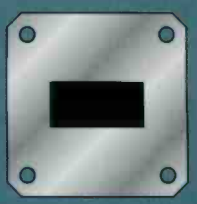


UG-343B/U



UG-344/U

UG-52B/U
UG-40B/U
WR75 Choke
UG-541A/U
UG-596A/U



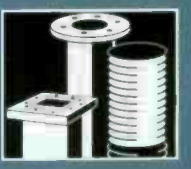
UG-51/U
UG-39/U
WR75 Cover
UG-419/U
UG-595/U

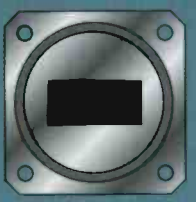
Type Numbers for Rigid Waveguide Components – with UG Choke/UG Cover Flanges

Waveguide Size	EIA-	WR187	WR137	WR112	WR90
	IEC-	R48	R70	R84	R100
	RCSC-	WG12	WG14	WG15	WG16
Choke Flange		UG-148C/U	UG-343B/U	UG-52B/U	UG-40B/U
Cover Flange		UG-149A/U	UG-344/U	UG-51/U	UG-39/U
Straight Section, Variable Length		R187(*u*)A(*size*)B(*)N	R137(*u*)A(*size*)B(*)N	R112(*u*)A(*size*)B(*)N	R090(*u*)A(*size*)B(*)N
2 ft Flex-Twist		F187PA0240B(*)	F137PA0240B(*)	F112PA0240B(*)	F090PA0240B(*)
3 ft Flex-Twist		F187PA0360B(*)	F137PA0360B(*)	F112PA0360B(*)	F090PA0360B(*)
90° E-Plane Elbow		E187PA070B070(*)N	E137PA040B040(*)N	E112PA040B040(*)N	E090PA036B036(*)N
90° H-Plane Elbow		H187PA070B070(*)N	H137PA040B040(*)N	H112PA040B040(*)N	H090PA036B036(*)N
90° Twist		D187AB(*)N	D137AB(*)N	D112AB(*)N	D090AB(*)N
Pressure Inlet		55675-187	55675-137	55675-112	55675-90
Pressure Window		55000A-187	55000A-137	55000-112	55000A-90
Pressure Window / Inlet		**	53648-137	**	53648-90
Field Choke Flange		53015-187	53015-137	53015-112	53015-90
Field Cover Flange		53025-187	53025-137	53025-112	53025-90
Silver Solder Choke Flange		52084	17690	52153	22534
Silver Solder Cover Flange		52086-2	19048-3	52152-2	19056-2
Flange Hardware Kit		55224-187	55224-137	55224-112	55224-90
Flange Gasket		10683-307	10683-304	10683-305	10683-329
UG Choke to Type N Female Adapter		C187AN(*)G	C137AN(*)G	C112AN(*)G	C090AN(*)G
UG Cover to Type N Female Adapter		C187BN(*)G	C137BN(*)G	C112BN(*)G	C090BN(*)G

Waveguide Size	EIA-	WR75	WR62	WR42
	IEC-	R120	R140	R220
	RCSC-	WG17	WG18	WG20
Choke Flange		WR75	UG-541A/U	UG-596A/U
Cover Flange		WR75	UG-419/U	UG-595/U
Straight Section, Variable Length		R075(*u*)A(*size*)BSN	R062(*u*)A(*size*)BSN	R042(*u*)A(*size*)BSN
2 ft Flex-Twist		F075PA0240BS	F062PA0240BS	F042PA0240BS
3 ft Flex-Twist		F075PA0360BS	F062PA0360BS	F042PA0360BS
90° E-Plane Elbow		E075PA036B036SN	E062PA026B026SN	E042PA023B023SN
90° H-Plane Elbow		H075PA036B036SN	H062PA026B026SN	H042PA023B023SN
90° Twist		D075ABSN	D062ABSN	D042ABSN
Pressure Inlet		55675-75	55675-62	55675-42
Pressure Window		55000A-75	55000-62	55000A-42
Pressure Window / Inlet		53648-75	**	53648-42
Field Choke Flange		53015-75	53015-62	53015-42
Field Cover Flange		53025-75	53025-62	53025-42
Silver Solder Choke Flange		51752	53238	53558
Silver Solder Cover Flange		51745-2	53239-2	53559-2
Flange Hardware Kit		55224-75	55224-62	55224-42
Flange Gasket		10683-312	10683-319	10683-328
UG Choke to Type N Female Adapter		C075AN(*)G	C062AN(*)G	**
UG Cover to Type N Female Adapter		C075BN(*)G	C062BN(*)G	**

* Specify the frequency code from the Size and Frequency Codes table on page 222. ** Not available. ***u*** Unit of measure. Specify P for imperial (inches) or M for metric (millimeters). ***size*** Straight section length code. Specify the length using four digits. For example, 4.0 inches = 0040, 14.6 inches = 0146, 90 mm = 0090, and 190 mm = 0190. Maximum length is 144 inches (3660 mm). Complete type number must contain 13 characters.





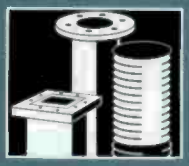
PBR84
PBR100
PBR120
PBR140
PBR220
PBR320

Type Numbers for Rigid Waveguide Components – with PBR/PBR Flanges

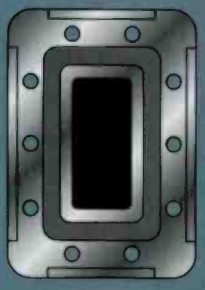
Waveguide Size	EIA-	WR112	WR90	WR75
	IEC-	R84	R100	R120
	RCSC-	WG15	WG16	WG17
Both Flanges		PBR84	PBR100	PBR120
Straight Section, Variable Length		R112(*u*)K(*size*)K(*)N	R090(*u*)K(*size*)K(*)N	R075(*u*)K(*size*)KSN
600mm Flex-Twist		F112MK0600K(*)	F090MK0600K(*)	F075MK0600KS
900mm Flex-Twist		F112MK0900K(*)	F090MK0900K(*)	F075MK0900KS
90° E-Plane Elbow		E112MK102K102(*)N	E090MK091K091(*)N	E075MK091K091SN
90° H-Plane Elbow		H112MK102K102(*)N	H090MK091K091(*)N	H075MK091K091SN
90° Twist		D112KK(*)N	D090KK(*)N	D075KKSN
Pressure Inlet		**	**	243495-120
Pressure Window		243498-84	243498-100	110088
Pressure Window/Inlet		**	**	**
Field Flange		**	**	**
Silver Solder Flange		**	**	108671-2
Flange Hardware Kit		100845-12	100845-13	100845-8
Flange Gasket		114111	106837-5	106837-4
Coaxial Adapter, Type N female		C112KN(*)G	C090KN(*)G	C075KNSG
Coaxial Adapter, SMA female		On Request	On Request	C075KSSG

Waveguide Size	EIA-	WR62	WR42	WR28
	IEC-	R140	R220	R320
	RCSC-	WG18	WG20	WG22
Both Flanges		PBR140	PDB220	PBR320
Straight Section, Variable Length		R062(*u*)K(*size*)KSN	R042(*u*)K(*size*)KSN	R028(*u*)K(*size*)K(*)N
600mm Flex-Twist		F062MK0600KS	F042MK0600KS	F028MK0600K(*)
900mm Flex-Twist		F062MK0900KS	F042MK0900KS	F028MK0900K(*
90° E-Plane Elbow		E062MK066K066SN	E042MK058K058SN	E028MK051K051(*)N
90° H-Plane Elbow		H062MK066K066SN	H042MK058K058SN	H028MK051K051(*)N
90° Twist		D062KKSN	D042KKSN	D028KK(*)N
Pressure Inlet		243495-140	243495-220	243495-320
Pressure Window		110089	112587	112626
Pressure Window/Inlet		**	**	**
Field Flange		**	**	**
Silver Solder Flange		110107	110037	110079
Flange Hardware Kit		100845-11	106838	107031
Flange Gasket		114110	106837-1	10683-451
Coaxial Adapter, Type N female		C062KNSG	**	**
Coaxial Adapter, SMA female		C062KSSG	C042KSSG	**

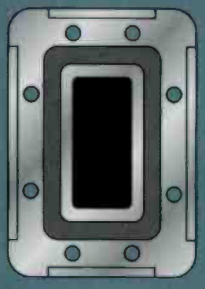
* Specify the frequency code from the Size and Frequency Codes table on page 222. ** Not available. ***u*** Unit of measure. Specify P for Imperial (inches) or M for metric (millimeters). ***size*** Straight section length code. Specify the length using four digits. For example, 4.0 inches = 0040, 14.6 inches = 0146, 90 mm = 0090, and 190 mm = 0190. Maximum length is 144 inches (3660 mm). Complete type number must contain 13 characters.
PBR180 flanged components available on request.



Microwave Transmission Lines



CPR229G



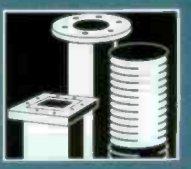
CPR187G
CPR159G
CPR137G
CPR112G
CPR90G

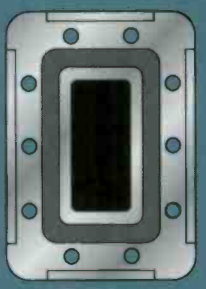
Type Numbers for Rigid Waveguide Components – with CPR( )G/CPR( )G Flanges

Waveguide Size	EIA-	WR229	WR187	WR159
	IEC-	R40	R48	R58
	RCSC-	WG11A	WG12	WG13
Both Flanges		CPR229G	CPR187G	CPR159G
Straight Section, Variable Length		R229(*u*)C(*size*)C(*)N	R187(*u*)C(*size*)C(*)N	R159(*u*)C(*size*)C(*)N
2 ft Flex-Twist		F229PC0240C(*)	F187PC0240C(*)	F159PC0240C(*)
3 ft Flex-Twist		F229PC0360C(*)	F187PC0360C(*)	F159PC0360C(*)
90° E-Plane Elbow		E229PC078C078(*)N	E187PC070C070(*)N	E159PC070C070(*)ND
90° H-Plane Elbow		H229PC078C078(*)N	H187PC070C070(*)N	H159PC070C070(*)N
90° Twist		D229CC(*)N	D187CC(*)N	D159CC(*)N
Pressure Inlet		55674-229	55674-187	55674-159
Pressure Window		55001-229	55001-187	55001-159
Pressure Window / Inlet		**	**	55463-159
Field Flange		56045-229	56045-187	56045-159
Silver Solder Flange		55456-1	56309-1	54754-1
Flange Hardware Kit		55219-229	55219-187	55219-159
Full Thickness Flange Gasket		31619	55688	54769
Half Thickness Gasket		55072-229	55072-187	55072-159
Coaxial Adapter, Type N female		C229CN(*)G	C187CN(*)G	C159CN(*)G
Coaxial Adapter, SMA female		On Request	On Request	On Request

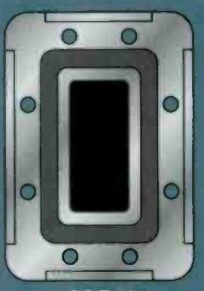
Waveguide Size	EIA-	WR137	WR112	WR90
	IEC-	R70	R84	R100
	RCSC-	WG14	WG15	WG16
Both Flanges		CPR137G	CPR112G	CPR90G
Straight Section, Variable Length		R137(*u*)C(*size*)C(*)N	R112(*u*)C(*size*)C(*)N	R090(*u*)C(*size*)C(*)N
2 ft Flex-Twist		F137PC0240C(*)	F112PC0240C(*)	F090PC0240C(*)
3 ft Flex-Twist		F137PC0360C(*)	F112PC0360C(*)	F090PC0360C(*)
90° E-Plane Elbow		E137PC040C040(*)N	E112PC040C040(*)N	E090PC036C036(*)N
90° H-Plane Elbow		H137PC040C040(*)N	H112PC040C040(*)N	H090PC036C036(*)N
90° Twist		D137CC(*)N	D112CC(*)N	D090CC(*)N
Pressure Inlet		55674-137	55674-112	55674-90
Pressure Window		55001-137	55001-112	55001-90
Pressure Window / Inlet		55463-137	55463-112	55463-90
Field Flange		56045-137	56045-112	56045-90
Silver Solder Flange		62137-3	54560-1	54681-2
Flange Hardware Kit		55219-137	55219-112	55219-90
Full Thickness Flange Gasket		28030	32349	31861
Half Thickness Gasket		55072-137	55072-112	55072-90
Coaxial Adapter, Type N female		C137CN(*)G	C112CN(*)G	C090CN(*)G
Coaxial Adapter, SMA female		On Request	On Request	On Request

* Specify the frequency code from the Size and Frequency Codes table on page 222. ** Not available. ***u*** Unit of measure. Specify P for imperial (inches) or M for metric (millimeters). ***size*** Straight section length code. Specify the length using four digits. For example, 4.0 inches = 0040, 14.6 inches = 0146, 90 mm = 0090, and 190 mm = 0190. Maximum length is 144 inches (3660 mm). Complete type number must contain 13 characters.

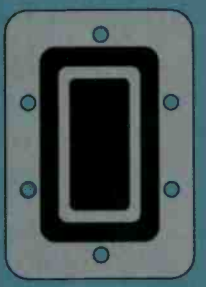




PDR40



PDR48
PDR70
PDR84
PDR100



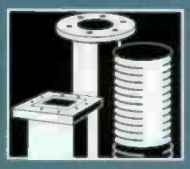
PDR120
PDR140
PDR180

Type Numbers for Rigid Waveguide Components – with PDR/PDR Flanges

Waveguide Size Both Flanges	EIA- IEC- RCSC-	WR229 R40 WG11A PDR40	WR187 R48 WG12 PDR48	WR137 R70 WG14 PDR70	WR112 R84 WG15 PDR84
Straight Section, Variable Length		R229(*u*)H(*size*)H(*)N	R187(*u*)H(*size*)H(*)N	R137(*u*)H(*size*)H(*)N	R112(*u*)H(*size*)H(*)N
600mm Flex-Twist		F229MH0600H(*)	F187MH0600H(*)	F137MH0600H(*)	F112MH0600H(*)
900mm Flex-Twist		F229MH0900H(*)	F187MH0900H(*)	F137MH0900H(*)	F112MH0900H(*)
90° E-Plane Elbow		E229MH198H198(*)N	E187MH178H178(*)N	E137MH102H102(*)N	E112MH102H102(*)N
90° H-Plane Elbow		H229MH198H198(*)N	H187MH178H178(*)N	H137MH102H102(*)N	H112MH102H102(*)N
90° Twist		D229HH(*)N	D187HH(*)N	D137HH(*)N	D112HH(*)N
Pressure Inlet		114112-40	114112-48	114112-70	114112-84
Pressure Window		223306-40	223306-48	223306-70	223306-84
Pressure Window/ Inlet		**	**	**	**
Field Flange		**	**	**	**
Silver Solder Flange		110066	221715-48	221715-70	221715-84
Flange Hardware Kit		100899-5	107709	106803	100845-6
Flange Gasket		106945	107710	104246	107192
Coaxial Adapter, Type N female		C229HN(*)G	C187HN(*)G	C137HN(*)G	C112HN(*)G
Coaxial Adapter, SMA female		On Request	On Request	On Request	On Request

Waveguide Size Both Flanges	EIA- IEC- RCSC-	WR90 R100 WG16 PDR100	WR75 R120 WG17 PDR120	WR62 R140 WG18 PDR140	WR51 R180 WG19 PDR180
Straight Section, Variable Length		R090(*u*)H(*size*)H(*)N	R075(*u*)H(*size*)HSN	R062(*u*)H(*size*)HSN	R051(*u*)H(*size*)HSN
600mm Flex-Twist		F090MH0600H(*)	F075MH0600HS	F062MH0600HS	F051MH0600HS
900mm Flex-Twist		F090MH0900H(*)	F075MH0900HS	F062MH0900HS	F051MH0900HS
90° E-Plane Elbow		E090MH091H090(*)N	E075MH091H090SN	E062MH066H066SN	On Request
90° H-Plane Elbow		H090MH091H090(*)N	H075MH091H090SN	H062MH066H066SN	On Request
90° Twist		D090HH(*)N	D075HHSN	D062HHSN	On Request
Pressure Inlet		114112-100	114112-120	114112-140	On Request
Pressure Window		223306-100	223306-120	223306-140	223306-180
Pressure Window/ Inlet		**	**	**	**
Field Flange		**	**	**	**
Silver Solder Flange		221715-100	221715-120	221715-140	110181
Flange Hardware Kit		107132	100845-3	100845-7	107681
Flange Gasket		107144	106337	107206	107682
Coaxial Adapter, Type N female		C090HN(*)G	C075HNSG	C062HNSG	**
Coaxial Adapter, SMA female		On Request	C075HSSG	C062HSSG	C051HSSG

* Specify the frequency code from the Size and Frequency Codes table on page 222. ** Not available. *u* Unit of measure. Specify P for imperial (inches) or M for metric (millimeters). ***size*** Stralght section length code. Specify the length uslng four digits. For example, 4.0 inches = 0040, 14.6 inches = 0146, 90 mm = 0090, and 190 mm = 0190. Maximum length is 144 inches (3660 mm). Complete type number must contain 13 characters.
PDR58 flanged components available on request.



Microwave Transmission Lines

High Power Components for Earth Station Applications

Waveguide Size	Frequency Band, GHz	Flex Twist & Flex (No Twist) 1 ft (0.3 m)	2 ft (0.6 m)	3 ft (0.9 m)	Pressure Window Type No.	Average Power Watts	Flange Mates with	VSWR max. (R.L., dB)
Flex-Twist Section								
WR137	5.925-6.425	**162047-12**	**162047-24**	**162047-36**	–	2900	CRP137G	1.10 (26.4)
WR75	10.95-14.5	**163228-12**	**163228-24**	**163228-36**	–	1000	Cover and Cover/Gasket	1.10 (26.4)
Flex (No Twist) Section								
WR137	5.925-6.425	**162048-12**	**162048-24**	**162048-36**	–	4400	CPR137G	1.10 (26.4)
Pressure Window								
WR137	5.850-6.425	–	–	–	**202378**	1000	CPR137G	1.10 (26.4)
					202378-2	5000	CPR137G	1.10 (26.4)
WR159	5.850-6.425	–	–	–	**202378-5**	5000	CPR159G	1.10 (26.4)
WR75	14.0-14.5	–	–	–	**202378-3**	2000	Choke and cover	1.10 (26.4)
					202378-4	500	Choke and cover	1.10 (26.4)

Power Dividers have 1.03 maximum VSWR, within the operating band stated in the table below. Insertion loss is 3 ±0.25 dB for each port. Power divides from "In" port to "Out" ports (refer to diagram. Power dividers cannot be used as combiners.

Standard Termination Loads for unused rectangular waveguide port of dual polarized microwave antennas. Maximum VSWR is 1.10. Low VSWR loads for use with circular waveguide transitions are listed on page 242. Flange blanking plates, and termination loads used with IEC flange types are available on request.

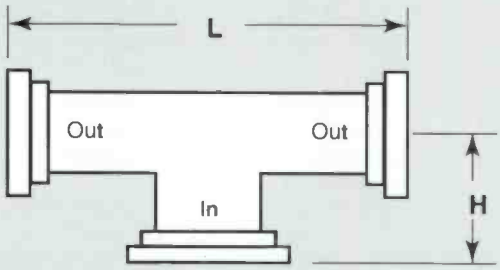
Two-Way Power Dividers

Waveguide Type	Frequency Band, GHz	Flanges Mate With	Dimensions In (mm) L	H	Type No.
WR75	12.7-13.2	WR75 Choke or Cover**	5.00 (127)	1.38 (33)	**62832-127**
WR137	5.925-6.425	UG-344/U, UG-343B/U**	5.00 (127)	1.69 (43)	**62835-59**
WR137	6.425-7.125	UG-344/U, UG-343B/U**	5.00 (127)	1.69 (43)	**62835-64**
WR137	6.425-7.125	CPR137G	5.00 (127)	1.69 (43)	**62844-64**

**Compatible cover/gasket flanges mate with either choke or cover flanges.

Standard Termination Loads

Mates with Flange Type	Load Type No.
CPR229G	**39099-229**
CPR187G	**39099-187**
UG-148C/U	**39098-187**
CPR159G	**39099-159**
CPR137G	**39099-137**
UG-343B/U	**39098-137**
CPR112G	**39099-112**
UG-52B/U	**39098-112**
CPR90G	**39099-90**
UG-40B/U	**39098-90**
WR75 Choke	**39098-75**
UG-596A/U	**39098-42**
7/8" EIA Flange	**43734**



Hangers. Hardware is stainless steel. Attach using angle adapter or threaded rod support kit described below.

A Rigid Hanger.....Type **19007-(*)**

A Sliding Hanger .....Type **19008-(*)**

*Insert numeral portion of EIA waveguide designation, i.e., 19007-137 is rigid hanger for WR137 waveguide.

B Flex-Twist Section Hanger. Use to minimize vibration and movement. Includes 3/8" diameter, 24 in (610 mm) long stainless steel threaded rod, nuts and washers.

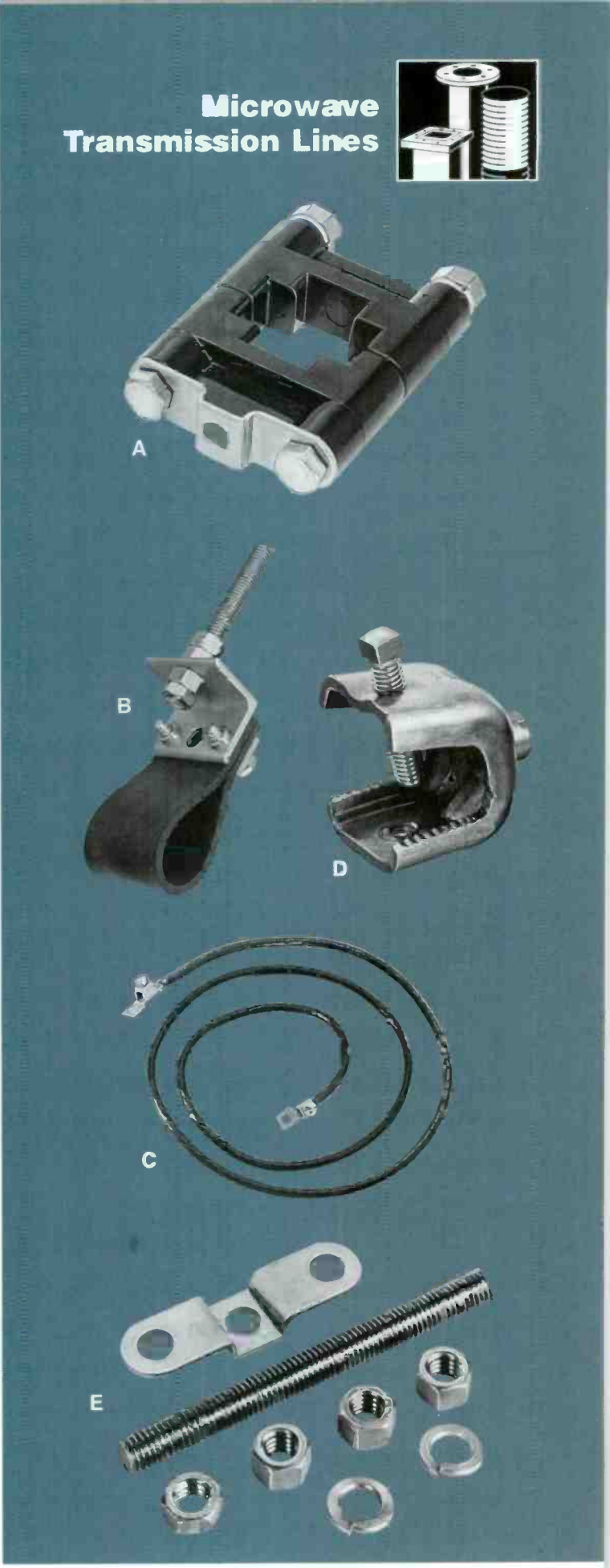
Waveguide	Type Number
WR229	**66412-229**
WR159	**66412-159**
WR137	**66412-137**
WR90	**66412-90**

C Current By-Pass Kit. Five feet (1.5 m) of No. 6 copper wire and lugs to provide a low-loss current path around flexible waveguide sections .....Type **49486**

D Angle Adapter Kit. Includes 10 stainless steel clamps to mount hangers to angle support members up to 7/8 in (22 mm) thick .....Type **31768A**

E Threaded Rod Support Kit. Stainless steel. Use to mount hangers away from supporting structure, under waveguide bridge and inside equipment room. Includes 3/8" diameter threaded rod, nuts and washers. Attach to ceiling using included ceiling mounting plate.

12 in (305 mm) rod .....Type **31771**
12 in (305 mm) rod, kit of 5.....Type **31771-4**
24 in (610 mm) rod .....Type **31771-9**
24 in (610 mm) rod, kit of 5.....Type **31771-6**



Rectangular Waveguide Flanges

A majority of Andrew standard flanges utilized in North America are based on EIA (Electronic Industry Association) or U. S. Military (MIL) standards. IEC (International Electrotechnical Commission) standards are utilized throughout other parts of the world. EIA, MIL and IEC flanges are compatible but not identical. Variations in equivalent flanges include slight differences in nominal dimensions, tolerances, gasket style and thickness, and addition or deletion of alignment pins and holes or alignment bolts. Compatible flanges are listed in the tables on the following pages. The three basic types of flanges utilized throughout the industry are unpressurizable contact, pressurizable contact, and choke/cover flanges. It should be noted that these three flange types are not interchangeable.

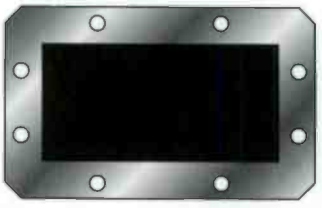


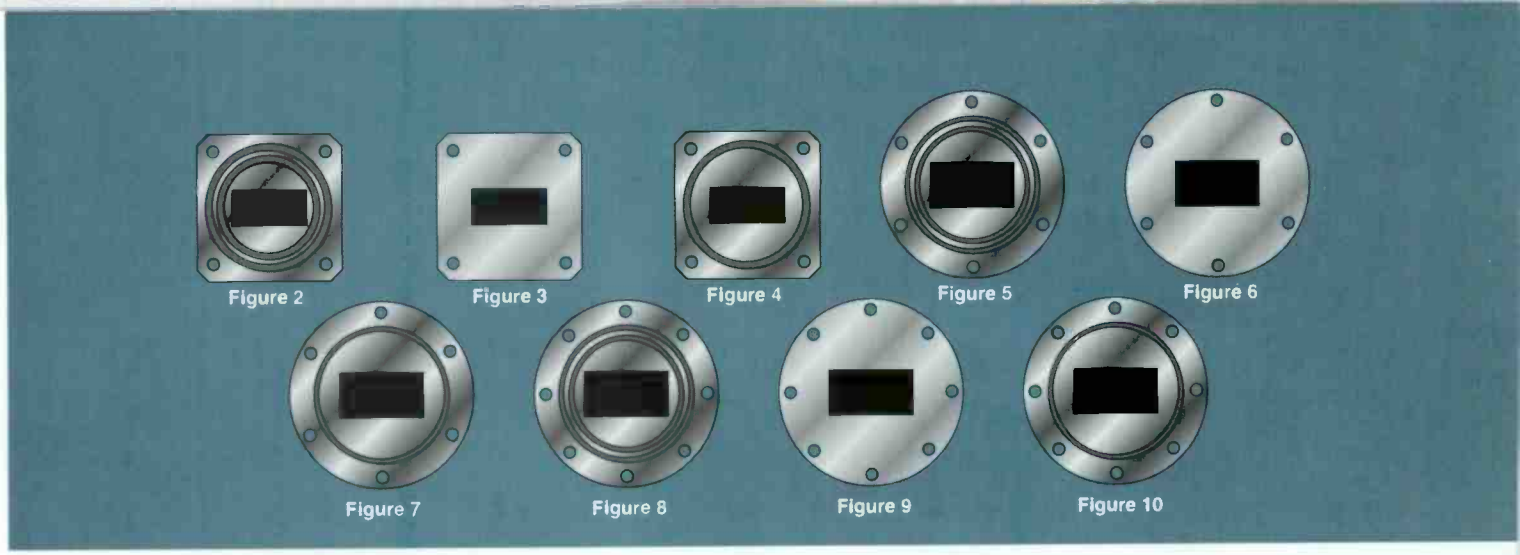
Figure 1
Unpressurizable Contact Flange – Always Rectangular

Unpressurizable Contact Flanges

CMR and UER Series Contact Flanges are not pressurizable and do not require gaskets. CMR flanges are always rectangular in shape, have alternate tapped and clear holes and are secured with bolts only. The IEC equivalents have all clear holes and are secured with bolts, nuts and lockwashers.

Unpressurizable Contact Flanges

Waveguide Type, EIA	Flange Series Equivalents EIA	IEC	Fig. No.	Dimensions, Inches (Millimeters)
WR90	CMR90	UER100	1	1.77 x 1.27 (45.0 x 32.3)
WR112	CMR112	UER84	1	2.02 x 1.38 (51.3 x 35.1)
WR137	CMR137	UER70	1	2.28 x 1.53 (57.9 x 38.9)
WR159	CMR159	UER58	1	2.50 x 1.75 (63.5 x 44.5)
WR187	CMR187	UER48	1	2.78 x 1.78 (70.6. x 45.2)
WR229	CMR229	UER40	1	3.16 x 2.00 (80.3 x 50.8)



Choke, Cover and Cover/Gasket Flanges

Choke, cover and cover/gasket flanges are square or round, depending on waveguide size. U. S. MIL and IEC versions are interchangeable. The flanges are pressurizable and require gaskets to ensure proper sealing. The flanges mate as explained below and as specified in the Mating Information table.

Choke Flanges CBR, CAR and Equivalent UG Series include a gasket groove, choke, and tapped holes for mating with cover flanges. Two choke flanges cannot be mated.

Cover Flanges - UBR, UAR and Equivalent UG Series are flat, without a gasket groove, and have clear holes for mating with choke flanges and other cover flanges. Use of a special seal is required for pressurization of two mating cover flanges.

Cover/Gasket Flanges - PBR and PAR Series are flat, include a gasket groove, and have clear holes for mating with cover, choke, or other cover/gasket flanges. Cover/gasket flanges use a single gasket when mated with cover flanges and a double gasket when mated with choke flanges or other cover/gasket flanges. When using a double gasket, at least one should have rectangular cross section.

"C-Series HELIAX® Elliptical Waveguide Connectors (for example, 252DCT) are functionally identical to PAR/PBR (cover gasket) series and the above mating information applies.

Choke, Cover and Cover/Gasket Flanges

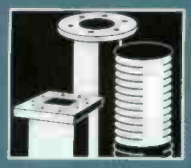
Waveguide Type, EIA	Choke Flanges U.S. MIL	Choke Flanges IEC	Choke Flanges Fig No.	Cover Flanges U.S. MIL	Cover Flanges IEC	Cover Flanges Fig No.	Cove/Gasket Flanges IEC	Cove/Gasket Flanges Fig No.	Flange Dimensions Inches (Millimeters)
WR42	UG-596A/U	CRR220	2	UG-595/U	UBR220	3	PBR220	4	0.88 (22.4) sq.
WR62	UG-541A/U	CBR140	2	UG-419/U	UBR140	3	PBR140	4	1.31 (33.3) sq.
WR75	51752*	CBR120	2	51745*	UBR120	3	UBR120	4	1.50 (38.1) sq.
WR90	UG-40B/U	CBR100	2	UB-39/U	UBR100	3	PBR100	4	1.63 (41.4) sq.
WR112	UG-52B/U	CBR84	2	UG-51/U	UBR84	3	PBR84	4	1.88 (47.8) sq.
WR137	UG-343B/U	CAR70	5	UG-344/U	UAR70	6	PAR70	7	3.13 (79.5) dia.
WR159	–	CAR58	5	–	UAR58	6	PAR58	7	3.38 (85.9) dia.
WR187	UG-148C/U	CAR48	8	UG-149A/U	UAR48	9	PAR48	10	3.63 (92.2) dia.
WR284	UG-54B/U	CAR32	8**	UG-53/U	UAR32	9**	PAR32	10**	5.31 (134.9) dia.

*Andrew type numbers for WR75 flanges. **Bolt hole positions are rotated 22.5° from the positions shown.

Mating Information - Choke/Cover Flanges (Square or Round)

	Choke UG	Choke CBR, PBR	Cover UG	Cover UBR,UAR	Cover/Gasket PBR, PAR
Choke UG	Does NOT Mate	Does NOT Mate	Mates	Mates	Mates
Choke CBR, CAR	Does NOT Mate	Does NOT Mate	Mates	Mates	Mates
Cover UG	Mates	Mates	Mates (NOT pressurizable)	Mates (NOT pressurizable)	Mates
Modified UG Cover w/ Gasket Groove	Mates	Mates	Mates	Mates	Mates
Cover UBR, UAR	Mates	Mates	Mates (NOT pressurizable)	Mates (NOT pressurizable)	Mates
Cover/Gasket PBR, PAR, #	Mates	Mates	Mates	Mates	Mates

Also applies to "C-series " and "M-series" (Metric) HELIAX elliptical waveguide connectors (i.e. 252DCT, 252DCMT etc.).



Microwave Transmission Lines

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

Various Contact Flanges – Always Rectangular

Pressurizable Contact Flanges

CPR and PDR series contact flanges are rectangular in shape and have clear holes secured with bolts and nuts. The flanges are pressurizable and require gaskets to ensure proper sealing. The flanges mate as explained below and as specified in the Mating Information table.

CPR( )G Series include a gasket groove and mate with another CPR( )G using the supplied full thickness gasket and U. S. hardware.

PDR Series include a gasket groove and mate with another PDR using the supplied two gaskets and metric hardware. Compared with CPR( )G, PDR flanges have deeper gasket grooves and use different gaskets.

CPR( )F Series do not include a gasket groove and, when mated with another CPR( )F, require a special seal. CPR( )F mates with CPR( )G using a CPR half gasket (order separately from table below).

To Mate CPR( )G with PDR use one CPR half thickness gasket (order separately from table below) and the gasket supplied with the PDR flange. Except where noted otherwise in the table, either U.S. (CPR) or metric (PDR) hardware can be used. Small tolerance differences between U. S. and metric hardware to mate CPR/PDR flanges result in negligible VSWR contributions.

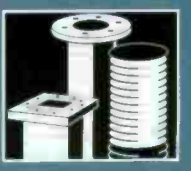
"E-Series" HELIAX Elliptical Waveguide Connectors (for example, 252DET) are functionally identical to CPR( )G series and the above mating information applies.

Pressure Windows normally do not have gasket grooves and include one CPR half-thickness gasket for mating with CPR( )G series flanges.

Pressurizable Contact Flanges

Waveguide Type, EIA	With Groove EIA	With Groove MIL Type	With Groove IEC	Fig. No.	Without Groove EIA	Without Groove MIL Type	Fig. No.	Dimensions, Inches (Millimeters)
WR75	–	–	PDR120	1	–	–	–	1.94 x 1.57 (49.2 x 39.9)
WR90	CPR90G	UG-1360/U	PDR100*	2	CPR90G	UG-1736/U	3	2.09 x 1.59 (53.1 x 40.4)
WR112	CPR112G	UG-1358/U	PDR84*	2	CPR112F	UG-1734/U	3	2.50 x 1.75 (63.5 x 44.5)
WR137	CPR137G	UG-1356/U	PDR70**	2	CPR137F	UG-1732/U	3	2.69 x 1.94(68.3 x 49.3)
WR159	CPR159G	UG-1354/U	PDR58	2	CPR159F	UG-1730/U	3	3.19 x 2.44 (81.0 x 62.0)
WR187	CPR187G	UG-1352/U	PDR48	2	CPR187F	UG-1728/U	3	3.50 x 2.50 (88.9 x 63.5)
WR229	CPR229G	UG-1350/U	PDR40	4	CPR229F	UG-1726/U	5	3.88 x 2.75 (98.6 x 69.9)
WR284	CPR284G	UG-1348/U	PDR32	4	CPR284F	UG-1724/U	5	4.50 x 3.00 (114 x 76.2)
WR340	CPR340G	UG-1346/U	PDR26	4	CPR340F	UG-1712/U	5	5.44 x 3.75 (138 x 95.3)
WR430	CPR430G	UG-1344/U	PDR22	4	CPR430F	UG-1716/U	5	6.34 x 4.19 (161 x 106)

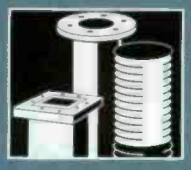
*Mates with equivalent CPR series flange with 4 mm hardware only. **Mates with equivalent CPR series flange with U.S. #10 hardware only.



Mating Information - Contact Flanges (Rectangular)

	CPR( )G	CPR( )F	PDR
CPR90G†	Mates	Mates using Half Thickness Gasket 55072-90*	Mates using Half Thickness Gasket 55072-90* and 4mm Hardware**
CPR112G†	Mates	Mates using Half Thickness Gasket 55072-112*	Mates using Half Thickness Gasket 55072-112 * and 4mm Hardware**
CPR137G†	Mates	Mates using Half Thickness Gasket 55072-137*	Mates using Half Thickness Gasket 55072-137 * and #10 Hardware***
CPR159G†	Mates	Mates using Half Thickness Gasket 55072-159*	Mates using Half Thickness Gasket 55072-159* and Either Hardware Supplied
CPR187G†	Mates	Mates using Half Thickness Gasket 55072-187*	Mates using Half Thickness Gasket 55072-187* and Either Hardware Supplied
CPR229G†	Mates	Mates using Half Thickness Gasket 55072-229*	Mates using Half Thickness Gasket 55072-229* and Either Hardware Supplied
CPR284G†	Mates	Mates using Half Thickness Gasket 55072-284*	Mates using Half Thickness Gasket 55072-284* and Either Hardware Supplied
CPR90F	Mates using Half Thickness Gasket 55072-90*	Mates (NOT Pressurizable)	Mates using 4mm Hardware**
CPR112F	Mates using Half Thickness Gasket 55072-112*	Mates (NOT Pressurizable)	Mates using 4mm Hardware**
CPR137F	Mates using Half Thickness Gasket 55072-137*	Mates (NOT Pressurizable)	Mates using #10 Hardware***
CPR159F	Mates using Half Thickness Gasket 55072-159*	Mates (NOT Pressurizable)	Mates using Either Hardware Supplied
CPR187F	Mates using Half Thickness Gasket 55072-187*	Mates (NOT Pressurizable)	Mates using Either Hardware Supplied
CPR229F	Mates using Half Thickness Gasket 55072-229*	Mates (NOT Pressurizable)	Mates using Either Hardware Supplied
CPR284F	Mates using Half Thickness Gasket 55072-284*	Mates (NOT Pressurizable)	Mates using Either Hardware Supplied
PDR180†	Does NOT Mate	Does NOT Mate	Mates
PDR140†	Does NOT Mate	Does NOT Mate	Mates
PDR120†	Does NOT Mate	Does NOT Mate	Mates
PDR100†	Mates using Half Thickness Gasket 55072-90* and 4mm Hardware**	Mates using 4mm Hardware**	Mates
PDR84†	Mates using Half Thickness Gasket 55072-112 * and 4mm Hardware**	Mates using 4mm Hardware**	Mates
PDR70†	Mates using Half Thickness Gasket 55072-137 * and #10 Hardware***	Mates using #10 Hardware***	Mates
PDR48†	Mates using Half Thickness Gasket 55072-187* and Either Hardware Supplied	Mates using Either Hardware Supplied	Mates
PDR40†	Mates using Half Thickness Gasket 55072-229* and Either Hardware Supplied	Mates using Either Hardware Supplied	Mates
CMR	Mates with CMR and UER "ONLY"		
UER	Mates with CMR and UER "ONLY"		

* Purchase separately ** Supplied in PDR Hardware Kit *** Supplied in CPR Hardware Kit
† Also applies to "E-series" and "M-series" (Metric) HELIAX® elliptical waveguide connectors (i.e. 252DET , 252DEMT etc.).



Circular Waveguide

Lowest Attenuation

Circular waveguide offers substantially lower attenuation than elliptical or rectangular waveguide. This can result in the use of smaller antennas, reducing tower loading and saving antenna cost.

Dual Polarization Capability

A single waveguide run can carry two polarizations with 30 dB minimum isolation, eliminating the need for a second waveguide run.

Full Range of Transitions and Components

Simplifies system planning. All elements are designed to work together, maximizing system performance.

General

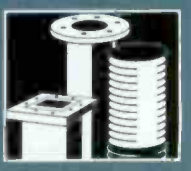
Circular waveguide is used for long vertical feeder runs in systems where multiband capability is needed or where low attenuation is critical. The axial symmetry of circular waveguide allows the simultaneous propagation of two orthogonal TE_{11} modes. A single waveguide run can carry two polarizations with 30 dB minimum isolation.

Electrical Characteristics

Closed and Open Systems. Circular waveguide systems which have circular-to-rectangular transitions at both ends are considered "closed" systems. Horn-reflector antennas fed directly with circular waveguide have only one circular-to-rectangular transition (at the bottom) and are considered "open".

Attenuation curves are illustrated on pages 248 and 249. Add 0.3 dB to allow for the transitions in a "closed" system and 0.15 dB in an "open" system.

VSWR (Return Loss, dB) for a complete single-polarized system, of any length, including straight sections and transitions (except 17.7 - 19.7 GHz), is guaranteed 1.04 (34.2) maximum and is typically 1.03 (36.6) maximum. A similar dual-polarized system is guaranteed 1.06 (30.7) maximum and is typically 1.04 (34.2) maximum. A single or dual polarized 17.7 - 19.7 GHz system is guaranteed 1.15 (23.1) maximum.



RML (reconverted mode level) is the level of higher order mode energy reconverted to the dominant mode in a circular waveguide system. In a closed system, higher modes become trapped within the circular waveguide because they cannot propagate in the connecting rectangular waveguide. Ground delay distortion and noise result when a portion of this energy, delayed in time, is reconverted to the dominant mode. Andrew circular waveguide systems are designed for minimum RML. Each circular-to-rectangular transition includes a non-linear tapered circular-to-circular transition section to minimize the generation of unwanted modes and prevent their propagation into the circular-to-rectangular transition section. In addition, Andrew offers a circular-to-rectangular transition with a built-in mode filter (for TM_{01} and TE_{21}) for use at the bottom of a closed system. These unwanted modes are not trapped in an "open" system and the bottom mode filter is, therefore, not needed. However, depending on the operating frequency, the TM_{11} mode can sometimes be generated in an "open" system and a TM_{11} mode filter (described on page 242) may be required.

Circular Waveguide Straight Sections

Andrew circular waveguide is made of heavy-wall high conductivity copper tubing, specially coated to prevent corrosion and deterioration of attenuation characteristics. Stainless steel hardware and flange gaskets are included. Order straight sections from table below.

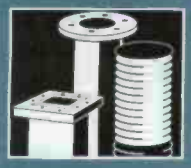
Frequency Band Codes

Operating Band, GHz	Circular Waveguide Frequency Band Code	Antenna Frequency Band Code
3.54-4.2	-11	-35
5.925-6.425	-3	-59
6.425-7.125	-4	-65
7.125-7.7	-5	-71
7.725-8.500	-7	-77
10.7-11.7	-8	-107
12.2-12.7	-9	-122
12.7-13.25	-10	-127
17.7-19.7	-23	-180

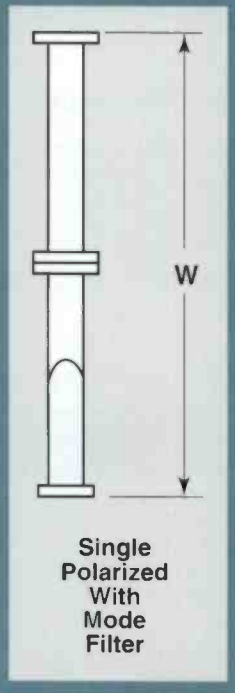
Straight Section Ordering Information

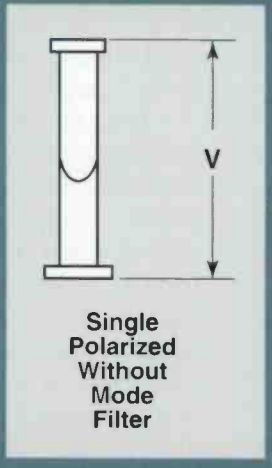
Length	Flanges	WC281	WC166	WC109
Recommended Operating Bands, GHz*** (Specify Operating Band)		3.54-4.2 5.925-6.425 10.7-11.7 6.425-7.125	5.925-6.425 6.425-7.125 7.125-7.750 7.725-8.500 10.7-11.7	10.7-11.7 12.2-12.7 12.7-13.25 17.7-19.7
20ft*	Fixed	–	49608-240-(†)	54346-240-(†)
12 ft, 6-1/4 in	Fixed Swivel/Fixed	48600A-1-(†) 48600A-2-(†)	68573-166-(†) 68574-166-(†)	– –
12 ft, 6 in	Fixed Swivel/Fixed	49607-150-(†) 48613A-150-(†)	49608-150-(†) 69021-150-(†)	– –
8 ft	Swivel/Fixed	48613A-96-(†)	69021-96-(†)	–
2 ft	Swivel/Fixed	–	69021-24-(†)	54345-24-(†)
Special	Fixed Swivel/Fixed	49607-(†)** 48613A-(†)**	49608-(†)** 69021-(†)**	54346-(†)** 54345-(†)**
Weight, lb/ft (kg/m)		3.6 (5.4)	2.8 (4.2)	1.2 (1.8)

* Standard straight sections shipped from Scotland are 6 meters.
** Specify length in inches or millimeters.
*** For other bands, contact Andrew.
† Insert frequency band code from table.



Microwave Transmission Lines





Circular-to-Rectangular Waveguide Transitions

These transitions convert from circular to rectangular waveguides at one or both ends of the vertical run. Transitions include swivel flanges to simplify installation and polarization alignment. Both rectangular waveguide inputs on dual-polarized transitions enter the circular waveguide in the same plane†. This simplifies installation and routing. Alignment pins, flange hardware, pressure gaskets, and circular waveguide taper sections are included with the transition.

"Open" horn-reflector antenna systems use one transition without a mode filter at the bottom of the circular waveguide run. All other antenna systems use transitions at the top and bottom of the circular waveguide run. For these, a transition without a mode filter is used at the top and a transition with a mode filter is used at the bottom.

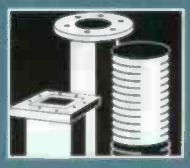
† Patented United States 3,924,205; Canada 965,852; United Kingdom 1,394,334; Italy 984,278 and pending in other countries.

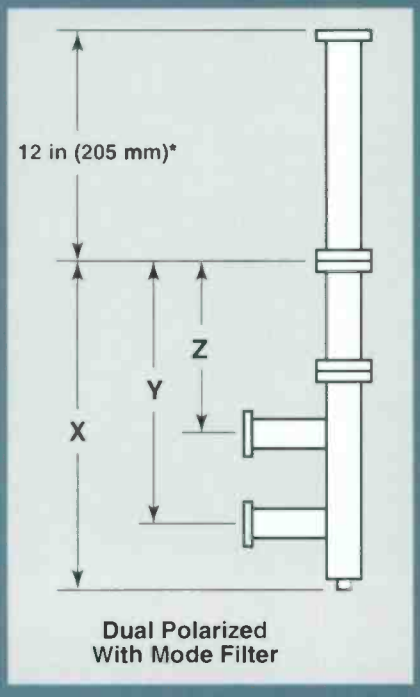
*Single Polarized** Circular-to-Rectangular Waveguide Transitions*

Frequency Band, GHz	Rectangular Flange Mates with EIA or Mil	IEC***	With Mode Filter (A)	No Mode Filter (B)	Dimensions, in (mm) V	W
WC166						
5.925-6.425	CPR137G	PDR70	**65239-3**	**58016A-3**	18.0 (457)	30.0 (762)
6.425-7.125	CPR137G	PDR70	**65240-1**	**64157A-1**	18.0 (457)	30.0 (762)
7.125-7.750	CPR137G	PDR70	**65322-1**	**65321-A**	18.0 (457)	30.0 (762)
7.725-8500	CPR112G	PDR84	**65323-3**	**57459A-3**	18.5 (470)	30.5 (775)
WC109						
10.700-11.700	CPR90G	PDR100	**65242-107**	**57222A-107**	13.6 (345)	25.6 (650)
12.200-12.700	WR75 Cover/Gasket*	–	**65242-122**	**57222A-122**	13.8 (351)	25.8 (655)
12.700-13.250	WR75 Cover/Gasket*	–	**67550**	**67549**	13.8 (351)	25.8 (655)

* Andrew "Cover/Gasket" flanges mate with either choke or cover flanges or the corresponding HELIAX® elliptical waveguide connectors.
** Not applicable for horn-reflector antenna systems. Use dual polarized transition with one port terminated with load. (page 242)
*** For detailed information on mating flanges refer to pages 234-237.

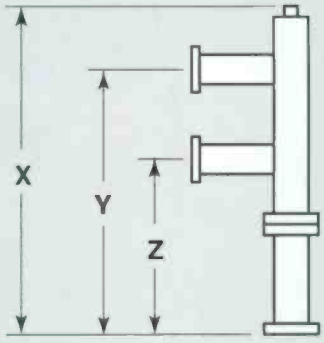
Microwave Transmission Lines





Dual Polarized With Mode Filter

* Except 160515-177 is 18 in (457 mm)

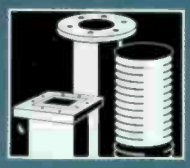


Dual Polarized Without Mode Filter

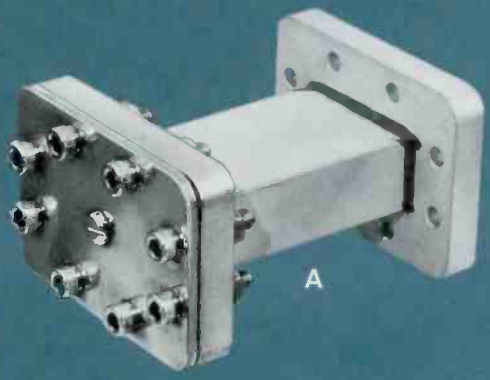
Dual Polarized Circular-to-Rectangular Waveguide Transitions

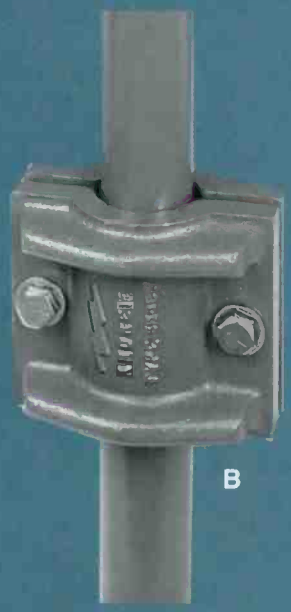
Frequency Band, GHz	Rectangular Flange Mates with EIA or Mil	IEC**	With Mode Filter (C)	No Mode Filter (D)	Dimensions, in (mm) X	Y	Z
WC281							
3.700-4.200	CPR229G	PDR40	–	**69385**	32.8 (833)	30.1 (765)	23.0 (584)
WC166							
5.925-6.425	CPR137G	PDR70	**65236-1**	**62866A-1**	19.9 (505)	16.9 (429)	11.4 (190)
5.925-6.425	CPR159G	PDR58	**65237-1**	**64159A-1**	19.9 (505)	16.9 (429)	11.4 (190)
6.425-7.125	CPR137G	PDR70	**65238-1**	**64147A-1**	19.9 (505)	16.9 (429)	11.4 (190)
7.125-7.750	CPR137G	PDR70	**65324-1**	**64848A-1**	17.3 (439)	14.3 (363)	9.8 (249)
7.725-8.500	CPR112G	PDR84	**65316-1**	**64703A-1**	19.1 (485)	16.1 (409)	12.0 (305)
10.700-11.700	CPR90G	PDR100	–	**69383**	23.0 (584)	22.0 (559)	17.6 (447)
WC109							
10.700-11.700	CPR90G	PDR100	**65241-107**	**64100A-107**	14.1 (358)	11.1 (282)	8.6 (218)
12.200-12.700	WR75 Cover/Gasket*	–	**65241-122**	**64100A-122**	12.6 (320)	9.6 (244)	7.4 (188)
12.700-13.250	–	PDR120	**69876**	**69877**	10.5 (267)	9.6 (244)	7.4 (188)
12.700-13.250	WR75 Cover/Gasket*	–	**68999**	**68998**	12.6 (320)	9.6 (244)	7.4 (188)
17.700-19.700	UG-596A/U, UG-595U	CBR220, UBR220, PBR220	**160515-177††**	**160516-177††**	16.8 (427)	15.6 (396)	14.0 (356)

* Andrew "Cover/Gasket" flanges mate with either choke or cover flanges or the corresponding HELIAX® elliptical waveguide connectors.
** For detailed information on mating flanges refer to pages 234-237.
†† Includes termination load for single polarized applications.



Microwave Transmission Lines





A Termination Load for unused rectangular waveguide port of dual-polarized transitions. Maximum VSWR is 1.02 within the operating bands specified for transitions. Pressurizable.

Flange Type	Load Type No.
CPR90G	**62901-90**
CPR112G	**62901-112**
CPR137G	**62901-137**
CPR159G	**62901-159**
CPR229G	**62901-229**
WR75 Cover/Gasket	**62900-75**
WR112 Cover/Gasket	**62900-12**
WR137 Cover/Gasket	**62900-137**

B Axial Ratio Compensator. Rotatable clamp installed at the bottom of the circular waveguide run and adjusted to provide maximum polarization isolation. One required for single-polarized run. One, two, or three are required (see table) for dual-polarized runs.

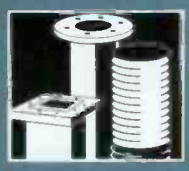
For	Photo Ref.	Clamp Type No.	Maximum Length of Waveguide, ft (m) 1 Clamp	2 Clamps	3 Clamps
WC281	B	**64271**	200 (60)	400 (120)	600 (180)
WC166	B	**57568**	200 (60)	400 (120)	600 (180)
WC109	B	**54348**	150 (45)	300 (90)	450 (135)

Horn-Reflector System Mode Filter. Reduces group delay ripple by TM_{11} higher order mode to less than 3 nanoseconds per hop. Recommended for dual-band systems and single-band systems operating in the higher of the two frequency bands listed in the table. Not required for waveguide runs shorter than 25 feet (7.6 m). Top flange is WC281.

Bottom Flange	Frequency Bands, GHz	Type No.	Length in (mm)
WC281	3.6-4.2, 5.925-6.425	**69907**	42 (1067)
WC281	3.6-4.2, 6.425-7.125	**69908**	72 (1829)
WC281	5.925-6.425, 10.7-11.7	**162240**	78 (1981)
WC269	3.6-4.2, 5.925-6.425	**69485**	42 (1067)
WC166	5.925-6.425, 10.7-11.7	**69910**	57 (1448)

Taper Transitions convert from one circular waveguide size to another or from circular to square waveguide. Stainless steel hardware and flange gaskets are included.

From	To	Transition Type No.	Length in (mm)
Circular-to-Circular Waveguide			
WC281 Swivel	WC269	**69273**	6 (152)
WC281 Swivel	WC212	**49545**	18 (457)
WC281 Swivel	WC205	**69272**	18 (457)
WC281 Swivel	WC166	**69271**	18 (457)
WC281 Swivel	WC109	**69269**	18 (457)
WC269 Swivel	WC212	**69492**	18 (457)
WC166	WC109	**69277**	11 (279)
WC166	WC75	**69382**	17 (432)
WC109	WC75	**55648**	6 (152)
Circular-to-Square Waveguide			
WC281	WS176	**202559**	30(762)
WC166	WS108	**205137**	19 (483)



Accessories

A Alignment Shorting Plate. A brass plate used during initial alignment. It is installed at the top of the run while the axial ratio compensator is adjusted. See table below.

B Pulling Head. Attaches to top waveguide section flange. Waveguide sections can be assembled at ground level and the entire assembly lifted into place on the tower (not required if sections are to be lifted individually and assembled on the tower). See table below.

C Current By-Pass Kit. Five feet of No. 6 copper wire and lugs to provide a low-loss current path around flexible waveguide sections .....Type **49486**

WC281 Waveguide Flange Alignment Wrench. (Not shown) Vice grip wrench with stainless steel roller-bearing chain .....Type **48607**

Flange Hardware Kit (Not shown) Includes a set of hex-head bolts, nuts, lock washers, and pressure gaskets, sufficient to join two circular waveguide flange units. This hardware kit is provided with each section of circular waveguide and is also available individually. All hardware is stainless steel. See table below.

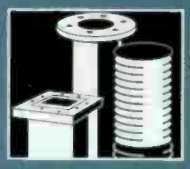
Adapters

D Angle Member Adapter Kit of 1 for mounting sliding or spring/sliding hangers to angle or flat tower members up to 7/8 in (22 mm) thick .....Type **13555A**

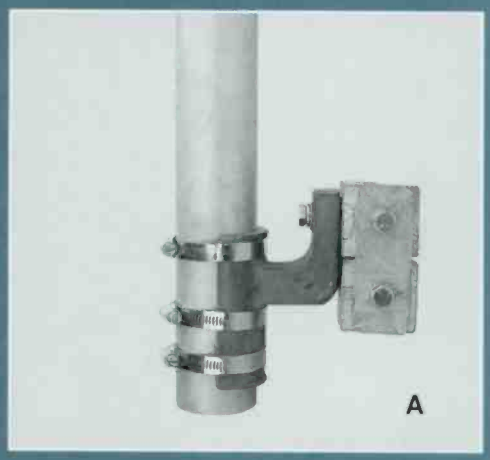
E Round Member Adapter kit of 10. Includes two cast iron clamp halves with stainless steel hardware for mounting hangers to round tower members 1-3 in (25-75 mm) in diameter.....Type **65500**

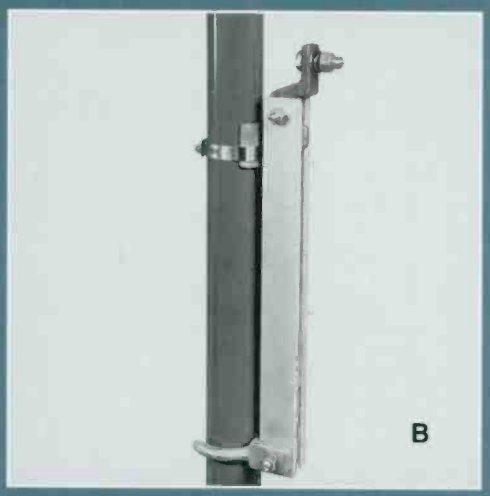
Accessory Type Numbers

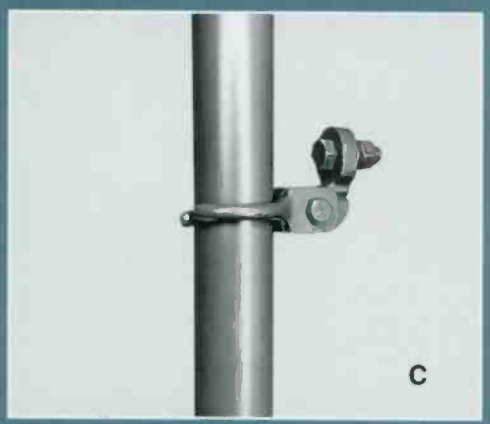
	WC281	WC166	WC109
Alignment Shorting Plate	64382	57569	56207
Pulling Head	64775-281	64775-166	64775-109
Flange Hardware Kit	48614	57570-1	54109



Microwave Transmission Lines







Circular Waveguide Support Systems

The Andrew standard support system uses the rigid, spring/sliding, and sliding hangers. This system is available for all sizes except WC281. Typical system planning information is presented on pages 238 and 239. A second method, for horn-reflector antennas, is KS compatible and uses sliding restrainers. It is available for WC281 and WC166.

Andrew Standard Circular Waveguide Support System Components

Hangers are used to mount circular waveguide in a spring-suspended system on a tower or other support structure and to accommodate the differential expansion and between between the waveguide and the tower or support structure. Hangers are brass with 3/8" stainless steel mounting hardware.

Tower members should be drilled only with the consent of the tower manufacturer because of possible weakening of the structure. If holes are not provided and cannot be drilled, angle members or round member adapters are used to attach the hangers to the tower.

A **Rigid Hangers** anchor the circular waveguide to the tower at the top of the waveguide run. (Includes one heavy-duty angle adapter.) See table below.

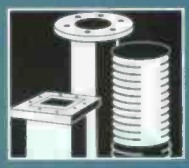
B **Spring/Sliding Hangers** support the waveguide, limit lateral motion, and accommodate differential expansion and contraction. See table below.

C **Sliding Hangers** limit lateral motion. See table below.

Hangers

Waveguide	Rigid	Sliding	Spring/Sliding
WC166	69932	69933	69934
WC109	19007A-109	19008A-109	19009A-109

Hanger Placement. One rigid hanger is required 6 to 12 in (150 to 300 mm) below the top waveguide section flange. For horn-reflector antenna systems, the rigid hanger is used only during installation. It is replaced with a spring/sliding hanger after the waveguide run is in place. For WC109 and WC166, sliding hangers and spring/sliding hangers are used alternately at 8 to 12 ft (2.4 to 3.7 m) intervals. See pages 238 and 239 for system planning details.



KS Compatible Circular Waveguide Support System Components

In this system the entire weight of the circular waveguide run is supported at the mounting frame assembly of the horn-reflector antenna using the waveguide support assembly and support plate. The Wilson bolt assembly allows precision height adjustment of the waveguide run and sliding restrainers restrict the lateral movement of the waveguide.

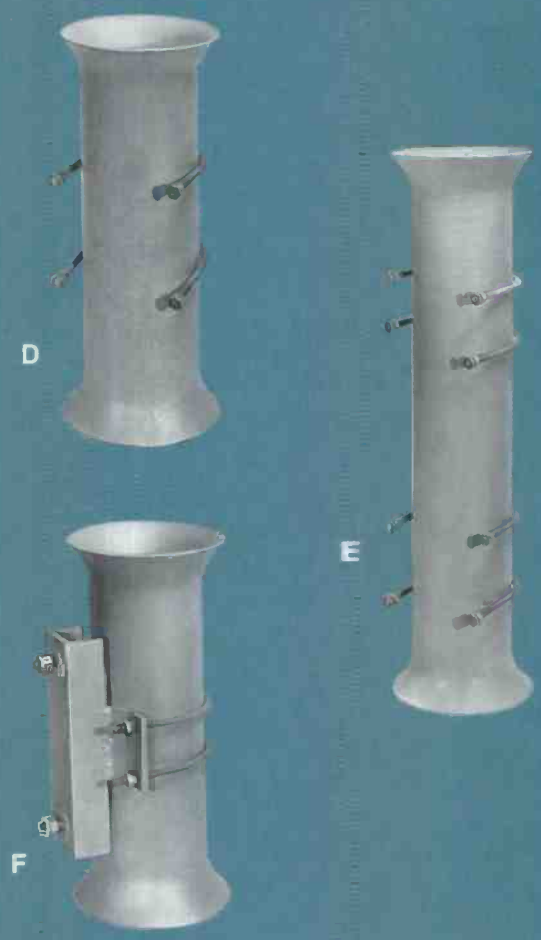
D Sliding Restrainer, 18 in (460 mm). Position every 12 ft 6-1/4 in at all circular waveguide flange joints. Includes two 3/8" x 6 in on-center U-bolts and hardware to interface with customer supplied support brackets. See table below.

E Sliding Restrainer, 30 in (760 mm). Position every 12 ft 6-1/4 in at all circular waveguide flange joints. Used in place of item D (above) beyond 175 ft (55 m) below the support plate for certain KS tower applications. Includes four 3/8" x 6 in on-center U-bolts and hardware to interface with customer supplied support brackets. See table below.

F Sliding Restrainer, Bottom. Use on flange joint at the bottom of the circular waveguide run. Includes bracket and hardware for attachment to network slot angles. See table below.

Sliding Restrainer Type Numbers

Size	18 in (460 mm)	30 in (760 mm)	Bottom
WC281	48602	48603	48604
WC166	49008	49009	49010



Connecting Waveguides

The circular waveguide run is connected to the antenna and the radio equipment using HELIAX® elliptical waveguide and/or rectangular waveguide components. These are described in detail on pages 174-218 and 220-233.

G Elliptical Waveguide Sliding Support. For use with 4-port combiner or dual polarized circular-to-rectangular transition to eliminate the requirement for flexible waveguide sections. Accommodates vertical movement and provides support to the elliptical waveguide near the network end of the run. Use with elliptical waveguide hangers described on page 212 .....Type **200970**

Pressurization

Microwave waveguides should be maintained under dry air or dry nitrogen pressure to prevent moisture condensation. All sizes are pressurizable to 10 lb/in² (70 kPa). Check antenna pressurization limits to ensure antenna limits are not being exceeded. Pressurization equipment is described on pages 250-285.

Calculations

dB and dBm

The dB is a logarithmic unit comparing two power levels.

$$dB = 10 \log_{10} \frac{P_1}{P_2}$$

Where P_1 is the larger power
If P_1 = 10 watts and P_2 = 1 watt, then

$$dB = 10 \log_{10} \frac{10}{1} = 10 \text{ dB}$$

The dBm is a comparison to a reference power of 1 milliwatt (0.001 watt).

$$dBm = 10 \log_{10} \frac{P_1}{0.001}$$

Free Space Propagation Attenuation (Isotropic)

Imperial Units:

$$L_{fs} = 96.6 + 20 \log_{10} D + \log_{10} f$$

Where L_{fs} = loss in free space in dB
D = path length in miles
f = frequency in GHz

Metric Units:

$$L_{fs} = 92.5 + 20 \log_{10} D + 20 \log_{10} f$$

Where L_{fs} = loss in free space in dB
D = path length in kilometers
f = frequency in GHz

Calculating Receive Signal Level and Antenna Gain

When transmitter power is expressed in dBm and all other units are expressed in dB, receive power in dBm can be calculated using the following formula:

$$P_r = P_t - L_{w1} - L_{f1} + G_{a1} - L_{fs} + G_{a2} - L_{w2} - L_{f2}$$

Where: P_r = receive power level (dBm)
P_t = transmit power (dBm)
L_w = transmission line losses
L_f = filter losses
L_{fs} = free space path loss
G_{a1} = transmit antenna gain
G_{a2} = receive antenna gain

Thus for a 6.175 GHz system with a transmit power of 5 watts (37 dBm) and 200 feet of Type EWP52 HELIAX elliptical waveguide (attenuation 1.2 dB/100 feet) at each end, filter losses of 0.5 dB at each end, and Andrew UHX8-59H, UHX8-59H antennas at each end (Mid-band Gain 41.3 dB) over a path 30 miles long (L_{fs} = 141.9 per preceding example).

$P_r = 37 - 2.4 - .5 + 41.3 - 141.9 + 41.3 - 2.4 - .5 = 28.1$dBm

When the minimum receive signal level required to meet performance objectives (C) is known and the necessary fade margin (FM) is added, the total antenna gain (Gt) required can be calculated using the following expression:

$$G_t = P_t - L_{w1} - L_{f1} - L_{fs} - L_{w2} - L_{f2} - FM\ 96\ C$$

In the above system with a transmit power of 5 watts (37 dBm), 200 feet of EWP52 elliptical waveguide (attenuation of 1.2 dB/100 ft) at each end, filter losses of 0.5 dB at each end, operating over a 30 mile path, assuming a receive signal threshold level requirement (C) of -70 dBm and a desired fade margin of 38 dB, the total antenna gain (G_t) required is:

$G_t = 37 - 2.4 - .5 - 141.9 - 2.4 - .5 - 38 - (-70) = -78.7$

To achieve the system performance goal, a negative gain (loss) of 78.76 dB must be made up by the gain of the antennas. If antennas with equal gain are used at each end of the path, each antenna must then have a gain of 39 dB. Andrew UHX8-59H antennas with a mid-band gain of 41.3 dB will, therefore, satisfy the requirement.

Calculation of System Return Loss

Resultant system return loss is governed by the phase relations between the standing waves of individual components and cannot be precisely calculated. The resultant return loss can be estimated, however, using the procedure described below. The 0.7 multiplication factor, mentioned in Step 5, is based on data taken by Andrew on thousands of antenna systems. Properly installed transmission systems will typically measure well within the calculated resultant return loss. Andrew specifications include safety margins and components are typically better than the published return loss specifications. For this reason, systems using all Andrew components will usually ensure much better system return loss performance than the calculated values.

Step 1. Convert VSWR or RL to reflection coefficients, in decimal form, for all components in the system.
Step 2. Divide components into three groups:
Top (antenna, radome, flex, etc.)
Transmission Line (waveguide or cable feeder)
Bottom (flex, elbow, pressure window, etc.)
Step 3. Add the reflection coefficient of all top components and convert the total to RL. Double the calculated attenuation in dB of the transmission line feeder and add this to the previous figure. Then convert the total back to a reflection coefficient.
Step 4. To the final reflection coefficient obtained in Step 3, add the reflection coefficient of the transmission line and all bottom components.
Step 5. Multiply the total reflection coefficient from Step 4 by 0.7 and convert the result to VSWR or return loss.

Example

Steps 1 and 2:

Antenna/Transmission Line System

		VSWR	Reflection Coefficient
Top Components	Antenna	1.06	0.029
	Flex Section	1.03	0.015
Transmission Line	Waveguide, Attenuation: 2.36 dB	1.06	0.029
Bottom Components	Flex Section	1.03	0.015
	Pressure Window	1.01	0.005

Step 3:
(1) Add top components [0.029 + 0.015 = 0.044]
(2) Convert to return loss [27.1 dB]
(3) Double Transmission Line attenuation [2 x 2.36 = 4.72 dB]
(4) Add (2) and (3) [27.1 + 4.72 = 31.8 dB]
(5) Convert 31.8 dB to reflection coefficient = 0.026

Step 4:
(6) Add (5) and transmission line and bottom component [0.026 + 0.029 + 0.015 + 0.005 = 0.075]

Step 5:
(7) Multiply (6) by 0.7 [0.075 x 0.7 = 0.0525]
Convert to VSWR = 1.1 [1.1 is est. peak system VSWR]
Convert to Return Loss = 25.5
[25.5 dB is estimated peak system return loss]

Microwave Antenna System Slide Calculator

The Andrew "Microwave Antenna System Slide Calculator/Transmission Line Selector" is available on request. The computer includes useful scales and tables for calculating parabolic antenna characteristics, free space propagation, HELIAX cable and waveguide performance, and other antenna system calculations.

To obtain a copy, ask for Bulletin 8525 (Imperial units) or M8525 (metric units). The metric unit is available with instructions in English, Italian, German, Spanish, and French.

Definitions

Return loss, RL, is the decibel ratio of the incident volt-age to the reflected voltage.

Reflection coefficient, $|\Gamma|$ is the numerical ratio of the reflected voltage to the incident voltage.

Voltage Standing Wave Ratio, VSWR, is the numerical ratio of the maximum voltage to the minimum voltage that would exist on the uniform reference transmission line.

Conversion Formulas

The following formulas can be used for determining values not listed in the table below.

$$RL = -20 \log_{10} (|\Gamma|)$$

$$|\Gamma| = \frac{VSWR - 1}{VSWR + 1}$$

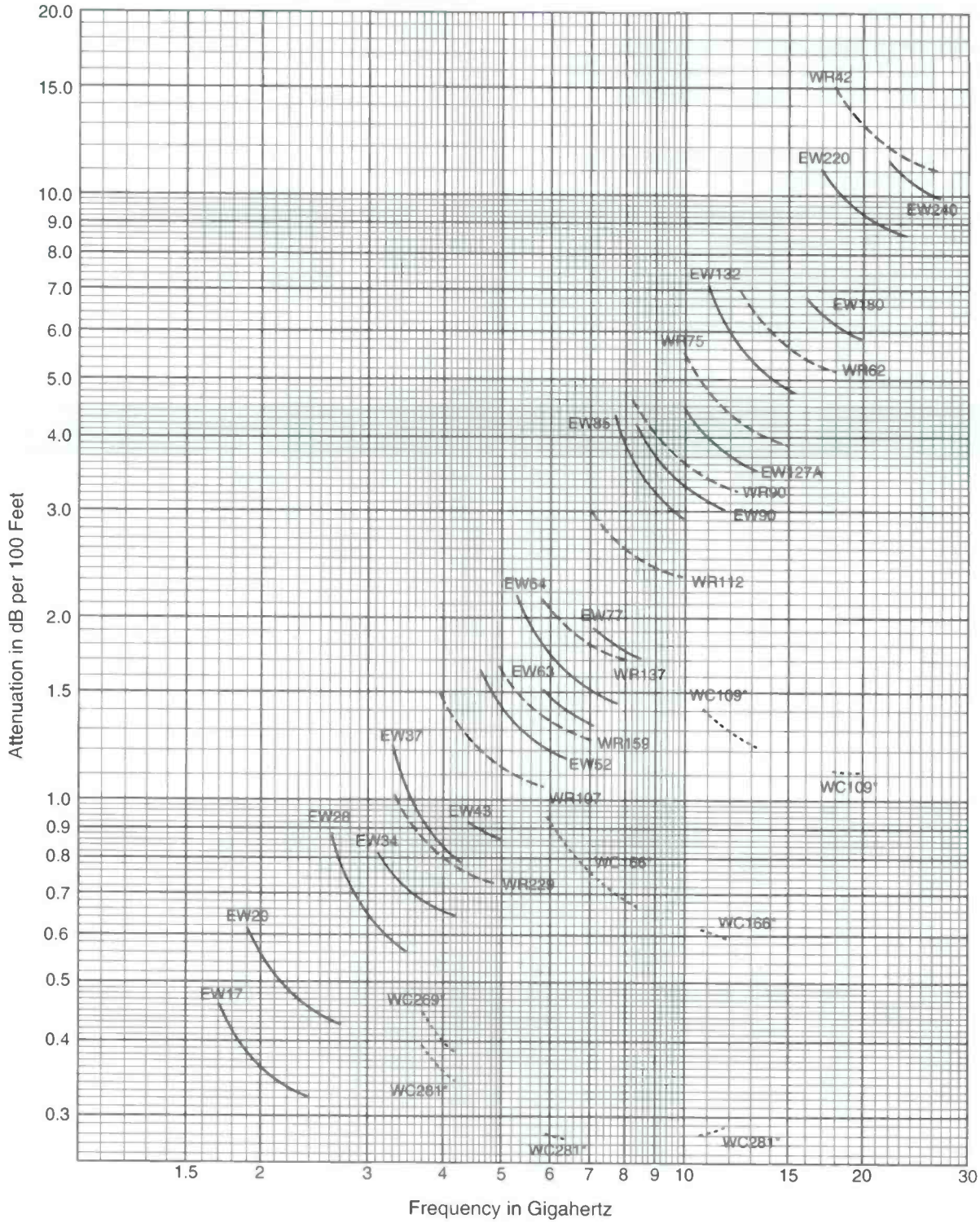
$$|\Gamma| = \text{antilog}_{10} \frac{(-RL)}{20}$$

$$VSWR = \frac{1 + |\Gamma|}{1 - |\Gamma|}$$

Conversion Table

Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR	Return Loss, dB	Reflection Coefficient, %	VSWR
14.0	19.95	1.50	22.0	7.943	1.173	30.0	3.162	1.065	38.0	1.259	1.025
14.2	19.50	1.48	22.2	7.762	1.168	30.2	3.090	1.064	38.2	1.230	1.025
14.4	19.05	1.47	22.4	7.586	1.164	30.4	3.020	1.062	38.4	1.202	1.024
14.6	18.62	1.46	22.6	7.413	1.160	30.6	2.951	1.061	38.6	1.175	1.024
14.8	18.20	1.44	22.8	7.244	1.156	30.8	2.884	1.059	38.8	1.148	1.023
15.0	17.78	1.43	23.0	7.079	1.152	31.0	2.818	1.058	39.0	1.122	1.023
15.2	17.38	1.42	23.2	6.918	1.149	31.2	2.754	1.057	39.2	1.096	1.022
15.4	16.98	1.41	23.4	6.761	1.145	31.4	2.692	1.055	39.4	1.072	1.022
15.6	16.60	1.40	23.6	6.607	1.141	31.6	2.630	1.054	39.6	1.047	1.021
15.8	16.22	1.39	23.8	6.457	1.138	31.8	2.570	1.053	39.8	1.023	1.021
16.0	15.85	1.38	24.0	6.310	1.135	32.0	2.512	1.052	40.0	1.000	1.020
16.2	15.49	1.37	24.2	6.166	1.131	32.2	2.255	1.050	40.2	0.9772	1.020
16.4	15.14	1.36	24.4	6.026	1.128	32.4	2.399	1.049	40.4	0.9550	1.019
16.6	14.79	135	24.6	5.888	1.125	32.6	2.344	1.048	40.6	0.9333	1.019
16.8	14.45	1.34	24.8	5.754	1.122	32.8	2.291	1.047	40.8	0.9210	1.018
17.0	14.13	1.33	25.0	5.563	1.119	33.0	2.239	1.046	41.0	0.8913	1.018
17.2	13.80	1.32	25.2	5.495	1.116	33.2	2.188	1.045	41.2	0.8710	1.018
17.4	13.49	1.31	25.4	5.370	1.114	33.4	2.138	1.044	41.4	0.8710	1.017
17.6	13.18	1.30	25.6	5.248	1.111	33.6	2.089	1.043	41.6	0.8318	1.017
17.8	12.88	1.30	25.8	5.129	1.108	33.8	2.042	1.042	41.8	0.8128	1.016
18.0	12.59	1.29	26.0	5.012	1.106	34.0	1.995	1.041	42.0	0.7943	1.016
18.2	12.30	1.28	26.2	4.898	1.103	34.2	1.950	1.040	42.2	0.7762	1.016
18.4	12.02	1.27	26.4	4.786	1.101	34.4	1.905	1.039	42.4	0.7586	1.015
18.6	11.75	1.27	26.6	4.677	1.098	34.6	1.862	1.038	42.6	0.7413	1.015
18.8	11.48	1.26	26.8	4.571	1.096	34.8	1.820	1.037	42.8	0.7244	1.015
19.0	11.22	1.25	27.0	4.467	1.094	35.0	1.778	1.036	43.0	0.7079	1.014
19.2	10.96	1.25	27.2	4.365	1.091	35.2	1.738	1.035	43.2	0.6918	1.014
19.4	10.72	1.24	27.4	4.266	1.089	35.4	1.698	1.035	43.4	0.6761	1.014
19.6	10.47	1.234	26.7	4.169	1.087	35.6	1.660	1.034	43.6	0.6607	1.013
19.8	10.23	1.228	27.8	4.074	1.085	35.8	1.622	1.033	43.8	0.6457	1.013
20.0	10.00	1.222	28.0	3.981	1.083	36.0	1.585	1.032	44.0	0.6310	1.013
20.2	9.772	1.217	28.2	3.890	1.081	36.2	1.549	1.031	44.2	0.6166	1.012
20.4	9.550	1.211	28.4	3.802	1.079	36.4	1.514	1.031	44.4	0.6026	1.012
20.6	9.333	1.206	28.6	3.715	1.077	36.6	1.479	1.030	44.6	0.5888	1.012
20.8	9.120	1.201	28.8	3.631	1.075	36.8	1.445	1.029	44.8	0.5754	1.012
21.0	8.931	1.196	29.0	3.548	1.074	37.0	1.413	1.029	45.0	0.5623	1.011
21.2	8.710	1.191	29.2	3.467	1.072	37.2	1.380	1.028	45.2	0.5495	1.011
21.4	8.511	1.186	29.4	3.388	1.070	37.4	1.349	1.027	45.4	0.5370	1.011
21.6	8.318	1.181	29.6	3.311	1.068	37.6	1.318	1.027	45.6	0.5248	1.011
21.8	8.128	1.177	29.8	3.236	1.067	37.8	1.288	1.026	45.8	05129	1.010

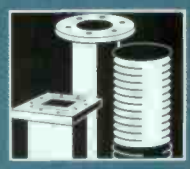
Waveguide Attenuation (Imperial Units)



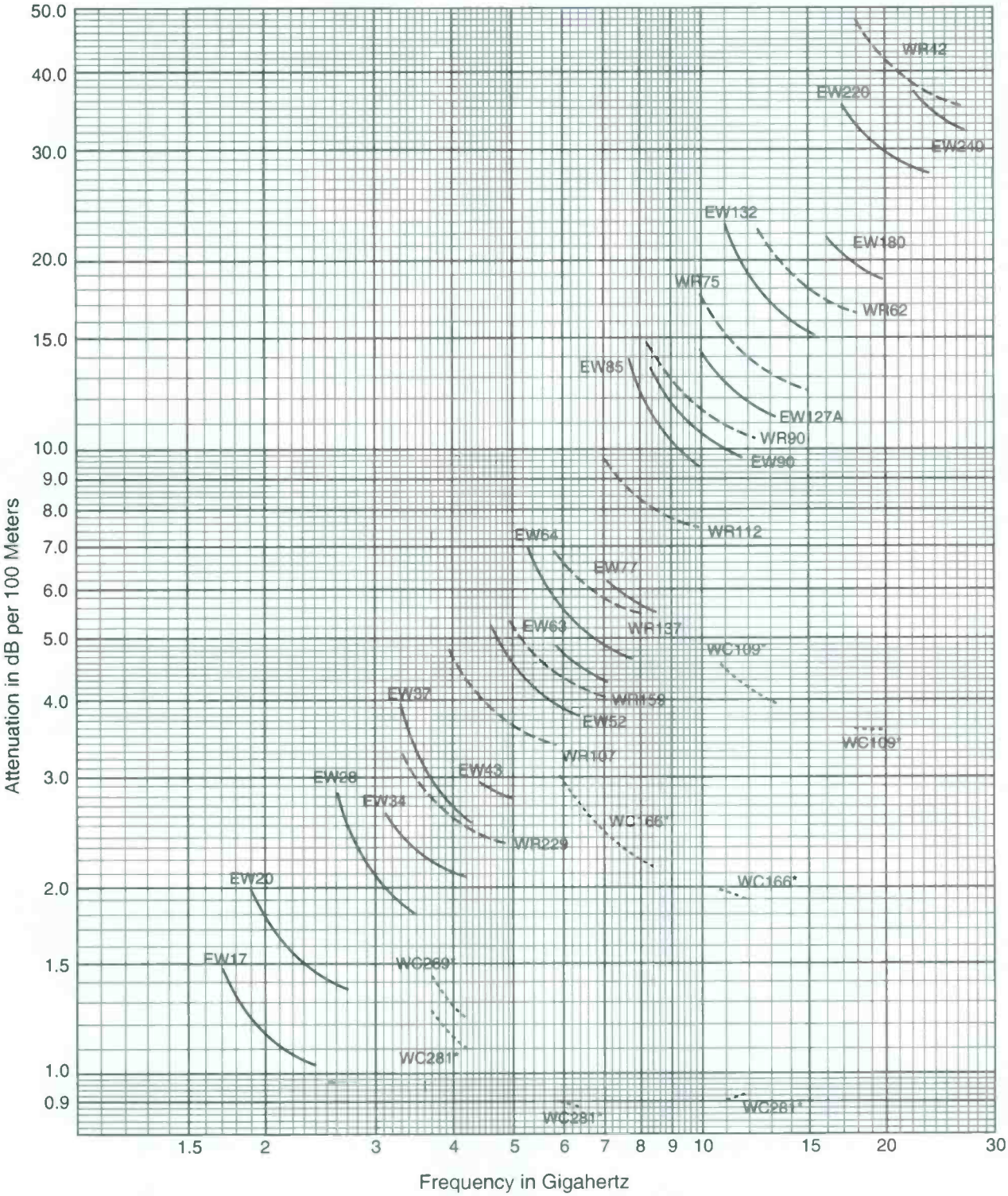
Attenuation curves based on:
- VSWR 1.0
- Ambient Temperature 24° C (75° F)
- High Conductivity Copper

The above attenuation curves are guaranteed within ±5%

*Does not include transition or network losses. See page 238.



Waveguide Attenuation (Metric Units)

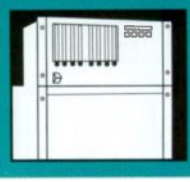


Attenuation curves based on:
- VSWR 1.0
- Ambient Temperature 24° C (75° F)
- High Conductivity Copper

The above attenuation curves are guaranteed within ±5%

*Does not include transition or network losses. See page 238.

Pressurization



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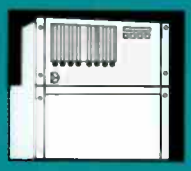
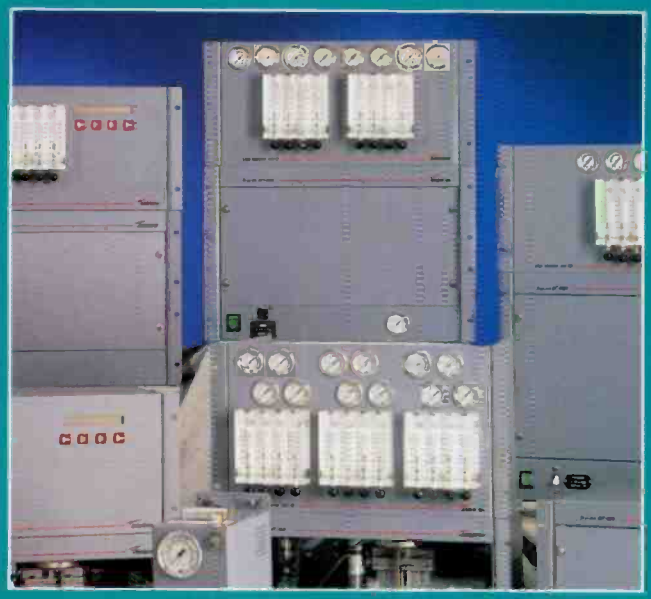
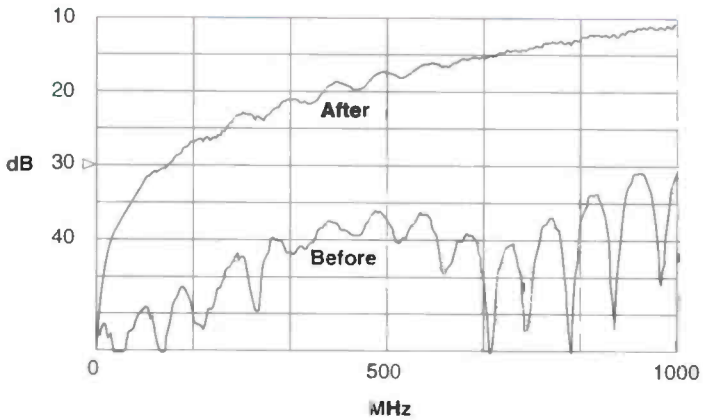


Pressurization



Moisture in a transmission line can cause corrosion that increases attenuation and reduces system performance.

Burned PTFE shows the conductive path formed by dust-laden moisture. As the path arcs over, the transmission line fails.



Transmission line return loss before and after water drop.

General Information

Pressurize Your Antenna System for Better Performance and Greater Protection

Improve System Performance, Save Money

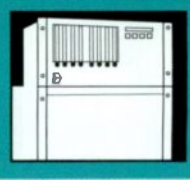
Andrew pressurization equipment can improve the performance of your premium antenna system components and save you money. The constant supply of dry air under pressure assures you of high signal quality, low VSWR, and reduced risk of component damage from voltage breakdown and corrosion. Operating costs are less because of lower maintenance costs. As a result, lower total costs are realized over the life of the system. You supply a better product for your customers and achieve more market coverage per dollar.

Reduce Risk of Damage, Interruption of Service

Pressurization of your antenna system reduces your risk of damage and costly interruption of service. Over 50 years of Andrew experience and thousands of installations assures you of dependable reliability. Andrew dehydrators are thoroughly inspected to meet high quality standards and individually tested for eight hours to verify the operation of every unit. The wide variety of Andrew pressurization equipment available assures you of compatibility with your system and the design flexibility to meet future needs.

Minimize Down Time, Protect Revenue

Protection of your revenue stream is important to us because we know that in your business, every minute counts. That's why in the U.S.A. we provide emergency loaner equipment whenever you need it — 24 hours a day, 365 days a year. Our line monitors provide sensing of pressure and humidity and switching of remote alarms of your choice. These alarms quickly alert you to the possible onset of electrical performance degradation so that you can take action.



Simplify Installation, Save Time

Choosing Andrew as a single source for both your pressurization system and antenna system saves you time. There's no need to manage several suppliers. Our wide selection of products and documentation and quick response time to your technical questions assure you of proper installation. You'll also save time with our rapid response to cost and delivery inquiries and simplified order entry.

Tailored To Your Needs

The Andrew dedicated R&D department and environmental laboratory can provide you with custom design and manufacturing capabilities. When you inquire about special systems requirements, you will receive a quick response. We have a variety of monitoring and alarm feature sets. We'll design, build, and test to satisfy military or other unique requirements.

World Class Pressurization

Regulations

All Andrew dehydrators described in this Catalog, except 40525A Series, have been tested and qualified to meet the following worldwide regulatory requirements, where applicable based upon voltage and power frequency.

Conforms to UL 508, Industrial Control Equipment and UL 303, Refrigeration and AC Compressor Units as tested by ETL Testing Laboratories, Inc., Cortland, New York, a Nationally Recognized Testing Laboratory (NRTL).

Certified to CSA 22, Heating and Cooling Equipment as tested by ETL Testing Laboratories, Inc., Cortland, New York, a Nationally Recognized Testing Laboratory (NRTL).

FCC

Class A, Part 15, Sub-part B and DOC Regulations CRC, C.1374

CE

IEC 801-2	Electrostatic Discharge Susceptibility - Immune to ESA from Severity Level 1 (2 kV) through Severity Level 3 (8 kV).
IEC 801-3	Radiated Susceptibility - Electric Field Immune to RFI at 3 V/m from 27 to 500 MHz.
IEC 801-4	Conducted Transients Susceptibility - Immune to conducted line voltage bursts.
EN50082-1	European Community Generic Immunity
CISPR 11	Group 1, Class A EN55011
CISPR 14	(EN55014)
EN60209-1, 1992	European Safety

All our pressurization products meet EPA standards.

Types of Dry Gas Supply

Pressurization systems can be classified as static or dynamic.

Static Systems: In a non-pressurized system, a breathing static desiccator may be utilized. As the system pressure increases, air is forced out through the desiccator. As pressure decreases, make-up air passes through the desiccator which absorbs the moisture before allowing dry air to enter the system. A static desiccator will last many months on a very small, tight system of 2 ft^3 (57 l) or less.

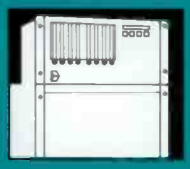
In a pressurized static system, the transmission line is pressured by an external source such as a hand pump or other means and the source removed. Since the system is not hermetically sealed, it will require frequent inspection for recharging. The gas inlet valve must be readily accessible, and the system operation is very labor intensive.

Dynamic Systems: A dynamic system incorporates a pressurizing source that provides dry gas on demand. The pressurizing source may be nitrogen tanks with a regulator, or an automatic dehydrator. The source is permanently connected to the transmission line system and recharges it to a preset positive pressure as required to compensate for leakage losses.

Nitrogen tanks are used for small tight systems where AC power is unavailable. There are no moving parts and they provide a low dewpoint, but the hidden costs of monitoring and tank replacement can be expensive. They are recommended only for systems having low internal and purge volumes. System leaks bleed down tanks rapidly and nitrogen tank delivery can be erratic.

Manual regenerative dehydrators, which use moisture adsorptive desiccant that is regenerated by baking, are also ideal for small, tight systems and are economical. They require electrical power and the desiccant must be inspected and regenerated periodically.

The new fully automatic membrane dehydrators are recommended for low to high system and purge volumes, and are designed to cycle on and off or run continuously in an emergency, providing a maintenance-free system. Older "pressure swing" automatic dehydrators perform a similar function, but do not provide the same trouble-free performance, low noise and vibration, and continuous drying as do the membrane units. Replace your old and obsolete system with a state-of-the-art DryLine® dehydrator. See page 261.



Pressurization

Dehydrator Selection Considerations

- *Total System Volume*
- *System Pressure Rating*
- *Availability of Maintenance*
- *Availability of Electric Power*

Total System Volume. System volume is determined by totaling the volume of each air dielectric transmission line and feed horn for a given installation. For an earth station antenna, the system volume may consist of less than one cubic foot inside the feed and combiner. For a large microwave system, it may consist of many cubic feet of air contained in several hundred feet of air dielectric cable or waveguide.

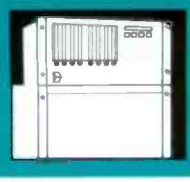
The selected dehydrator must be capable of supplying this volume plus an anticipated leak rate of 1%, and provide sufficient capacity to maintain pressure during a 19°C (35°F) temperature drop in 60 minutes.

These variables have been taken into account in the dehydrator sizing, which is calculated from the worksheet on pages 256-257.

Dehydrator Characteristics Chart

Dehydrator Series	Output Pressure Range lb/in² (kPa)	Maintenance/ Type of Regeneration	Electric Power	Output Capacity ft³/min (l/min)	Meets Regulatory Requirements
Up to 2 ft³ (57 l) System Volume					
SD-002A	(Static Desiccator)	Disposable	None	–	–
Up to 10 ft³ (283 l) System Volume					
878A, 860G	(Hand Pump)	Manual	None	NA	NA
40525A-2,-3	3 (21) start, 8 (55) stop	Manual	ac	0.9 (25)	None
40525A-4,-5	1 (7) start, 5 (34) stop	Manual	ac	0.9 (25)	None
MRH-052	3 (21) start, 5 (34) stop	Manual	ac or dc	0.05 (1.4)	UL/CSA/CE
MRL-052	0.3 (2.1) start, 0.5 (3.5) stop	Manual	ac or dc	0.05 (1.4)	UL/CSA/CE
MRSH-052	3 (21) start, 5 (34) stop	Manual	ac or dc	0.05 (1.4)	CE
MRSL-052	0.3 (2.1) start, 0.5 (3.5) stop	Manual	ac or dc	0.05 (1.4)	CE
MTH-050	Constant 5 (35)	Automatic, Membrane	ac or dc	0.05 (1.4)	UL/CSA/CE
10 - 66 ft³ (283 - 1869 l) System Volume					
MT-300	3 (21) start, 8 (55) stop	Automatic, Membrane	ac	0.3 (8.5)	UL/CSA/CE
MT-300 + ML* + Tank	Adjustable, Constant 0 - 2 (0 - 14)	Automatic, Membrane	ac	0.3 (8.5)	UL/CSA/CE
XT- 300 + XH*	Programmable 0.5 - 15 (3.5 - 105)	Automatic, Membrane	ac	0.3 (8.5)	UL/CSA/CE
66 - 132 ft³ (1869 - 3738 l) System Volume					
MT-600	3 (21) start, 8 (55) stop	Automatic, Membrane	ac	0.6 (17)	UL/CSA/CE
XT- 600 + XH*	Programmable 0.5 - 15 (3.5 - 105)	Automatic, Membrane	ac	0.6 (17)	UL/CSA/CE
132 - 374 ft³ (3738 - 10592 l) System Volume					
MT-1700	3 (21) start, 8 (55) stop	Automatic, Membrane	ac	1.7 (48)	UL/CSA/CE
XT- 1700 + XH*	Programmable 0.5 - 15 (3.5 - 105)	Automatic, Membrane	ac	1.7 (48)	UL/CSA/CE

* Dehydrator and line monitor combination.



System Pressure Rating. The pressure inside a transmission line system must be maintained at a positive level and below the maximum pressure rating of the components in the system. See "Caution" at the top of calculation page 257.

Availability of Maintenance. Hand pumps, nitrogen, static desiccators and manual regenerative dehydrators are best suited to low volume tight systems at readily accessible sites. However, the monitoring and changing of the desiccator or nitrogen tanks under adverse weather conditions are labor intensive. Remote and unattended sites are best suited for the fully automatic membrane dehydrator, which is virtually maintenance-free. All Andrew dehydrators can be changed out in less than 10 minutes without losing system pressure.

Availability of Electric Power. Dehydrators are available in multiple voltages. The selection must be compatible with the available Mains power, taking into account proper wire size to prevent voltage drop from the building Mains to the dehydrator, and proper Mains circuit breaker size. Dehydrators are available for 115 Vac/60 Hz and 220 Vac/50 Hz operation and for 21 to 68 Vdc operation. Some units operate over wider ac and dc ranges.

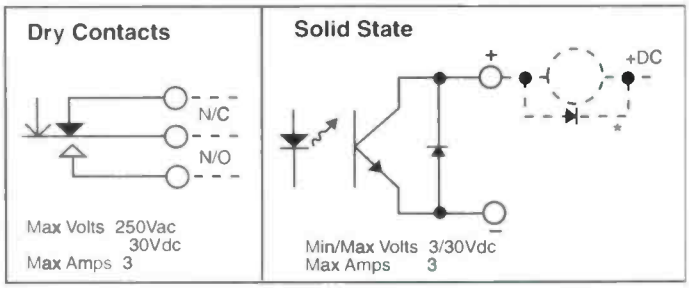
Detailed descriptions, features and characteristics follow on pages 258 through 267.

Alarm Options and Benefits

Alarms are available to alert you to system status. These contacts are brought to a chassis-mounted terminal strip (for dehydrators) or to a rear-mounted terminal strip (for XH line monitors). The low pressure alarm on MT-300/600/1700 is on a cable, instead of at the terminal strip. The contacts are designed to activate a customer provided alarm system.

Alarm types available are dry contact relay closure and solid state transistor switch. Dry contacts are factory wired for a normally open (N/O) condition, but can be restrapped for normally closed, as needed.

Low Pressure Alarm. Standard on all dehydrators. When pressure drops below a set point, dry contacts will close or the switch will operate to signal an alarm to the customer provided system. For the XT series dehydrators, the alarm setting is user programmable; for all other units it is factory set.



* Indicates loads must be diode suppressed

A low pressure alarm can alert you to a power failure, (the dehydrator is not being activated), waveguide damage by projectiles or a lightning strike (the dehydrator runs, but cannot provide the minimum pressure), or a dehydrator malfunction.

High Pressure Alarm. Option available on XL/XH series line monitors and 40004 pressurization monitors. When pressure increases above a set point, dry contacts (40004) or a solid state switch (XL/XH) operate to signal an alarm. The XL/XH setting is user programmable; the 40004 is factory set.

Excessive Run Alarm. Option for most dehydrators. Adjustable by the user to indicate continuous running of the dehydrator. When the unit reaches the preset excess run time, a contact will close or a switch will operate to signal the alarm.

The excess run alarm will alert you to system degradation due to failure or vandalism, or a dehydrator that fails to shut off in the normal time. The unit should be preset for a few minutes above the normal dehydrator run time.

High Humidity Alarm. Option for most dehydrators. The alarm is factory set to operate at 10% system relative humidity. When the dewpoint of the system reaches the set point, a solid state switch will operate and signal the alarm.

The high humidity alarm alerts you to an insufficiently purged system at time of initial installation, moisture penetration of an operating system or a malfunction in the dehydrator.

Flow Meters

Flow meters, available with the multiple output line monitors, are useful in monitoring system performance and programming maintenance. Two scales are provided for observation depending on dehydrator output. A black ball measures flow from 0 to 7 ft^3/hr (0 to 200 l/hr) and a silver ball from 8 to 28 ft^3/hr (225 to 790 l/hr) They are used to check the integrity of the various lines.

The red arrow indicator is placed at the location of the ball while the system is being pressurized to establish a base value. A positive deviation from this initial setting is an indication of degradation of that particular line.

Contact Type by Dehydrator Series

Dehydrator Series	Low Pressure	High Pressure	Excess Run	High Humidity	Power Fail
MR-050	Dry Contacts	–	–	–	–
MRS-050	Dry Contacts	–	–	–	–
MT-050	Dry Contacts	–	–	–	–
MT-300/310/600/1700	Dry Contacts	–	Solid State (MT-310 only)	Solid State (MT-310 only)	Solid State (MT-310 -212 only)
XT-300/600/1700 (see XL/XH)	–	–	–	–	–
XL/XH	Solid State	Solid State	Solid State	Solid State	–

Dehydrator Selection

Pressurization Work Sheet No. 1

Reproduce as required for each site.

Line Type		Volumes ft³ / 1000 ft	Volumes liters / 1000 m
HELIAX® Air Dielectric Coaxial Cable			
1/2"	HJ4-50	0.68	63
5/8"	HJ4.5-50	1.92	178
7/8"	HJ5-50	3.5	325
1-1/4"	LDF6-50	1.7	158
1-5/8"	HJ7-50A	14.0	1301
2-1/4"	HJ12-50	21.5	1997
3"	HJ8-50B	36.7	3410
4"	HJ11-50	69.9	6494
5"	HJ9-50	117.0	10870
SCL-950		512	47570
HELIAX Elliptical Waveguide			
EW220	21.2-23.6 GHz	0.8	74
EW180	17.7-19.7 GHz	1.2	111
EW132	14.0-15.35 GHz	1.8	167
EW127A	11.7-13.25 GHz	2.7	251
EW90	10.5-11.7 GHz	3.6	334
EW85	8.5-9.8 GHz	4.2	390
EW77	7.125-8.5 GHz	6.3	585
EW64	7.125-7.750 GHz	7.8	725
EW63	6.425-7.125 GHz	9.2	855
EW52	5.6-4.25 GHz	11.3	1045
EW43	4.4-5.0 GHz	18.2	1690
EW37	3.58-4.26 GHz	21.1	1960
EW34	3.58-4.26 GHz	25.0	2323
EW28	2.9-3.4 GHz	36.0	3345
EW20	2.5-2.7 GHz	60.5	5621
EW17	1.7-2.3 GHz	71.0	6596
Circular Waveguide			
WC109		6.5	604
WC166		15.0	1394
WC205		22.9	2127
WC269		39.5	3670
WC281		43.1	4002
Rigid Transmission Line			
7/8"		3.36	312
1-5/8"		12.6	1171
3-1/8"		48.7	4524
6-1/8"		194.0	18023
GUIDELine® Waveguide			
GLW-1350		994	92343
GLW1500		1227	113988
GLW1700		1576	146410
GLW1750		1670	155143
Rectangular Waveguide			
WR42	17.7-26.5 GHz	0.5	46
WR62	12.4-18.0 GHz	1.3	124
WR75	10.0-15.0 GHz	2.0	181
WR90	8.2-12.4 GHz	2.5	232
WR112	7.05-10.0 GHz	3.9	362
WR137	5.85-8.2 GHz	6.0	551
WR159	4.9-7.05 GHz	8.8	817
WR187	3.95-5.85	11.3	1053
WR229	3.3-4.9	18.2	1691

Protection of your transmission line system depends on the proper selection of your dehydrator. The following steps make it easy.

1. Calculate Total Site Transmission Line Volume

Using the following equation and the table to the left, determine the volume of each transmission line. Add the volumes to obtain the total site volume.

Site #_____

Example: Data from column to the left $\frac{\text{Volume} \times \text{Length}}{1000}$ = cubic feet (liters)

Line # 1 , Size 7/8" , Length 450 ft ; $\frac{\text{Vol } 3.5 \text{ ft}^3 \times \text{L } 450 \text{ ft}}{1000} =$ 1.57 cu ft (liters)

Line # 1 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 2 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 3 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 4 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 5 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 6 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 7 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Line # 8 , Size _____ , Length _____ ; $\frac{\text{Vol} \_\_\_\_ \times \text{L} \_\_\_\_}{1000} =$ _____ cu ft (liters)

Total Site Volume_____ cu ft (liters)

2. Dehydrator Selector by System Volume

Match the total site volume calculated in step 1 to one of the volume ranges in the chart below. Select a dehydrator based on your desired maintenance level. Details are presented on the referenced pages.

Dehydrator Series	Description	Page
0-2 ft³ (0-57 l) Systems		
SD-002A	Static Desiccator	258
0-10 ft³ (0-283 l) Systems		
878A, 860G	Hand Pump	258
40525A	Manual Regenerative Dehydrators	259
MR Series, MRS Series	Manual Regenerative Dehydrators	259
MT-050 Series	Automatic Dehydrators	262
10-66 ft³ (283-1869 l) Systems		
MT-300 Series	Automatic Dehydrator	264
XT-300 Series	Automatic Dehydrator, Programmable	264
66-132 ft³ (1869-3738 l) Systems		
MT-600 Series	Automatic Dehydrator	266
XT-600 Series	Automatic Dehydrator, Programmable	266
132-374 ft³ (3738-10592 l) Systems		
MT-1700 Series	Automatic Dehydrator	267
XT-1700 Series	Automatic Dehydrator, Programmable	267

Dehydrator Selection

Pressurization Worksheet No. 2

For Additional System Characteristics

Caution: UMX-459,-465,-611; UHX-34,-35,-36, -37; HPX12-6511C; FP/FPX-34,-36; and P-186 antennas have lower pressure ratings than other antennas as indicated in the chart below.

Antenna Maximum Pressure Ratings

Antenna	Max. Pressure Rating, lb/in² (kPa)
UMX-459	0.5 (3.5)
UMX-465	5 (35)
UMX-611	5 (35)
UHX-34,-35,-36,-37	5 (35)
FP/FPX-34,-36	5 (35)
HPX12-6511C	5 (35)
P-186	2 (14)
2 GHz Dual Polarized UHX	3 (21)

Definitions

A System Volume, ft³ (l)

Compressor Outputs and Pressures

Variable: Dehydrator	B Compressor Output ft³/min (l/m)	C Stop Pressure lb/in²	D Start Pressure lb/in²
40525A/40525A-3	0.9 (25)	8	3
40525A-4/40525A-5	0.9 (25)	5	1
MRH-050	0.05 (1.4)	5	3
MRL-050	0.05 (1.4)	0.5	0.3
MRSH-050	0.05 (1.4)	5	3
MRSL-050	0.05 (1.4)	0.5	0.3
MTH-050	0.05 (1.4)	constant at 5 lb/in²	
MT-300	0.3 (8.5)	8	3
XT-300	0.3 (8.5)	user set	
MT-600	0.6 (17)	8	3
XT-600	0.6 (17)	user set	
MT-1700	1.7 (17)	8	3
XT-1700	1.7 (8.5)	user set	

E Air Volume Required to Pressurize, ft³ (l)

F Time to Purge, minutes

G Time to Pressurize from C to D, minutes

H Cycle Time, minutes

1. *Time to Purge System*

$F = \frac{A}{B} \times 3 =$ _____ minutes

2. *Air Volume Required to Pressurize*

$E = A \times \frac{(D - C)}{14.7^*} =$ _____ ft³ (l)

3. *Time to Pressurize from C to D*

$G = \frac{E}{B} =$ _____ minutes

4. Cycle Time

$H = \frac{G}{\text{Leak}} =$ _____ minutes

(0.01 to 0.08)

*14.7 lb/in² (103 kPa)

Purging the System

Before putting your transmission line system into service, purge each line to remove the moist air that was trapped inside during installation. Leave a flange(s) open at the antenna end and operate the dehydrator until the volume has been changed at least three times. Secure the flange(s).

If the above method is not possible, create a leak in the tubing fitting prior to the manifold/line monitor so that the dehydrator pressurizes the system every 60 minutes. Allow the dehydrator to run overnight and then retighten the fitting.

Pressurizing the System

Once the system has been purged, dehydrator run time and cycle time may be calculated by filling in equations 3 and 4. This will provide complete system parameters.

Cycle Time

Cycle time will vary by the type of dehydrator and the quality of the system. For example:

A. A very tight system using an MR series dehydrator will have a leak rate of approximately 1 to 2%.

B. A very tight system using an MT/XT series dehydrator will have a leak rate of approximately 4%, since the feedback is 3 of the 4%.

C. A leaky system using an MT/XT series dehydrator could have a leak rate of 8%, since the feed-back is 3% of the 8%.

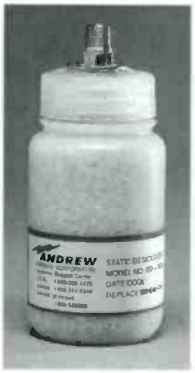
D. Cycle time does not apply to MT-050 series dehydrators, or dehydrators combined with ML or XL monitors, or 31614-3 or 42813A tanks.

Commonly used conversion factors

lb/in² x 69 = mbar
lb/in² x 6.895 = kPa
ft³ x 28.32 = liters
ft³ x 0.2832 = m³
in x 25.4 = mm
in WG x 27.68 = lb/in²

Dehydrators

System Volumes up to 2 ft³ (57 l) - Static Desiccators



SD-002A

Type SD-002A Static Desiccator is a compact and economical disposable device which eliminates moisture in small transmission line/antenna systems. The unit has no moving parts, yet it can provide many months of protection. Typical service life, in a system having 1 ft³ volume and experiencing a temperature change of -10°C (30°F) per day, is approximately one year, at 40% RH.

The static desiccator mounts directly to any convenient pressure inlet having a 1/8" NPT female fitting. Mount it in a location that is easily accessible for viewing and replacement. The translucent polyethylene container allows visual inspection of the desiccant as the color turns from blue to pink/white.

Applications

In general, one unit is recommended for feed and combiners having less than 1 ft³ (28 l) volume. Two units are recommended for feed and combiners having more than 1 ft³ (28 l) volume. Two desiccators can be installed on two separate pressure inlets or can be combined using 1/8" NPT fittings on a single inlet. If a 1/8" NPT fitting is not available, use a pressure inlet (see pages 226-228). ***Pressure inlets are not included with the static desiccator.***

Microwave Applications. Ideal for rooftop applications at any frequency with waveguide up to 10 ft (3 m) in length.

ESA Applications. Typical applications are shown in the table. The recommendations are for antennas without air dielectric feeder systems (e.g., connected using foam dielectric cable or having radio equipment mounted inside the antenna hub). Actual requirements should be based on total system volume.

Antenna Configuration (With 2-port combiner, Includes 3 ft of cross axis Tx waveguide)

	Number of SD-002A
Ku Band: 7.6 m or smaller	1
C Band: 7.3/7.6 m or smaller receive only	2
C Band: 4.6 m or smaller	1
C Band: 7.3 m and larger receive/transmit	*

Note: If the volume consists of a long run of waveguide (in excess of 10 ft), then an SD-002A should be applied at each end.

Static Desiccator Characteristics

Dimensions	2 in (51 mm) diameter by 4 in (102 mm) long, excluding the 1/8" NPT fitting
Net Weight	0.4 lb (0.18 kg)
Shipping Dimensions	3 in W x 3 in D x 6 in L (76 x 76 x 152 mm)
Shipping Weight	0.6 lb (0.27 kg)
Temperature range	-50°C (-58°F) to +50°C (122°F)
Interface	1/8" NPT male threads

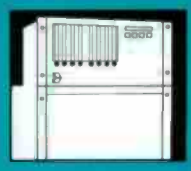
System Volumes up to 10 ft³ (283 l) - Hand Pumps

878A and 860G

Hand pumps 878A and 860G are lightweight portable air drying systems capable of pressurizing up to 30 lb/in² (210 kPa). Removal of moisture is accomplished by passing ambient air through a cylinder of color indicating silica gel desiccant. The pump contains a sight glass to view the moisture condition of the desiccant. When the dark blue color changes to amber, it is time to replace or regenerate the desiccant. Do not use the pump after the desiccant turns amber. The desiccant may be regenerated by baking in an oven at 177°C (350°F) for approximately four hours until it returns to a dark blue color. Allow to cool in a sealed container. Initial system purging is recommended. It takes 80 strokes to purge a 1 ft³ volume with one air change. To pressurize the same volume, it requires 5.5 strokes per 1.0 lb/in².

Applications

Hand pumps are suitable for use in pressurizing any small, tight, electromechanical apparatus requiring dry air to protect against the ingress of moisture, and can supply approximately 135 ft³ (3857 l) of dry air under ambient conditions of 40% Relative Humidity and 21°C (70°F) before regeneration is required.



40525A

MRL-052-101

MRSH-052-101

Hand Pump Characteristics

Dimensions	8 in (203 mm) base, 2.5 in (64 mm) diameter housing, 26 in (660 mm) total height
Net Weight	9.0 lb (4.1 kg)
Shipping Dimensions	12 in W x 12 in D x 28 in H (305 x 305 x 711 mm)
Shipping Weight	13.0 lb (5.9 kg)
Temperature range	-15°C to +50°C (5°F to 122°F)
Hose Length	7 feet (2.1 m)
Interface	gas inlet valve

Each pump comes with a 7 ft (2 m) hose to easily reach a gas inlet valve. If the system does not contain a pressure gauge, the Model 860G hand pump contains a 0-30 lb/in² (207 kPa) gauge and fittings.

System Volumes up to 10 ft³ (283 l) - Manually Regenerative Dehydrators

40525A/MR/MRS-050

Manual regenerative dehydrators provide an economical automatic drying system. "Automatic" for this series of dehydrators is defined as automatically responding to the pressure requirements of the system, not automatic regeneration of the desiccant.

The color indicating desiccant is easily viewed from the front of the unit, providing for programmed replacement. The desiccant canisters are quickly replaced without losing system pressure.

You can replace the desiccant with new desiccant or you can regenerate it. To regenerate the desiccant, remove it from the canister and bake it in an oven at 177°C (350°F) for approximately four hours, until it returns to a dark blue color. Allow it to cool in a sealed container. Then return the desiccant to the canister.

These dehydrators can supply 200 ft³ (2800 l) of -40°C (-40°F) dewpoint air under the ambient conditions of 40% RH and 21°C (70°F) before regeneration is required.

They are quiet, vibration-free and come in low and high pressure versions, as well as various voltages.

All dehydrators include a single line installation kit consisting of 20 ft (6 m) of 3/8" poly tubing, a shut-off valve and a 1/8" NPT to 3/8" poly tube elbow.

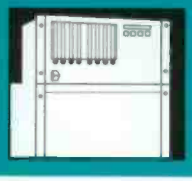
Applications

The 40525 series dehydrators are ideal where economy is the greatest consideration. These units contain a compressor, pressure switch and a desiccant container. They are available in ac versions only and are equipped with an UL/CSA approved 10 ft (3 m) long power cable with a U.S.A. plug which can be replaced with a proper in-country plug.

The MR-050 series dehydrators are especially designed to meet the new North American and European N-3 Standards for complete front access for installation and maintenance of the desiccant. The desiccant container and associated connections are readily accessible from the front of the unit. Front mounted controls and status indicators provide system pressure, visual humidity indication, illuminated on/off switch, circuit breaker and the system pressure shut off valve. Each dehydrator contains a low pressure alarm with Form C dry contacts routed to a terminal strip for connection to the customer furnished alarm system. These units may be rack mounted, wall mounted or self supported and are available in ac and dc versions.

The MRSL/H-050 series are identical in performance and features to the MR series. They are, however, packaged to mount in Slimline European 7R vertical racks.

The ac unit includes IEC power connectors and an International harmonized, 10 ft (3 m) long power cable with stripped leads for installation of a proper in-country plug. DC units include a DC power connector and a 10 ft (3 m) wired power cable with stripped leads.



Pressurization

40525A Series and MR/MRS-050 Series Dehydrator Characteristics

Output Pressure							
0.3-0.5 lb/in² (2-3.4 kPa):	–	–	MRL-052-101	MRL-052-102	MRL-052-103	MRSL-052-101	MRSL-052-103
1.0-5.0 lb/in² (7-34 kPa):	40525A-4	40525A-5	–	–	–	–	–
3.0-5.0 lb/in² (21-34 kPa):	–	–	MRH-052-101	MRH-052-102	MRH-052-103	MRSH-052-101	MRSH-052-103
3.0-8.0 lb/in² (21-56 kPa)	40525A	40525A-3	–	–	–	–	–

Electrical							
Input	115 V, 60 Hz	220 V, 50 Hz	115 V, 60 Hz	220 V, 50 Hz	10-72 Vdc	85-264 V, 47-400 Hz	10-72 Vdc
Volt-Amp, RMS	315	315	122	130	15	15	15
Power (True) Watts	230	230	100 (MRL/H)	100 (MRL/H)	11	11	11
Amps, Starting	7	7	1.7	0.6	1.7	1.7	1.7
Mains Breaker Size Amps	20	20	5	5	5	5	5
Utility Outlet (NEMA)	5	6	IEC Conn.	IEC Conn.	IEC Conn.	IEC Conn.	IEC Conn.
Recommended Wire Size (AWG) for Distance from Main Breaker up to 100 ft (30 m)	14	14	14	14	14	14	14

Mechanical							
Output Capacity, typical, ft³/min (l/min)	0.9 (25)	0.9 (25)	0.05 (1.4)	0.05 (1.4)	0.05 (1.4)	0.05 (1.4)	0.05 (1.4)
Absorbent Capacity, ft³ (l)	200 (5665)	200 (5665)	200 (5665)	200 (5665)	200 (5665)	200 (5665)	200 (5665)
Ambient Operating Temperature	0 to 32°C (32 to 90°F)	0 to 32°C (32 to 90°F)	-10 to 40°C (14 to 104°F)	-10 to 40°C (14 to 104°F)	-10 to 40°C (14 to 104°F)	-10 to 40°C (14 to 104°F)	-10 to 40°C (14 to 104°F)
Minimum Output Dewpoint at 23° C (73° F) and 95% RH	-36°C (-32°F)	-36°C (-32°F)	-40°C (-40°F)	-40°C (-40°F)	-40°C (-40°F)	-40°C (-40°F)	-40°C (-40°F)
Air Output Connector	3/8" compress	3/8" compress	3/8" compress	3/8" compress	3/8" compress	3/8" compress	3/8" compress

Dimensions/Weights	40525A Series	MRL/H-052 Series	MRSL/H-052 Series
Height, in (mm)	12 (305)	7 (178)	17.6 (447)
Width, in (mm)	15.75 (401)	19 (483)**	4.5 (115)
Depth, in (mm)	5 (127)	8.6 (218)	8.5 (216)
Rack Units (RUs)	–	4	–
Net Weight, lb (kg)	21 (9.5)	26 (11.8)	17 (7.7)
Shipping Weight Domestic, lb (kg)*	25.5 (11.5)	28 (12.7)	20 (9.1)
Shipping Size, Domestic* in (mm)	14 x 18 x 22 (355 x 457 x 589)	17 x 19 x 28 (431 x 482 x 711)	10 x 10 x 20 (250 x 250 x 500)

** 19 inch overall width, including rack mounting

* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Alarms

- *Low pressure alarm standard on MR/MRS units.*
- *High pressure alarm not required on MR/MRS units (overpressure relief value provided).*

Multiple Ports

- *For 4-port 1 RU mount with on/off valves only, use DP-4A. See page 268.*
- *For 2, 4 and 6 port wall mount only with on/off valves and pressure gauges, use 6600D series. See page 268.*
- *For 4, 8 and 12 port uni-mount with on/off valves, flow gauges and pressure gauges, use MH series, page 269.*

DryLine® MT/XT Series

State of the Art, Advanced, Automatic Regeneration, World Class Dehydrators

The DryLine dehydrator is the industry's most advanced system for pressurizing transmission lines. It sets new standards for drying performance. MTBF is as high as 55,000 hours (per MIL-HDBK-217F), double the industry standard. Units are warranted for three years or 3000 hours of compressor run time.

Great Convenience. A complete pressurization system is available in a convenient, two chassis DryLine package – the dehydrator and the line monitor. The package contains all of the components typically needed to pressurize an antenna/transmission line system. Depending on the options selected, these include the dehydrator compressor, output pressure regulator, pressure tank, manifold, alarm sensors and contacts, pressure gauges and flow meters. In other systems, these components typically have to be ordered separately and pieced together on site. A unique feature permits you to mount the line monitor panel in your equipment rack and locate the compressor in a remote area.

Low Noise and Vibration. All DryLine dehydrators are carefully balanced and custom isolated to minimize noise. In addition, a factory installed sound deadening option is offered which further reduces noise levels to as low as 82 dBA, on some models and 67 dBA on the MT-050. That is less than the sound emitted by a computer dot matrix printer. The low noise and vibration now make it practical to mount DryLine dehydrators directly into radio equipment racks, even in attended systems.

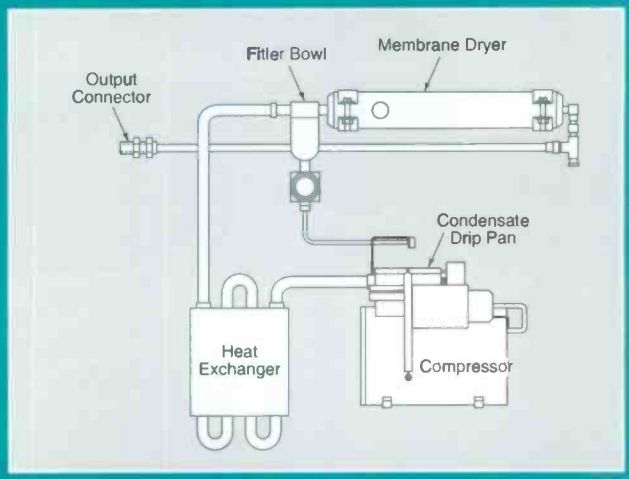
State-of-the-Art Monitoring and Control Features. Even the basic DryLine dehydrators include a built-in low pressure alarm, a pressure gauge and a total run time meter. Optional features include adjustable output pressure, low pressure tank and regulator, a full range of programmable alarms, microprocessor control and LCD displays. Displays on programmable units are in four languages and in both imperial and metric units.

Easy Installation. The units are self-contained in two chassis for easy installation. The uni-mount chassis design permits rack, floor or wall mounting with included hardware for the larger units. No additional parts are required. MT-050 requires a shelf for wall mounting.

Membrane dryers offer exceptional reliability and dewpoints in excess of -45°C (-50°F). They are fully "automatic" in that they automatically respond to the pressure requirements of the system and do not require regeneration due to use of a patented membrane and feedback system.

Importance of Open System Concept

The feedback system utilizes a small amount of dry system air to flow back through the dryer until the compressor again responds to the system. The advantages are (1) continued system drying; (2) elimination of moisture stratification in the system; and (3) elimination of the saturated towers found on small systems using pressure swing dehydrators. The low volume MT-050 contains an internal feedback system.



Referring to the above diagram, the patented drying system begins when filtered ambient air is compressed. Afterwards, it flows through a heat exchanger which condenses some of the moisture, then it is separated out of the air stream by a filter. The separated water is evaporated in a pan on the head of the compressor.

The saturated air then passes into the membrane where moisture is separated by a permeation process through an inert, maintenance-free fiber material. The separated moisture is purged from the membrane into the atmosphere.

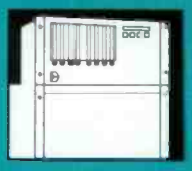
Notice

The specific patented membrane is constructed to allow the wet purge air to be somewhat enriched in oxygen and the dry output air to be somewhat depleted in oxygen. As the feed air contains only trace amounts of hydrogen, neither purge nor output air can contain a significant amount of hydrogen. The heat of compression and a 0.05 micron filter also prevent the growth or passage of bacteria.

Applications

Membrane dryers can be used on any system requiring fully automatic dehydrators from 0.1 ft^3 (3 l) to 374 ft^3 (1060 l) in volume. They will supply dry air at a dewpoint in excess of -45°C (-50°F) under the ambient condition of 95% RH at 49°C (120°F). MT dehydrators have low pressure alarm circuits with Form C dry contact closure, with the normally open pair brought out on the customer terminals. XL/XH line monitors offer solid state switches with floating transistor outputs.

115 Vac units contain an approved UL/CSA power cable and plug. 230 Vac units contain a harmonized power cable with stripped leads.



Pressurization

Mounting Options

Floor

Wall Mounting

Rack Mounting

System Volumes up to 10 ft³ (283 l) - DryLine® Dehydrators

MT-050

This small compact fully automatic membrane dehydrator is ideal for ESA, small microwave and cellular systems from 0.1 to 10 ft³ (283 l) in volume. It requires only 4 RUs 7 in (178 mm) of space and meets the new European N-3 standards for complete front access for installation and routine maintenance.

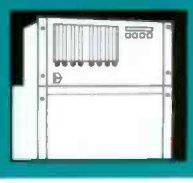
The MT-050 series are fixed pressure units, factory set at 5 lb/in² (35 kPa). They also include a built in pressure storage tank, low pressure alarm, pressure gauge, lighted On/Off switch and resettable circuit breaker.

North American domestic 115 V, 60 Hz units are shipped containing a UL/CSA approved power cable and plug. International 220 V, 50 Hz units and DC units are shipped containing an international harmonized power cable with stripped leads for application of in-country mains plug. All cables connect to the dehydrator with a captivated IEC plug.

All dehydrators contain a single line installation kit consisting of 20 ft (6 m) of 3/8" poly tubing, a shut-off valve and 1/8" NPT to 3/8" polyethylene tubing elbow.

Low pressure operation is possible through the addition of a wall-mount regulator. Pressure of 0.4 lb/in² (fixed) or 1 to 5 lb/in² (user adjustable) are available. See page 276.

The MT-050 is designed for rack mount or free standing operation. A wall mount shelf is available separately.



DryLine® MT-050 Series Dehydrator Characteristics

	MTH-050-101	MTH-050-102	MTH-050-103
Electrical			
Input	115 V, 60 Hz	220 V, 50 Hz	21-68 Vdc
Volt-Amp, RMS	184	184	230
Power (True) Watts	260	260	325
Amps, Starting	4	2	7 @ 48 V
Mains Breaker Size Amps	15	15	Voltage Dependent
Utility Outlet (NEMA)	IEC Connector	IEC Connector	Connector
Recommended Wire Size (AWG) for Distance from Main Breaker up to 100 ft (30 m)	14	14	14
Mechanical			
Output Capacity, typical, ft³/min (l/min)	0.05 (1.4)	0.05 (1.4)	0.05 (1.4)
Ambient Operating Temperature	1 to 40°C (33 to 104°F)	1 to 40°C (33 to 104°F)	1 to 40°C (33 to 104°F)
Minimum Output Dewpoint at 40°C (104°F) and 92% RH	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)
Air Output Connector	3/8" Compression	3/8" Compression	3/8" Compression
Dimensions/Weights			
Height, in (mm)	7.25 (184)	7.25 (182)	7.25 (182)
Width, in (mm)	19 (483)	19 (475)	19 (475)
Depth, in (mm)	14 (356)	14 (356)	18.25 (464)
Rack Units (RUs)	4	4	4
Net Weight, lb (kg)	42 (19)	42 (19)	47 (21)
Shipping Weight Domestic, lb (kg)*	52 (24)	52 (24)	57 (26)
Shipping Size, Domestic* in (mm)	13 x 27 x 20 (330 x 690 x 510)	13 x 27 x 20 (330 x 690 x 510)	13 x 27 x 20 (330 x 690 x 510)

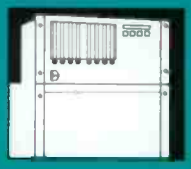
** 19 inch overall width, including rack mounting.
* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available, at extra cost, and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Alarms

- *Low pressure alarm standard on all units.*
- *High pressure alarm not required (Overpressure relief valve provided).*

Multiple Ports

- *For 4-port 1 RU mount with on/off valves only, use DP-4A. See page 268.*
- *For 2, 4 and 6 port wall mount only with on/off valves and pressure gauges, use 6600D series. See page 268.*
- *For 4, 8 and 12 port uni-mount with on/off valves, flow gauges and pressure gauges, use MH series, page 269.*



Pressurization

System Volumes 10 ft³ (283 l) to 66 ft³ (1869 l) - DryLine® Dehydrators

MT/XT-300/310 Series

The MT/XT-300 and MT-310 series dehydrators are equipped with the unique Andrew uni-mount system allowing for rack, wall or free-standing mounting without additional parts. They will supply dry air at a dewpoint in excess of -45°C (-50°F) under the ambient conditions of 95% RH at 49°C (120°F). Each MT dehydrator contains a low pressure alarm with form C dry contacts (see page 255) for connection to the customer furnished alarm system. The MT/XT-300s are also available in a sound deadened version. Rack adapters for mounting in a 23" equipment rack are available. See page 280. MT series are not adjustable and are factory set to come on at 3 lb/in² (21 kPa) and off at 8 lb/in² (55 kPa).

The MT-310 series is identical to the MT-300s with the addition of excess run and high humidity alarms.

MT/XT units at 115 Vac are shipped with a UL/CSA power cord and plug. 220 Vac units have a harmonized power cable with stripped leads.

The XT series dehydrators are microprocessor controlled and fully programmable. Since the microprocessor is contained in the line monitor, an XL/XH series monitor is required for XT dehydrator operation. The line monitor (shown attached to the dehydrator in the photograph) may be separated from the dehydrator up to 100 ft. A 50 ft or 100 ft control cable will be required. See page 280.

All dehydrators contain a single line installation kit consisting of 20 ft (6 m) of 3/8" poly tube, a shut-off valve and a 1/8" NPT to 3/8" polyethylene fitting and a 1/8" NPT street elbow.

Front covers are supplied only on sound deadened units.

In addition to the MT features, the XT series is microprocessor controlled allowing for programmability options of:

- *Compressor ON/OFF, 0.5 - 15 lb/in² (3.5 - 105 kPa)*
- *Covering most requirements for a low pressure tank and regulator*
- *Programmable low pressure alarm, starting at 0.1 lb/in² (0.7 kPa)*
- *Programmable high pressure alarm*
- *Programmable excess run alarm (0-99 minutes)*
- *High humidity alarm fixed at 7.5% RH*
- *LCD display for all functions*
- *Four languages; French, German, Spanish and English*
- *Readout in imperial or metric units*
- *Lightning surge protection*

The programmability is contained in the line monitors. XL/XH line monitors are described on page 270.

Applications

The -300 series dehydrators are for medium volume microwave, cellular and broadcast systems.

DryLine® MT/XT-300 Series Dehydrator Characteristics

No Sound Deadening: / With Sound Deadening:	MT-300 Series MT-300-101 / MT-300-201	MT-300 Series MT-300-102 / MT-300-202	MT-310 Series MT-310-101 / MT-310-201	MT-310 Series MT-310-102 / MT-310-202	XT-300 Series XT-300-101 / XT-300-201	XT-300 Series XT-300-102 / XT-300-202
Electrical						
Input	115 V, 60 Hz	220 V, 50/60 Hz	115 V, 60 Hz	220 V, 50/60 Hz	115 V, 60 Hz	220 V, 50/60 Hz
Volt-Amp, RMS	444	320	444	320	444	320
Power (True) Watts	390	300	390	300	390	300
Amps, Starting	7.7	3.9	7.7	3.9	7.7	3.9
Mains Breaker Size Amps	15	15	15	15	15	15
Utility Outlet (NEMA)	5-15R	6-15R	5-15R	6-15R	5-15R	6-15R
Recommended Wire Size (AWG) for Distance from Main Breaker up to 100 ft (30 m)	14	14	14	14	14	14
Mechanical						
Output Capacity, typical, ft³/min (l/min)	0.3 (8.5)	0.3 (8.5)	0.3 (8.5)	0.3 (8.5)	0.3 (8.5)	0.3 (8.5)
Ambient Operating Temperature	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)
Minimum Output Dewpoint at 49°C (120°F) and 95% RH	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)
Air Output Connector	3/8" compression	3/8" compression	3/8" compression	3/8" compression	3/8" compression	3/8" compression
Dimensions/Weights						
Height, in (mm)	12.22 (310)	12.22 (310)	12.22 (310)	12.22 (310)	12.22 (310)	12.22 (310)
Width, in (mm)	16.84 (428)**	16.84 (428)**	16.84 (428)**	16.84 (428)**	16.84 (428)**	16.84 (428)**
Depth, in (mm)	10.25 (260)	10.25 (260)	10.25 (260)	10.25 (260)	10.25 (260)	10.25 (260)
Rack Units (RUs)	7	7	7	7	7	7
Net Weight, lb (kg)	46 (21)	46 (21)	46 (21)	46 (21)	46 (21)	46 (21)
Shipping Weight Domestic, lb (kg)*	56 (25)	56 (25)	56 (25)	56 (25)	56 (25)	56 (25)
Shipping Size, Domestic* in (mm)	28 x 21 x 23 (710 x 535 x 585)	28 x 21 x 23 (710 x 535 x 585)	28 x 21 x 23 (710 x 535 x 585)	28 x 21 x 23 (710 x 535 x 585)	28 x 21 x 23 (710 x 535 x 585)	28 x 21 x 23 (710 x 535 x 585)

** 19 inch overall width, including rack mounting.
* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Packis available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Alarms

MT Series

- *Low pressure alarm standard on all units.*
- *High pressure alarm not required, but available in XT series.*
- *Excess run and high humidity alarm standard in MT-310 series.*
- *For additional alarms, use XT series dehydrators.*

XT Series

Use X series line monitors. Refer to page 270.

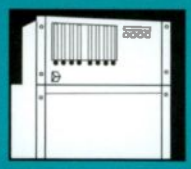
Multiple Ports

MT Series

- *For 4-port 1 RU mount with on/off valves only, use DP-4A. See page 268.*
- *For 2, 4 and 6 port wall mount only with on/off valves and pressure gauges, use 6600D series. See page 268.*
- *For 4, 8 and 12 port uni-mount with on/off valves, flow gauges and pressure gauges, use MH series, page 269.*

XT Series

Use X series line monitors. Refer to page 254.



Pressurization

System Volumes 66 ft³ (1869 l) to 132 ft³ (3738 l) - DryLine® Dehydrators

MT/XT-600 Series

Applications

DryLine MT-600 Dehydrator provides the same features and benefits as the 300 series described on page 264. It is used on large TMW and broadcast systems.

All dehydrators contain a single line installation kit consisting of 20 ft (6 m) of 3/8" poly tube, a shut-off valve, a 1/8" NPT 3/8" polyethylene fitting and an 1/8" NPT street elbow.

DryLine® MT/XT-600 Series Dehydrator Characteristics

	MT-600 Series		XT-600 Series	
No Sound Deadening:	**MT-600-101**	**MT-600-102**	**XT-600-101**	**XT-600-102**
With Sound Deadening:	**MT-600-201**	**MT-600-202**	**XT-600-201**	**XT-600-202**
Electrical				
Input	115 V, 60 Hz	220 V, 50 Hz	115 V, 60 Hz	220 V, 50 Hz
Volt-Amp, RMS	1116	795	1116	795
Power (True) Watts	780	720	780	720
Amps, Starting	34.0	17.0	34.0	17.0
Mains Breaker Size Amps	15	15	15	15
Utility Outlet (NEMA)	5-15R	6-15R	5-15R	6-15R
Recommended Wire Size (AWG) for Distance from Main Breaker up to 100 ft (30 m)	12	12	12	12
Mechanical				
Output Capacity, typical, ft³ /min (l/min)	0.6 (17)	0.6 (17)	0.6 (17)	0.6 (17)
Ambient Operating Temperature	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)
Minimum Output Dewpoint at 49°C (120°F) and 95% RH	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)	-45°C (-50°F)
Air Output Connector	3/8" compression	3/8" compression	3/8" compression	3/8" compression
Dimensions/Weights				
Height, in (mm)	15.72 (399)	15.72 (399)	15.72 (399)	15.72 (399)
Width, in (mm)	16.84 (428)**	16.84 (428)**	16.84 (428)**	16.84 (428)**
Depth, in (mm)	13.5 (343)	13.5 (343)	13.5 (343)	13.5 (343)
Rack Units (RUs)	9	9	9	9
Net Weight, lb (kg)	68 (31)	68 (31)	68 (31)	68 (31)
Shipping Weight Domestic, lb (kg)*	78 (36)	78 (36)	78 (36)	78 (36)
Shipping Size, Domestic* in (mm)	27 x 23 x 26 (685 x 585 x 660)	27 x 23 x 26 (685 x 585 x 660)	27 x 23 x 26 (685 x 585 x 660)	27 x 23 x 26 (685 x 585 x 660)

** 19 inch overall width, including rack mounting. * Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Alarms

MT Series

- *Low pressure alarm standard on all units.*
- *High pressure alarm not required, but available in XT series.*
- *For additional alarms, use XT series dehydrators.*

XT Series

Use XH series line monitors. Refer to page 270.

Multiple Ports

MT Series

- *For 4-port 1 RU mount with on/off valves only, use DP-4A. See page 268.*
- *For 2, 4 and 6 port wall mount only with on/off valves and pressure gauges, use 6600D series. See page 268.*
- *For 4, 8 and 12 port uni-mount with on/off valves, flow gauges and pressure gauges, use MH series, page 269.*

XT Series

Use XH series line monitors. Refer to page 270.

System Volumes 132 ft³ (3738 l) to 374 ft³ (10592 l) - DryLine® Dehydrators

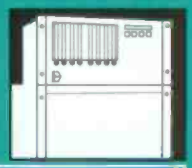
MT/XT-1700 Series

Applications

DryLine XT-1700 Dehydrator provides the same features and benefits as the 300 series described on page 264. It is used on very large TMW and broadcast systems.

All dehydrators contain a single line installation kit consisting of 20 ft (6 m) of 3/8" poly tube, a shut-off valve and a 1/8" NPT 3/8" polyethylene tube elbow.

Pressurization



A front cover is supplied with all MT-1700 and XT-1700 units.

DryLine® MT/XT-1700 Series Dehydrator Characteristics

With Sound Deadening:	MT-1700 Series MT-1700-201	MT-1700 Series MT-1700-202	XT-1700 Series XT-1700-201	XT-1700 Series XT-1700-202
Electrical				
Input	115 V/60 Hz	220 V/50 Hz	115 V/60 Hz	220 V/50 Hz
Volt-Amp, RMS	2280	1610	2280	1610
Power (True) Watts	1580	1430	1580	1430
Amps, Starting	68	34	68	34
Mains Breaker Size Amps	30	30	30	30
Utility Outlet (NEMA)	L5-30R	6-15R	L5-30R	6-15R
Recommended Wire Size (AWG) for Distance from Main Breaker up to 100 ft (30 m)	10	10	10	10
Mechanical				
Output Capacity, typical, ft³/min (l/min)	1.7 (48)	1.7 (48)	1.7 (48)	1.7 (48)
Ambient Operating Temperature	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)	1-49°C (33-120°F)
Minimum Output Dewpoint at 49°C (120°F) and 95% RH	-50°F (-45°C)	-50°F (-45°C)	-50°F (-45°C)	-50°F (-45°C)
Air Output Connector	3/8" compression	3/8" compression	3/8" compression	3/8" compression
Dimensions/Weights				
Height, in (mm)	15.72 (399)	15.72 (399)	15.72 (399)	15.72 (399)
Width, in (mm)	16.84 (428)**	16.84 (428)**	16.84 (428)**	16.84 (428)**
Depth, in (mm)	22.00 (559)	22.00 (559)	22.00 (559)	22.00 (559)
Rack Units (RUs)	9	9	9	9
Net Weight, lb (kg)	116 (53)	116 (53)	116 (53)	116 (53)
Shipping Weight Domestic, lb (kg)*	120 (55)	120 (55)	120 (55)	120 (55)
Shipping Size, Domestic* in (mm)	32 x 28 x 26 (815 x 715 x 635)	32 x 28 x 26 (815 x 715 x 635)	32 x 28 x 26 (815 x 715 x 635)	32 x 28 x 26 (815 x 715 x 635)

* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.
**19 inch overall width, including rack mounting.

Alarms

MT Series

- *Low pressure alarm standard on all units.*
- *High pressure alarm not required, but available in XT series.*
- *For additional alarms, use XT series dehydrators.*

XT Series

Use XH series line monitors. Refer to page 270.

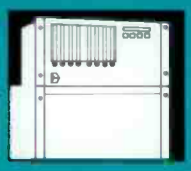
Multiple Ports

MT Series

- *For 4-port 1 RU mount with on/off valves only, use DP-4A. See page 268.*
- *For 2, 4 and 6 port wall mount only with on/off valves and pressure gauges, use 6600D series. See page 268.*
- *For 4, 8 and 12 port uni-mount with on/off valves, flow gauges and pressure gauges, use MH series, page 269.*

XT Series

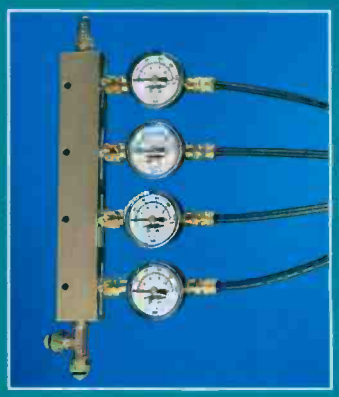
Use XH series line monitors. Refer to page 270.



Pressurization

DP-4A-001

L6600D-4



6600D-4

Distribution Panels

Multi-Port Manifolds for MR and MT Series Dehydrators

Type DP-4A-001 is a compact and economical distribution panel that provides four output ports. The unit is equipped with a shut-off valve per port.

The unit mounts in a standard 19" equipment rack or directly to the top of a wall mounted MR-050 or MT-050 dehydrator. May be used with any dehydrator except the DryLine XT series. It comes with a complete four port installation kit consisting of 100 ft (30.5 m) of 3/8" polyethylene tubing, four tubing mounting racks, 24 nylon ties, four connector 1/8" NPT to 3/8" tubing male, four 1/8" NPT street elbows, four 3/8" connector sleeves, one roll Teflon† tape, eight plastic inserts and one 3/8" tubing tee. Panels can be connected together to provide additional outputs above four.

DP-4A-001 Characteristics

Series	DP-4A-001
Height, in (mm)	1.75 (44)
Width, in (mm)	19 (483)
Depth, in (mm)	3 (76)
Net Weight lb (kg)	2.2 (1)
Shipping Weight Domestic lb (kg)*	9 (4)
Shipping Size Domestic, in (mm)	23 x 7 x 16 (584 x 178 x 406)

* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Gas Distribution Manifolds

The 6600 series manifolds are compact economical manifolds that provide up to six outlet ports. The units are equipped with shut-off valves and pressure gauges. Two or more may be combined using the included hex nipple. For use with any dehydrator. Includes installation accessories, 25 feet (7.6m) of 3/8" polyethylene tubing, connector 1/8" NPT to 3/8" tubing, 1/8" NPT street elbow and compression sleeve per line. Also 24 nylon ties, 4 tubing mounting racks and one roll of Teflon† tape are supplied.

† Teflon® is a registered trademark of E.I. du Pont de Nemours & Co., Inc.

High Pressure Manifolds

Includes a dual scale pressure gauge 0-15 lb/in² (0-100 kPa).

Two ports	Type **6600D-2**
Four ports	Type **6600D-4**
Six ports	Type **6600D-6**

Low Pressure Manifolds

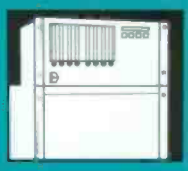
Same as the above manifolds except the range of the dual scale pressure gauge is 0-5 lb/in² (0-35 kPa).

Two ports	Type **L6600D-2**
Four ports	Type **L6600D-4**

Gas Distribution Manifold Characteristics

Series Number of Ports	6600D-2 2	L6600D-2 2	6600D-4 4	L6600D-4 4	6600D-6 6
Height, in (mm)	6.8 (173)	8.8 (224)	10.8 (274)	14.8 (376)	14.8 (376)
Width, in (mm)	4.6 (117)	6.9 (175)	4.6 (117)	6.9 (175)	4.6 (117)
Depth, in (mm)	2.25 (57)	3.0 (76)	2.25 (57)	3.0 (76)	2.25 (57)
Net Weight lb (kg)	2 (0.9)	5 (2.3)	4 (1.8)	7 (3.2)	6 (2.7)
Shipping Weight Domestic lb (kg)*	3 (1.4)	6 (2.7)	5 (2.3)	8 (3.6)	8 (3.6)
Shipping Size Domestic in (mm)	6 x 15 x 22 (152 x 381 x 559)	6 x 15 x 22 (152 x 381 x 559)	6 x 15 x 22 (152 x 381 x 559)	6 x 15 x 22 (152 x 381 x 559)	6 x 15 x 22 (152 x 381 x 559)

* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.



Line Monitors

DryLine® Gas Distribution Line Monitors for MT Dehydrators

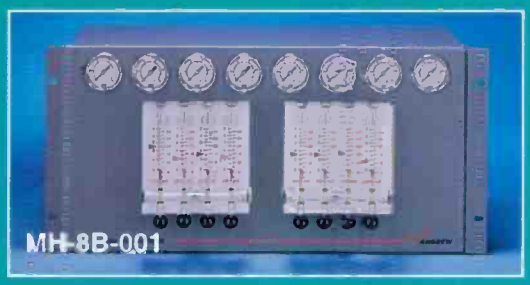
Applications. For multiple line MT dehydrator applications, any combination of ML and MH series line monitors may be used. The installation kit includes a tubing "tee" allowing the monitors to be ganged into the desired combinations. The maximum number of lines to be pressurized is limited only to the dehydrator capacity.

The ML-1 series (not shown) contains a low pressure tank and regulator which is adjustable from 0-2 lb/in² (0-14 kPa) and a pressure gauge. The ML-4 series contains the same, plus flow meters. ML Line Monitors are intended primarily for use on 2-pressure systems as illustrated on page 275. For other applications as additional external volume tank may be required. The MH series contains pressure gauges and flow meters. Flow meters contain shut-off valves. ML monitors require additional air volume between dehydrator and monitor.

Installation Kits. Each four-port line monitor includes one four-line installation kit. Eight-port monitors include two four-line kits; twelve-port monitors include three four-line kits. The four-line kit contains 100 ft (30.5 m) of 3/8" polyethylene tubing, four tubing mounting racks, 24 nylon ties, four 1/8" NPT to 3/8" male tubing connectors, four 1/8" NPT street elbows, four 3/8" connector sleeves, one roll Teflon† tape, eight plastic inserts and one 3/8" tubing tee.

Mounting. Line monitors are equipped with uni-mounts for rack or wall mounting.

† Teflon® is a registered trademark of E.I. du Pont de Nemours & Co., Inc.



M Series Line Monitor Characteristics

Series Number of Ports	ML-1-001 1	ML-4A-001 4	MH-4B-001 4	MH-8B-001 8	MH-12B-001 12
Height, in (mm)	10.47 (266)	10.47 (266)	8.72 (222)	8.72 (222)	10.47 (266)
Width, in (mm)	16.74 (425)**	16.74 (425)**	16.74 (425)**	16.74 (425)**	16.74 (425)**
Depth, in (mm)	7.63 (194)	7.63 (194)	7.63 (194)	7.63 (194)	7.63 (194)
Rack Units (RU's)	10.5 (6)	10.5 (6)	8.25 (5)	8.25 (5)	10.5 (6)
Net Weight, lb (kg)	20 (9)	25 (11)	14 (6)	16 (7)	21 (10)
Shipping Weight Domestic lb* (kg)*	28 (13)	32 (15)	21 (10)	26 (12)	30 (14)
Shipping Size, Domestic, in (mm)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)

** 19 inch overall width, including rack mounting.

* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons. Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Pressurization

DryLine® Gas Distribution Line Monitors for XT Dehydrators

Applications

Each XT dehydrator must have an XL or XH line monitor for microprocessor control.

Multiple Lines. The XH line monitors are available in one, four and eight port versions. You may use distribution panels (DP-4), manifolds (6600 series) and M series monitors (page 269) in combination with the required XL or XH line monitor to provide lines in addition to those provided by the required XL or XH line monitor.

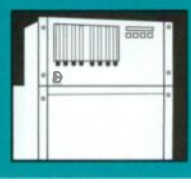
Features. The XT series dehydrator/line monitor combination includes advanced features, in addition to the features listed for the MT series on page 269. All alarms are solid state.

With Basic XL/XH Line Monitor:

- *Microprocessor control*
- *Programmable on/off*
- *Pressure sensor settings. Low pressure capability eliminates the need for a low pressure tank and regulator for most systems.**
- *Programmable low pressure alarm*
- *Programmable excess run alarm*
- *LCD display for all functions and alarms, including total run time and pressure sensor readout.*
- *Multiple lines*
- *Flow Meters*
- *Lightning surge protection*

Further capabilities provided by optional versions:

- *Programmable high pressure alarm*
- *Programmable high humidity alarm*
- *Redundant hot standby capability*



All models feature LCD display for total run time and system pressure for each line. Four and eight line models include a built-in manifold and flow meters. Model XL-1 includes an integral low-pressure tank and regulator for pressurizing broadcast waveguide. See page 277. For single pressure applications with the XL-1, an external volume tank may be required.

They may also be programmed in English (factory set), Spanish, French, German and metric or imperial units.

Installation Kits. Each four-port line monitor includes one four-line installation kit. Eight-port monitors include two four-line kits. The four-line kit contains 100 ft (30.5 m) of 3/8" polyethylene tubing, four tubing mounting racks, 24 nylon ties, four 1/8" NPT to 3/8" male tubing connectors, four 1/8" NPT street elbows, four 3/8" connector sleeves, one roll Teflon† tape, eight plastic inserts and one 3/8" tubing tee.

***Note:** When installing the air lines to the line monitor, they must be installed in order beginning with the number 1 port.*

* For a low pressure system, the XH line monitor may be programmed to the desired level.
For a system requiring two different low pressure settings, such as a large broadcast system, the XL-1 series monitor may be used. For example, the XL-1 may be programmed for 2 lb/in². A 2 lb/in² line may then be returned to the tank and the regulator set to provide a second line at 0.5 lb/in².

† Teflon® is a registered trademark of E.I. du Pont de Nemours & Co., Inc.

Line Monitors for XT Series Dehydrators

Standard Units 115 Vac 60 Hz	Standard Units 220 Vac 50 Hz	Redundant Hot Standby Units 115 Vac 60 Hz	Redundant Hot Standby Units 220 Vac 50 Hz	Low Pressure Alarm	Excess Run Alarm	High Humidity Alarm	High Pressure Alarm
XL-1 Series Single Line Output, Low Pressure Tank and Regulator							
XL-1-101	XL-1-102	XL-1-111	XL-1-112	•	•		
XL-1-701	XL-1-702	XL-1-711	XL-1-712	•	•	•	•
XH-1 Series Single Line Output							
XH-1-101	XH-1-102	XH-1-111	XH-1-112	•	•		
XH-1-701	XH-1-702	XH-1-711	XH-1-712	•	•	•	•
XH-4 Series Four Line Output							
XH-4A-101	XH-4A-102	XH-4A-111	XH-4A-112	•	•		
XH-4A-701	XH-4A-702	XH-4A-711	XH-4A-712	•	•	•	•
XH-8 Series Eight Line Output							
XH-8A-101	XH-8A-102	XH-8A-111	XH-8A-112	•	•		
XH-8A-701	XH-8A-702	XH-8A-711	XH-8A-712	•	•	•	•

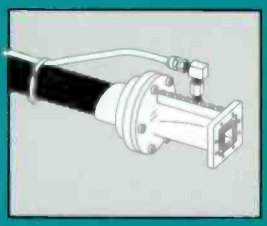
X Series Line Monitor Characteristics

Series	XL-1	XH-1	XH-4A	XH-8A
Number of Ports	1	1	4	8
Power, Watts	6	6	6	6
Rack Units (RU's)	10.5 (6)	8.25 (5)	8.25 (5)	8.25 (5)
Height, in (mm)	10.47 (266)	8.72 (222)	8.72 (222)	8.72 (222)
Width, in/mm	16.74 (425)**	16.74 (425)**	16.74 (425)**	16.74 (425)**
Depth in (mm)	7.63 (194)	7.63 (194)	7.63 (194)	7.63 (194)
Net Weight, lb (kg)	24 (11)	15 (7)	17 (8)	20 (9)
Shipping Weight Domestic, lb (kg)*	31 (14)	22 (10)	25 (11)	28 (13)
Shipping Size Domestic, in (mm)*	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)	19.5 x 27.5 x 16.5 (495 x 700 x 420)

** 19 inch overall width including mounting.
* Standard U.S. Domestic pack or Air Export pack consists of foam protection interior with fiberboard cartons.
Ocean Export Pack is available at extra cost and includes barrier bag and plywood crate. Request costing, size and weight on quotation and specify "export pack" at time of order.

Typical Systems Using Dehydrators (Except XT Series)

Single Line

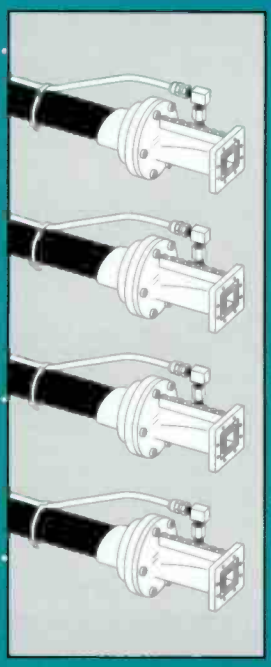


Distribution System

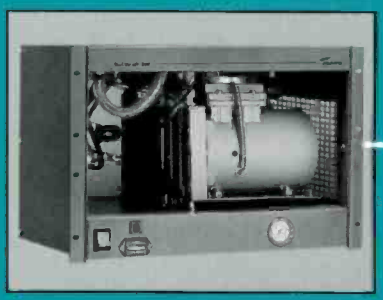
Distribution Panel, Rack Mount

DP-4A-001

Multiple Lines



Dehydrators



(MT-300 non-sound deadened unit shown)

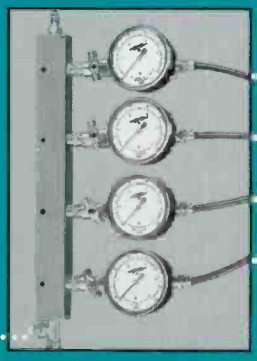
MT-300 / 310 / 600 / 1700

MTH-050

MRL / MRH-052 or 40525A

MRSL / MRSH-052

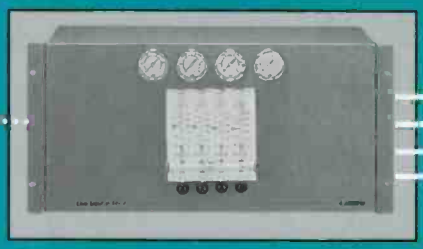
Manifold



6600D or L6600D Series

Manifolds may be ganged for additional lines.

Line Monitor



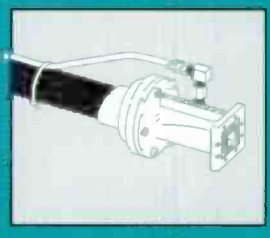
(MH-4A Shown)

MH-4B, 8B, 12B

ML-1,4 may require an external volume tank

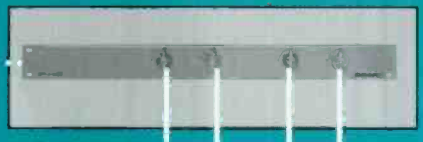
Typical Systems Using XT Series Dehydrators

Single Line



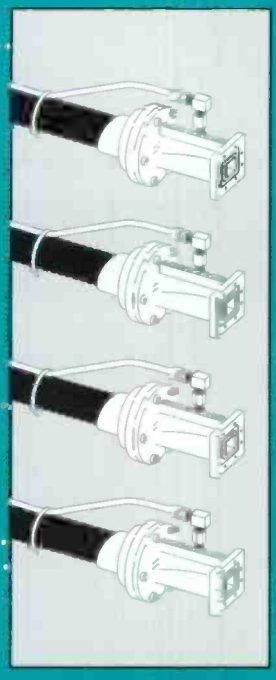
Distribution System

Distribution Panel, Rack Mount



DP-4A-001

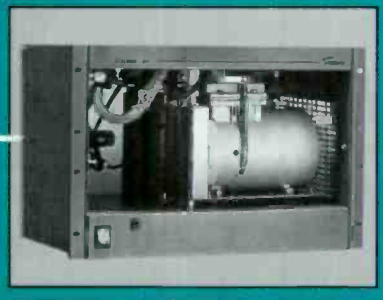
Multiple Lines



Dehydrator and Line Monitor

(An XL or XH Line Monitor is required)

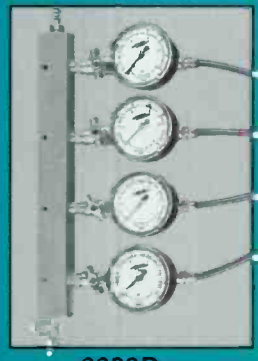
Dehydrator



(XT-300 non-sound deadened unit shown)

XT-300 / 600 / 1700

Manifold



6600D or L6600D Series

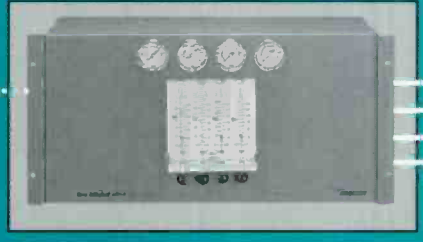
Manifolds may be ganged for additional lines.

Line Monitor

(XH-4A Shown)

XH-1, XH-4A or XH-8A
XL-1
(note: XL monitors are recommended for use with XT 300 and may require an external volume tank)

Line Monitor



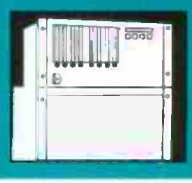
(MH-4 Shown)

Pressurization

Typical Systems Using Static Desiccator

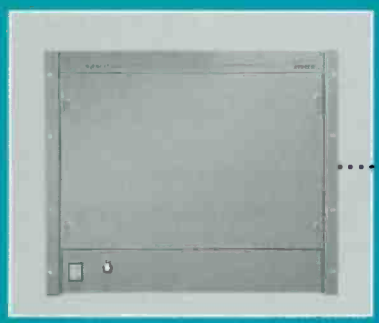
Static Desiccator SD-002A.

Static Desiccator SD-002A attached to 2 Port Combiner of 4.5 m ESA.



Special Broadcast System Requiring Two Different Low Pressure Outputs

Dehydrator



(XT-1700 is shown)

XT-300 / 600 / 1700

2 lb/in²

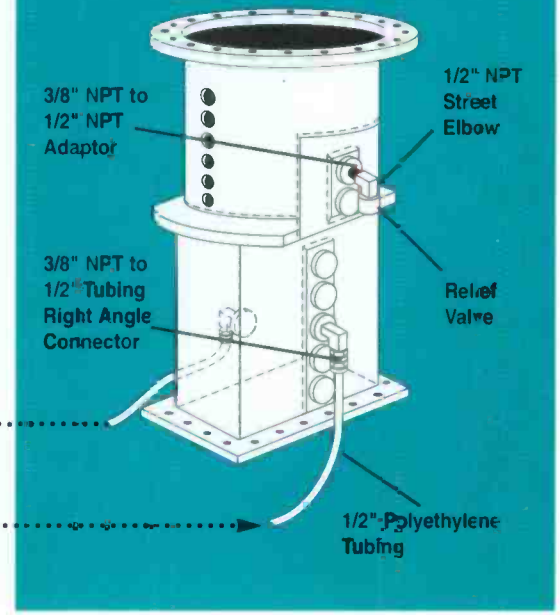
Line Monitor

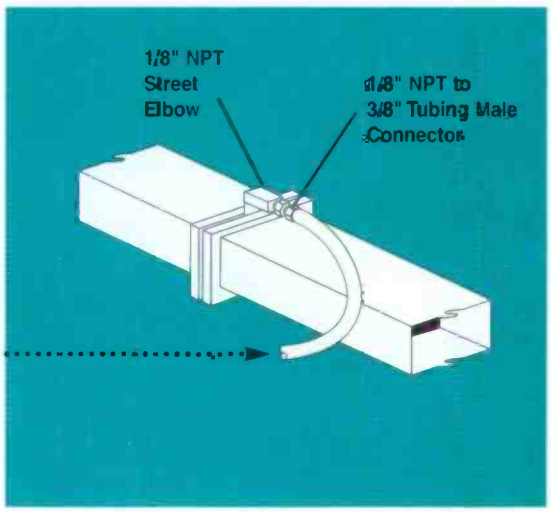
(XL-1 is shown)

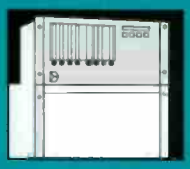
The XL-1 is programmed for the dehydrator to run at 2 lb/in². The 2 lb/in² return line is then regulated down to 0.5 lb/in² for pressurization of the rectangular waveguide.

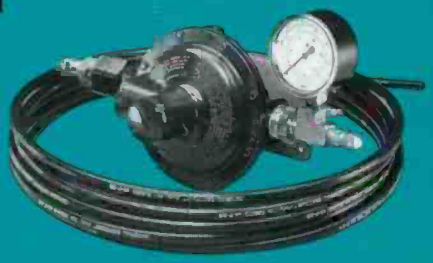
2 lb/in²

0.5 lb/in²



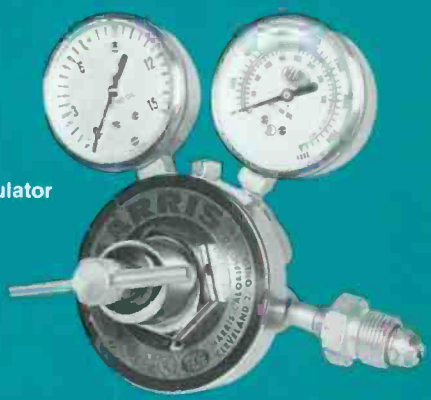






Low Pressure Wall-Mount Regulator

Low-Pressure Nitrogen Regulator Tank Assembly



Nitrogen Tank Regulator

Adapter

Regulating Tank

Pressurization Accessories

Low Pressure Components

Low-Pressure, Fixed, Wall-Mount Regulator, is factory set to reduce the pressure of microwave pressurization systems (typically 3-8 lb/in²), to 0.4 lb/in² (3 kPa). The regulator is supplied with a wall mounting bracket, 20 feet (6 m) of 3/8" polyethylene tubing and a 1/8" NPT male connector for attachment to the HELIAX coaxial cable or waveguide. Not to be used directly from any dehydrator except 40525A and MTH-050.....Type **42996A**

Low-Pressure, Adjustable, Wall-Mount Regulator, is user set to reduce the pressure of microwave pressurization systems (typically 3-8 lb/in²), to any value between 1 and 5 lb/in² (7 to 34 kPa). The regulator is supplied with a wall mounting bracket, 20 ft (6m) of 3/8" polyethylene tubing and a 1/8" NPT male connector for attachment to coaxial cable or waveguide. Not to be used directly on any dehydrator except 40525A and MTH-050 .....Type **AE01A-D1339-001**

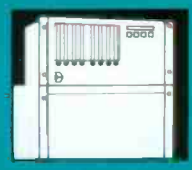
Low-Pressure Nitrogen Regulator Tank Assembly. Includes a wall-mount regulator, Type 42996A (described above) and a regulator assembly, factory set to 10 lb/in² (70 kPa), with high and low-pressure gauges for direct attachment to a nitrogen tank with a CGA 580 (0.965" right hand internal) connection. It is supplied with 20 feet (6 m) of 3/8" tubing and 1/8" NPT male pipe connector for attachment to the HELIAX coaxial cable or waveguide connectors .....Type **42969**

Nitrogen Tank Regulator. Adjustable 0-15 lb/in² (0-103 kPa) includes a pressure regulator, high- and low-pressure gauges, and 20 feet (6 m) of 3/8" polyethylene tubing and 1/8" NPT male connector. Fits CGA580 (0.965" right-hand internal) connection .....Type **858C**
Fits British 5/8" BSPP connection .....Type **858C-3**

Adapter to fit a CGA555 (0.903" left-hand external) nitrogen tank connection and mates to CGA 580 connection .....Type **35751**

Regulating Tank, 1-5 lb/in² (7-34 kPa). Use with any dehydrator to increase system volume. Prevents excessive cycling in low volume systems. Also used in 2 or 4 GHz systems to reduce maximum pressure to 5 lb/in² (34 kPa). The tank has a 1.5 ft³ (42 liter) capacity and is supplied with a 0-5 lb/in² gauge. The regulator can be adjusted down to 1.0 lb/in² (7 kPa) output pressure. Includes 20 feet (4.6 m) of 3/8" polyethylene tubing and one 1/8" NPT male connector. 20 H x 12 W x 27 L inches (510 x 305 x 685 mm). Net weight 33 lb (15 kg)
.....Type **31614-3**

Pressurization



AirTank. Use with any dehydrator to increase system volume by 1.5 ft³ (42 liters). Includes 3/8" tubing tee to prevent excessive cycling when pressurizing low volume systems, such as 1/2" and 7/8" cables. 17 H x 12 W x 27 L inches (432 x 305 x 685 mm).
Net weight 30 lb (14 kg).....Type **31614-4**

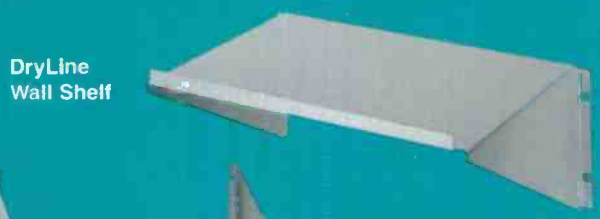
Regulating Tank, 0.4 lb/in² (3kPa) for use with 40525A and MT series dehydrators in UMX® multiband or earth station antenna systems. Prevents excessive cycling when pressurizing systems with a low internal volume. The tank has a 1.5 ft³ (42 l) capacity and is equipped with a factory set regulator which reduces output pressure to 0.4 lb/in² (3 kPa). Relief valve releases air when system pressure exceeds 1 lb/in² (0.7 kPa). Pressure activated, normally open, Form C dry contacts, 15 amps resistive. Contacts are activated if system pressure drops below factory set 0.1 lb/in². Includes 0-20 oz/in² pressure gauge, 20 feet (6 m) of 3/8" polyethylene tubing and one 1/8" NPT male connector. 23 H x 12 W x 27 L inches (585 x 305 x 685 mm).
Net weight 38 lb (17 kg).....Type **42813A**

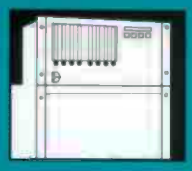
Floor Stand. For 40525A, 1930, 1920, MT and XT series dehydrators and regulating tanks. Includes two shelves 17.75 in by 23.3 in (450 x 590 mm). Allows for convenient placement of dehydrator above regulating tanks .....Type **30900**

Wall Shelf. For 40525/1930 series. Can also be mounted to a 19" equipment rack .....Type **30895**

Dryline® Wall Shelf.
For MT-050 series .....Type **AE01A-D1306-003**
For MT/XT-300/310/600 series
.....Type **AE01A-D1306-004**

Rack Shelf. Mounted to a 19" equipment rack to support MT/XT-1700 series .....Type **AE01D-D1055**





Pressurization

Single Switch

Dual Switch

Gauge Assembly

Pressure Gauge

Pressure Gauge

Pressure Sensor Switches

Can be used to activate remote warning lights or alarms when system pressure goes beyond specified low or high limits. Pressure activated, normally open, Form C, dry contacts, 15 amps resistive.

Single Switch. Low or high-pressure limit, adjustable 0-20 lb/in² (0-140 kPa).

Low-Pressure Limit factory set at 1.25 lb/in² (8.6 kPa). Includes 3/8" poly tube tee fitting for line insertion.....Type **31618-1**

High-Pressure Limit factory set at 10 lb/in² (70 kPa). Includes 3/8" poly tube tee fitting for line insertion.....Type **31618-2**

Low-Pressure Limit factory set at 1.25 lb/in² (8.6 kPa). Includes 1/4" NPT fitting for mounting on top of manifold .....Type **31618-4**

Dual Switch. Low and high-pressure limits, adjustable 0-20 lb/in² (0-140 kPa). Pressure activated, normally open, Form C, dry contacts, 15 amps resistive.

High-Pressure Limit factory set at 3 lb/in² (21 kPa). Low-pressure limit factory set at 1.25 lb/in² (8.6 kPa). Includes 1/4" NPT fitting for mounting on top of manifold .....Type **165046**

High-Pressure Limit factory set at 10 lb/in² (70 kPa). Low-Pressure Limit factory set at 1.25 lb/in² (8.6 kPa). Includes 1/4" NPT fitting for mounting on top of manifold .....Type **165046-2**

Pressure Gauges

Gauge Assembly. Indoor use only. Includes pressure gauge with steel case, gas inlet valve and tee with 1/8" NPT male pipe thread. Dual scale graduated in lb/in² and kPa.

0-30 lb/in² and 0-200 kPa for all waveguide sizes and cable sizes 1-5/8" and smaller....Type **18991A-1**

0-15 lb/in² and 0-100 kPa for cable sizes 3" and larger.....Type **18991A-2**

Pressure Gauge. Indoor use only. Steel case. Bottom Fitting. Male pipe thread. Dual scale graduated in lb/in² and kPa.

0-15 lb/in² and 0-100 kPa with 1/8" NPT thread. .....Type **3500A**

0-5 lb/in² and 0-35 kPa with 1/8" NPT thread. .....Type **33117-2**

Pressure Gauge. Indoor use only. Steel case. Back Fitting. Male pipe thread. Dual scale graduated in lb/in² and kPa.

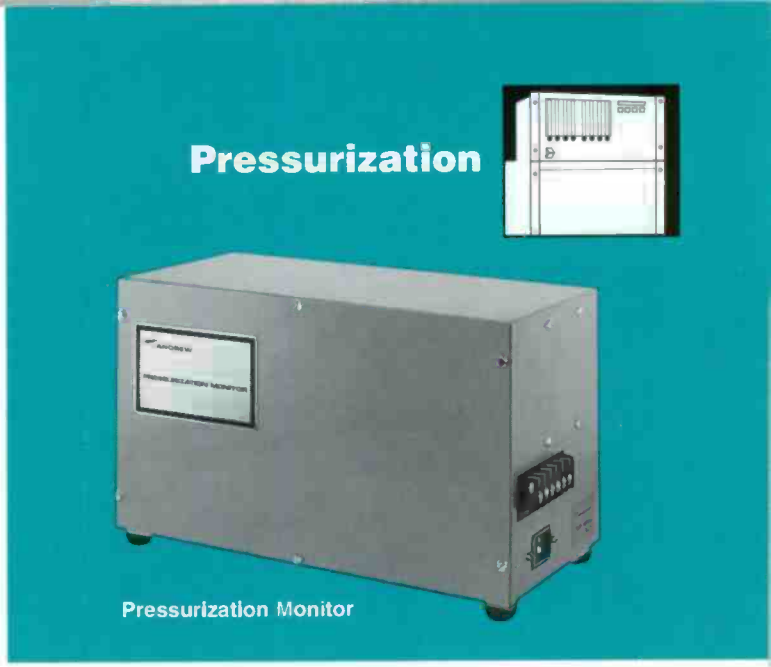
0-15 lb/in² and 0-100 kPa with 1/8" NPT thread. .....Type **3500A-2**

0-5 lb/in² and 0-35 kPa with 1/4" NPT thread. .....Type **33117-5**

Pressurization Monitors

Pressurization Monitor Weights and Dimensions

	Net Weight lb (kg)	Domestic Pack Shipping Weight lb (kg)	Domestic Pack Dimensions L x W x H in (mm)
40004A	8 (3.6)	11 (4.9)	12 x 6 x 7 (305 x 152 x 178)
40004A-2	8 (3.6)	11 (4.9)	12 x 6 x 7 (305 x 152 x 178)
40004A-3	7 (3.2)	10 (4.5)	12 x 6 x 7 (305 x 152 x 178)
40004A-4	6 (2.8)	8 (3.7)	12 x 6 x 7 (305 x 152 x 178)
40004B-5	8 (3.6)	11 (4.9)	12 x 6 x 7 (305 x 152 x 178)
40004B-6	10 (4.5)	12 (5.4)	12 x 6 x 7 (305 x 152 x 178)
40004B-7	10 (4.5)	12 (5.4)	12 x 6 x 7 (305 x 152 x 178)



Pressurization Monitor

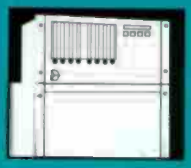
Low Pressure, High Pressure, High Humidity and Excess Run

Pressurization monitors activate remote warning light or alarm (not supplied) when system pressure, humidity or run time goes beyond specified limits. 40004 series monitors are for use with 40525A, 1920, 1930 and MT series dehydrators. Pressure activated, 15 amps resistive, Form C dry contacts. The dehydrator excess run timer, included with models 40004B-5, -6 and -7, activates contacts in case of excessive dehydrator operation. It is adjustable from 0-99 minutes. The humidity sensor is factory set at 10% relative humidity.

Pressurization Monitor Ordering Information

Features:	Input Voltage	Low Pressure Sensor	High Pressure Sensor	Humidity Sensor	High Pressure Relief	Excess Run Timer	Humidity Bypass
Limits:		1.5 lb/in² (10 kPa)*	10 lb/in² (70 kPa)*	10% RH	10 lb/in² (70 kPa)*	Adjustable 0-99 min	
40004A	120 V, 60 Hz	•	•	•			
40004A-2	230 V, 50Hz	•	•	•			
40004A-3		•	•				
40004A-4		•					
40004B-5	120 V, 60 Hz	•			•	•	
40004B-6	120 V, 60 Hz	•	•	•		•	
40004B-7	230 V, 50 Hz	•	•	•		•	

* Adjustable 0-20 lb/in2 (0-140 kPa).



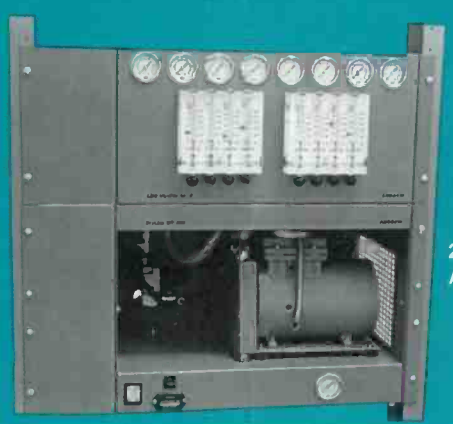
Pressurization

Mounting Rack

Mounting Strap

Polyethylene Tubing

Nylon Tie Kit



23" Rack Adapter

Installation Accessories

Mounting Rack, UV resistant, for polyethylene tubing. Hardware for wall mounting not included.
For 1/4" tubes (package of 10).
.....Type **AE01K-B0523-001**
For 3/8" tubes (package of 10).
.....Type **AE01K-B0523-002**
For 1/2" tubes (package of 10).
.....Type **AE01K-B0523-003**

Mounting Strap, UV resistant, for polyethylene tubing.
For 1/4" tubes (package of 10) .....Type **164004-3**
For 3/8" tubes (package of 10) .....Type **164004-1**
For 1/2" tubes (package of 10) .....Type **164004-2**

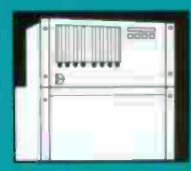
Polyethylene Tubing, UV resistant, for indoor/outdoor applications. Specify length in feet or meters.
1/4" tubing. Maximum length 1000 ft (305 m); minimum length 20 ft (6 m) .....Type **25435-4**
3/8" tubing. Maximum length 500 ft (150 m); minimum length 20 ft (6 m) .....Type **25435-5**
1/2" tubing. Maximum length 250 ft (75 m); minimum length 20 ft (6 m) .....Type **25435-8**

Nylon Tie Kit, UV resistant, for securing polyethylene tubing directly to interior or exterior waveguide. Package of ten .....Type **164027**

23" Rack Adapter. Attach a 19" rack component to a 23" rack.
For MT/XT-300 series dehydrator.
.....Type **AE01D-D1116-001**
For MT/XT-600 series dehydrator.
.....Type **AE01D-D1116-002**
For ML-1, ML-4, MH12, MH12A, XL-1 line monitor.
.....Type **AE01D-D1116-003**
For MH-4, MH4A, MH-8, MH-8A, MH-12, MH-12A, XH-1, XH-4A, XH-8A line monitor
.....Type **AE01D-D1116-004**

Signal Extension Cable for XT Pressurization System. Install XT Series dehydrator up to 100 ft from XH or XL Series line monitors. (Not Illustrated)
50 ft (15 m) length .....Type **AE01C-D0534-050**
100 ft (30 m) length .....Type **AE01C-D0534-100**

Pressurization



Fittings

Gas Inlet Valve. Has male threads and cap.
1/8" NPT threads .....Type **3017**
1/4" NPT threads .....Type **3017-2**

Gas Release Valve. Has male threads.
1/8" NPT threads .....Type **3027**

Gas Shut-Off Valve. Has male thread one end and female thread other end.
1/8" NPT threads .....Type **4949**

Pipe Tee. Has female threads each outlet.
1/8" NPT threads .....Type **3028**
1/4" NPT threads .....Type **3028-2**

Male Run Pipe Tee has 1/4" NPT pipe threads and two 3/8" poly tube outlets .....Type **25436-69**

Male Branch Tee has one 1/4" NPT male outlet and two 3/8" poly tube outlets.....Type **25436-62**

Street Tee has one 1/8" NPT male and two 1/8" NPT female outlets .....Type **3022**

Hex Pipe Nipple has male threads both ends.
1/8" NPT threads .....Type **25436-42**
1/4" NPT threads .....Type **25436-52**

Male Connector for polyethylene tubing. 1/8" NPT male pipe thread.
For 1/4" tubing .....Type **25436-20**
For 3/8" tubing .....Type **25436-68**
For 1/2" tubing .....Type **25436-84***

* Has 3/8" male pipe thread. Use with 25436-83, 3/8" to 1/8" reducer. Order separately.

Gas Inlet Valve

Gas Release Valve

Gas Shut-Off Valve

Pipe Tee

Male Run Pipe Tee

Male Branch Tee

Street Tee

Hex Pipe Nipple

Male Connector

Pressurization

Male Connector

Tee

Elbow

Splice Union

Pipe Plug

Teflon Tape

A. Metric Gas Inlet Adapter

B. Metric Gas Inlet Adapter

Fittings

Male Connector for polyethylene tubing. 1/4" NPT male pipe thread.

For 1/4" tubing .....Type **25436-61**
For 3/8" tubing .....Type **25436-63**

Tee for polyethylene tubing.

For 1/4" tubing .....Type **25436-519**
For 3/8" tubing .....Type **25436-81**

Elbow for polethylene tubing has 1/8" NPT male pipe thread.

For 1/4" tubing .....Type **25436-21**
For 3/8" tubing .....Type **25436-4**
For 1/2" tubing .....Type **25436-85***

* Has 3/8" male pipe thread. Use with 25436-83, 3/8" to 1/8" reducer. Order separately.

Splice Union for polyethylene tubing.

For 1/4" tubing .....Type **25436-522**
For 3/8" tubing .....Type **25436-32**
For 1/2" tubing .....Type **25436-526**

Pipe Plug. Has 1/8" NPT male threads .....Type **3018**

Teflon† Tape for sealing threaded joints. 7.5 ft (2.2 m) of tape on spool .....Type **3012A**

† Teflon® is a registered trademark of E.I. du Pont de Nemours & Co., Inc.

Reducer has 3/8" NPT female and 1/8" NPT male threads. (Not Illustrated) .....Type **25436-83**

Metric Gas Inlet Adapters

A M10X .75-6G metric adapter to 1/8" NPT for H4PDM, H5PDM-T and H4.5PDM connectors .....Type **AE01K-CO677-001**

B M12X 1.5-6G metric adapter to 1/8" NPT for H12PDM-T, H7PDM-T and L6PDM connectors. .....Type **AE01K-CO678-001**

Maintenance Components

Replacement Filter Cartridge, includes filter, for 1920/1930 series dehydrators .....Type **46173**

Replacement Filter Cartridge, includes filter.
For MT/XT -300 series.....Type **EFLTR-20201**
For MT/XT -600, -1700 series .....Type **EFLTR-20202**

Replacement Filters
For 1920/1930 series units. Package of six.
.....Type **46173-1**
For MT/XT-300 series units. Package of six.
.....Type **AE01K-B0518-001**
For MT/XT-600, -1700 series units. Package of six.
.....Type **AE01K-B0518-002**

Color Indicating Silica Gel Refill. For all sight glasses 1920/1930, 65630B/163903. 1 ounce package per sight glass .....Type **AE01K-B0214**

Color Indicating Silica Gel Refill. For Type 860A/878A hand pump (requires one can) or Type 40525A dehydrator (requires two cans) .....Type **210**

Color Indicating Calcium Sulfate for MR-050 series dehydrators. Use one 1.25 lb (0.56 kg) package per canister (Not Illustrated) .....Type **AE01K-C0561-001**

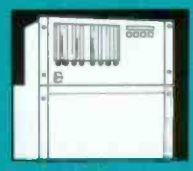
Non-Color Indicating Sorbead Refill for Type 65630B/163903 dehydrators. Requires one package.
5 lb (2.27 kg) .....Type **52665-2**

Color Indicating Desiccant for MRS-050 series canisters. Six bags, 2.5 lb (1.2 kg) each.
(Not illustrated) .....Type **AE01A-D1266-004**

Replacement Canister with Desiccant and Hose for MRS-050 series dehydrators. Two complete canisters per box (Not illustrated) .....Type **AE01A-D1266-003**

Pressure Swing Tower Overhaul Kit for one 1920/1930 series dehydrator. Includes molecular sieve, O rings, perforated disk and filter pads. Solenoid valve not included.....Type **AE01K-B0187**

Pressurization



Replacement Filter Cartridge

Replacement Filter Cartridges

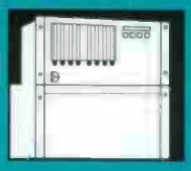
Replacement Filters

Color Indicating Silica Gel Refill

Color Indicating Silica Gel Refill

Non-Color Indicating Sorbead Refill

Pressure Swing Tower Overhaul Kit



Pressurization

Pressure Swing Dehydrator Compressor Overhaul Kit

Membrane Dehydrator Overhaul Kit

Spare Hose

Maintenance Components

Pressure Swing Dehydrator Compressor Overhaul Kit. Includes gaskets, rings, seals and valves:

For 1920/1921/1924 series .....Type **39878**
For 1930/1931/1934C series .....Type **40486**

Includes gasket, valves and muffler:

For 40525A series .....Type **39795-2**
For 78200-24 series .....Type **78199-24**
For 78200-48 series .....Type **78199-48**

Membrane Dehydrator Overhaul Kits.
Includes compressor overhaul kit, high temperature hose, clamps, isolators, water filter element and coalescent filter element.

For MT-050 series .....Type **AE01K-C0398-007**
For MT/XT-300 series. For units equipped with green WILKERSON filters .....Type **AE01K-C0398-001**
For MT/XT-600-( )( )1 series .....Type **AE01K-C0398-002**
For MT/XT-600-( )( )2 series .....Type **AE01K-C0398-003**
For MT/XT-1700-( )( )1 series .....Type **AE01K-C0398-004**
For MT/XT-1700-( )( )2 series .....Type **AE01K-C0398-005**

Spare Hose for 860G and 878A series hand pump dehydrators. 7 feet (2.13 m) long .....Type **10025**

For More Information

Literature

The Biannual Care and Feeding of Your Andrew Dehydrator. Explains dehydrator operation, preventative maintenance and trouble shooting for 1920, 1930, 40525A and 65630B models. 10 pages. Bulletin **1557**

DryLine® Dehydrators. More information on MT and XT series dehydrators. 8 pages. Bulletin **1660**

Use Pressurization to Protect RF Feedlines. Magazine article reprint. 6 pages. Bulletin **1845**

New Literature is constantly being added to the Andrew automated Fax system. Call 1-800-1700 or 708-873-3614 for current index and complimentary copies.

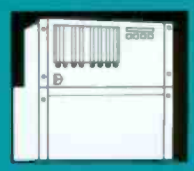
Computer Software

DryLine Dehydrator Planner. Prepare bills of materials quickly and easily on your PC using this decision guide planner. 3-1/2" diskette. Order **M54**

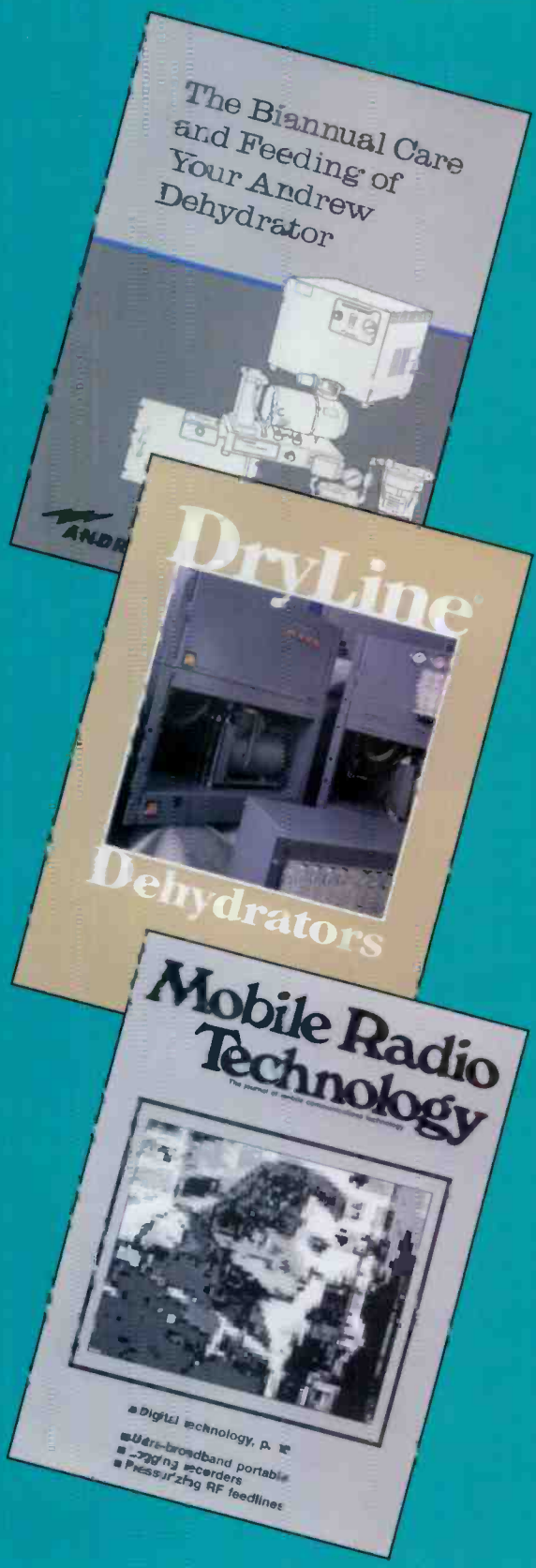
Dehydrator Repair and Free Loaner Program

Andrew maintains a repair center for pressurization equipment. Free loaner units are available for use while your equipment is being repaired by Andrew. Call ***Andrew Customer Service*** for details.

Repairable Dehydrators: 1930B/C Series, 1920D/E Series, 40525A, 65630B, 163903, 78200-24/48, MT/XT-300/600/1700 Series, MT-050 Series and MR/MRS-050 Series.



Pressurization



Broadcast Antenna Systems

INDEX

Broadcast Antenna Systems

Andrew TRASAR Antennas: Highest elevation broadcast installation in North America. KRQE, channel 13/KASY, channel 50 stacked antenna system atop Sandia Crest in Albuquerque, NM.

Broadcast Antenna Systems

Since 1937, Andrew has been providing engineering services and products to the broadcast industry. Hundreds of broadcasters have learned that Andrew technology is cost effective and can boost market share by offering the highest quality transmitted signal.

Technical Assistance

Any time you need technical assistance, you can call our **Broadcast Systems Dept. at 1-800-DIAL-4-RF.**

Wide Range of Antennas

- *High power ATW-Series TRASAR® traveling wave antennas for both UHF-TV and high band VHF-TV applications*
- *Maximum power AGW-Series GUIDELINER® waveguide antennas for UHF-TV applications*
- *ALP Series low and medium power antennas for UHF-TV*
- *G-Series emergency and standby antennas for UHF-TV*
- *HMD-Series transmitting antennas for wireless cable applications*

A Complete Range of Broadcast Transmission Lines

- *GUIDELine® high efficiency waveguide featuring advanced design for superior stability*
- *HRLine™ Rigid Coax for High Power installations*
- *MACXLine® rigid coaxial line featuring unique bellows inner conductor*
- *HELIAX® coaxial cables for low to medium power applications and standby/emergency antenna systems*

Advanced computer techniques are both prominent and indispensable elements of antenna design at Andrew.

Full Size antenna section undergoing azimuth pattern test in one of two Andrew anechoic chambers dedicated to broadcast products.

Applications Engineering Support

Andrew applications engineers are ready to assist you with planning and implementation.

When You Choose Andrew, You are Assured of Optimum Coverage of Your Market Area

Our broad product line promotes efficient system design. The number of antenna and transmission line combinations allows you to design a system that provides optimum market coverage at minimum cost.

Support Services Available from Andrew

When you choose an Andrew broadcast antenna you are drawing on a wealth of experience in antenna design, fabrication and testing. Andrew antenna designs benefit from the latest generation software tools and test equipment available. Andrew pioneered and perfected the near-field measurement techniques that are now employed by all broadcast antenna manufacturers to tune and test VHF and UHF TV broadcast antennas. The Andrew broadcast group has dedicated engineering and manufacturing assets, including an anechoic chamber, for reflection-free far-field tests. The broadcast group also has access to the Andrew outdoor far-field test range, when full-scale testing is required.

Andrew TRASAR® antennas include a ground check to ensure the antenna was transported to the transmitter site without damage. If the transmission line system includes Andrew GLW circular waveguide, a system check is also included with the equipment purchased. Additional field services are available on application.

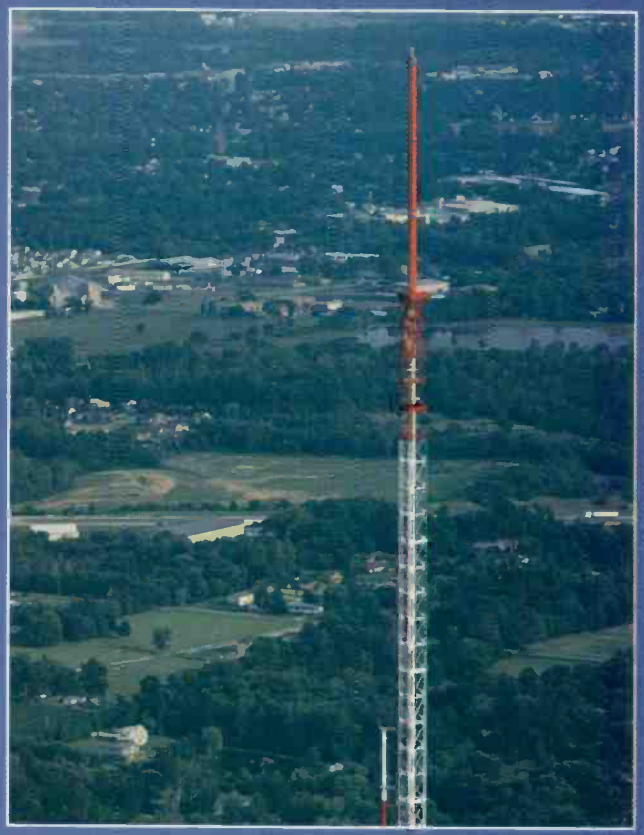
Help When you Need It

Technical assistance is available to you in the United States by calling **1-800-Dial-4-RF**. Because of our inventory position, emergency shipments of HELIAX® coaxial cable are normally possible within hours. Temporary or standby 2-bay antennas shown on page 301 are normally available for all UHF television channels within 24 hours.

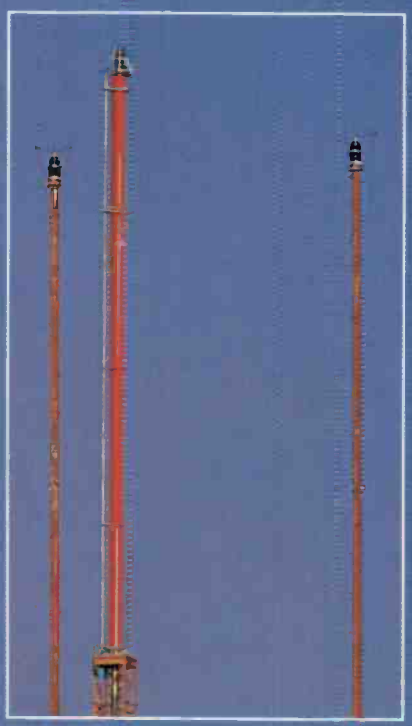
Our extensive experience in unique antenna designs is demonstrated at Mount Sutro by the delivery of superior performance with no impact to the other stations.

Partial interior view of Broadcast Products factory area. All welding operations on steel (pictured here), brass and aluminum antenna components are performed by certified personnel.

Broadcast Antenna Systems



All Andrew Broadcast antennas can be provided for top or side mounting and feature complete radome enclosures to permit pressurization and eliminate corrosion of interior elements.



The benefits of an Andrew pressurized antenna is evident here at Station KDAF, Dallas Texas where the Andrew antenna is protected against deterioration from environmental conditions.

Top and Side Mount Available

Andrew TV broadcast antennas come in both top and side mounted versions for optimizing tower design and coverage considerations.

Radome Enclosed for Long, Trouble Free Life

Andrew broadcast antennas feature full radomes to assure the following benefits:

- *Stable performance under all environmental conditions*
- *Minimal ice build-up due to natural shedding properties of fiberglass radome material and convection heating of enclosed space*

Choice of Azimuth and Elevation Patterns for Optimum Market Coverage

A wide variety of standard patterns are offered as shown on the following pages.

In addition, Andrew can customize both horizontally and vertically polarized patterns to assure optimum signal penetration in your market.

Heavy Null Fill Standard with Andrew

Heavy null fill is a standard feature of Andrew antennas. This produces maximum signal levels where you need it at your viewer's home. Examples of standard null filled elevation patterns are shown on pages 293 and 300.

Choose Horizontal, Elliptical or Circular Polarization for Optimum Viewer Reception

Andrew design concepts allow you to tailor your signal transmission to your market conditions. In many urban and suburban areas, horizontal-only polarization reception can be affected by buildings, airplanes, receiving antenna position, and even the weather.

Having a vertically polarized component can greatly enhance the probability of improved reception. Andrew TRASAR® and GUIDELINER® antennas are available in both horizontally and elliptically polarized versions. If appropriate, the vertically polarized azimuth pattern can be shaped differently than the horizontally polarized pattern.

Elliptical polarization allows you to transmit a vertically polarized signal in addition to your licensed horizontal ERP. The limiting case of elliptical polarization is circular polarization, where both horizontal and vertical power levels are the same. Any vertical to horizontal power ratio of one or less can be provided with the appropriate power split designed into the antenna.

Elliptical polarization is specified by indicating your desired ERP split, e.g., vertical ERP = 10% of horizontal ERP.

Complete Factory Testing to Achieve Desired Performance

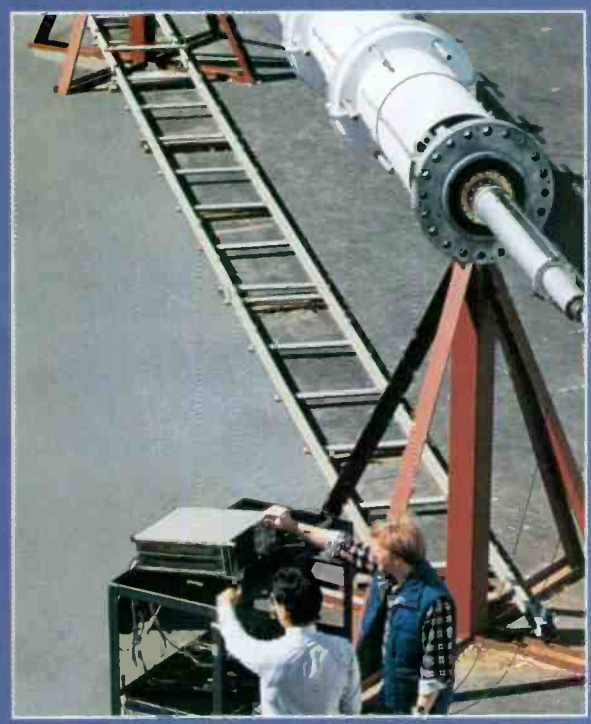
- *Factory tests using advanced computer aided techniques confirm specific gain and pattern characteristics. This assures the performance you expect and the optimum coverage you require*
- *Direct slotted line measurement of antenna VSWR at the input flange ensures very low reflected power and top quality signal*

Field Check Out

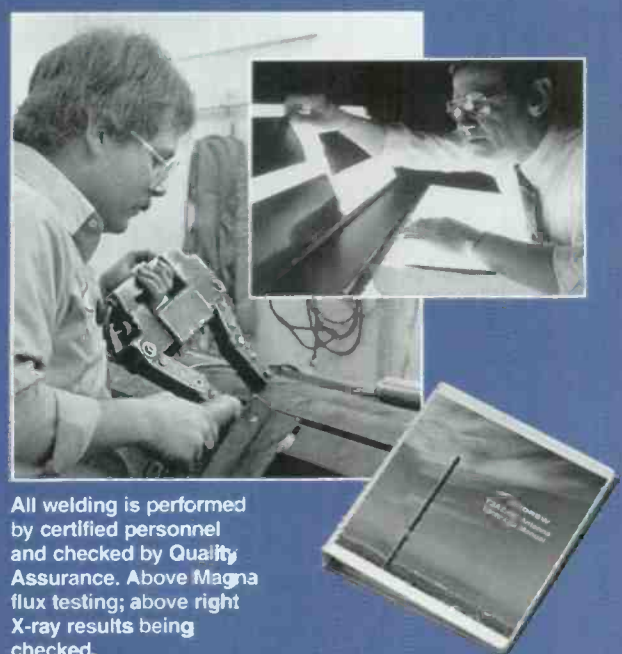
- *Complete mechanical inspection, together with VSWR and pressure integrity testing are provided on site prior to hoisting. This assures that factory test results are still valid and unchanged after shipment and final assembly*

Built-in Reliability/Maintainability

- *Four lightning rods project 3 ft above the top plate of the antenna to protect the beacon on all top mounted antennas*
- *Heavy internal DC ground across the internal feed line protects against lightning damage*
- *Climbing ladders or pegs, included with all top-mounted antennas, facilitate inspection and maintenance*
- *A fully illustrated operation and inspection manual is included with every antenna to ensure efficient inspection programs*
- *Pressurized radome protects antenna from hostile environments*



Complete factory testing ensures field performance of all Andrew broadcast antennas.



All welding is performed by certified personnel and checked by Quality Assurance. Above Magna flux testing; above right X-ray results being checked.

Fully illustrated O&M manual included with every antenna to simplify routine inspections and provide permanent record of data, parts and interface dimensions.

TRASAR® VHF-TV Transmitting Antennas

Specifications	
Channel Range:	7-13, one 6 MHz channel (174-216 MHz)
VSWR:	1.05 Visual +0.5 MHz 1.08 Color Sub-Carrier 1.10 Remainder of Channel
Deicing:	Fiberglass Radome Enclosed
Input Power:	100 kW, Peak Visual +20% Aural
Input Type:	Specify 50 or 75 ohm 6-1/8" EIA

Antenna Selection

Antennas are selected on the basis of:

- *Azimuth Pattern*
- *Elevation gain 6, 9, 12 or 16 are typical*
- *Beam tilt 0.75, 1.0 or 1.25° are typical*
- *Horizontal, elliptical or circular polarization*
- *Top or side mount*

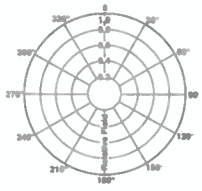
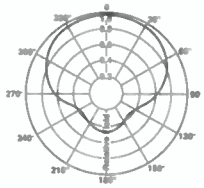
Standard Type Numbers are listed in the table. Specify channel number and, for elliptically/circularly polarized antennas, the desired power split. Other patterns, gains and beam tilts are available on request.

Azimuth Patterns

As shown in the table, omnidirectional and skull patterns are standard. Cardioid patterns are also available.

Note that patterns are typical and may vary slightly depending on channel, structural design criteria and tower mounting configuration.

Top-Mounted Antennas

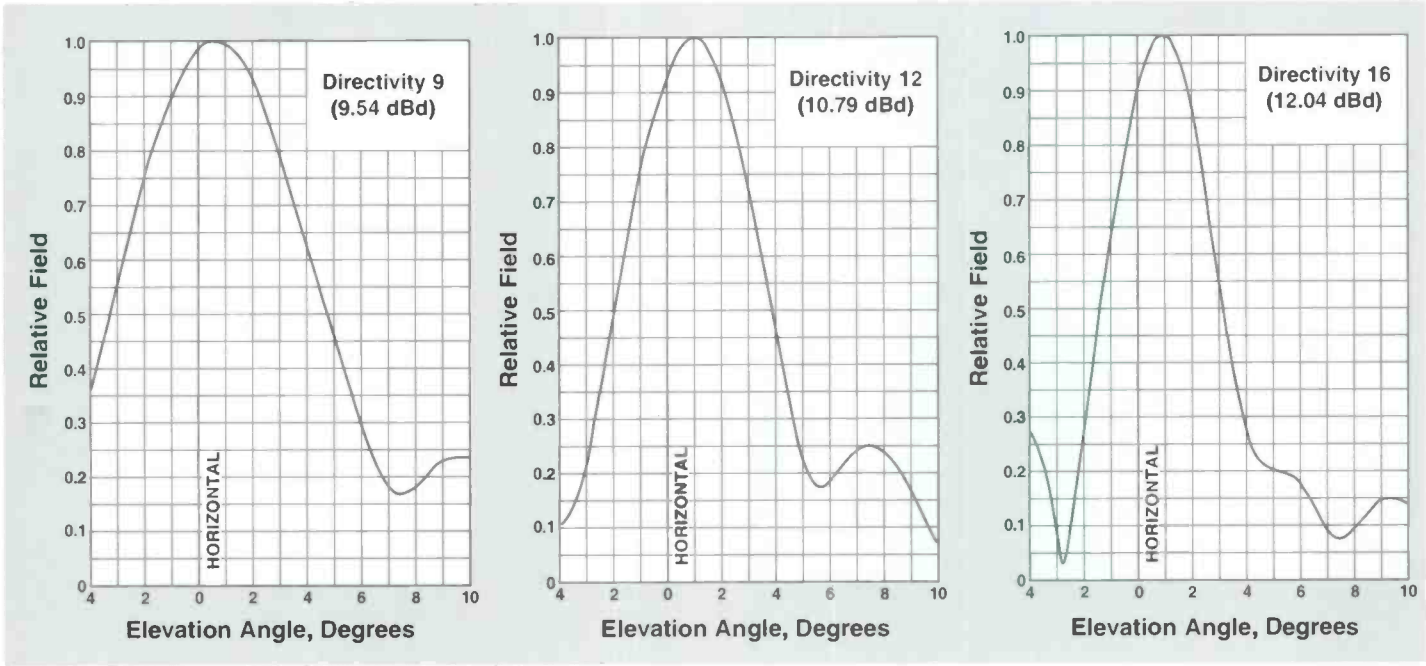
Azimuth Pattern Relative Field	Pol.	Peak Power Gain	Standard Type No.
Omnidirectional ±1 dB			
	Horiz.	6.00 (7.78 dBd)	**ATW6V3-HTO-(*)**
	Ellipt.	**	**ATW6V3-ETO-(*)**
	Horiz.	9.00 (9.54 dBd)	**ATW9V3-HTO-(*)**
	Ellipt.	**	**ATW9V3-ETO-(*)**
	Horiz.	12.00 (10.79 dBd)	**ATW12V3-HTO-(*)**
	Ellipt.	**	**ATW12V3-ETO-(*)**
	Horiz.	16.00 (12.04 dBd)	**ATW16V3-HTO-(*)**
	Ellipt.	**	**ATW16V3-ETO-(*)**
Directivity: 1.00 (0.00 dB)			
Skull			
	Horiz.	11.40 (10.57 dBd)	**ATW6V3-HTS-(*)**
	Ellipt.	**	**ATW6V3-ETS-(*)**
	Horiz.	17.10 (12.33 dBd)	**ATW9V3-HTS-(*)**
	Ellipt.	**	**ATW9V3-ETS-(*)**
	Horiz.	22.80 (13.58 dBd)	**ATW12V3-HTS-(*)**
	Ellipt.	**	**ATW12V3-ETS-(*)**
	Horiz.	30.40 (14.83 dBd)	**ATW16V3-HTS-(*)**
	Ellipt.	**	**ATW16V3-ETS-(*)**
Directivity: 1.90 (2.79 dB)			

* Specify VHF-TV channel number.
** Horizontal and vertical gains depend on power split. Specify power split.

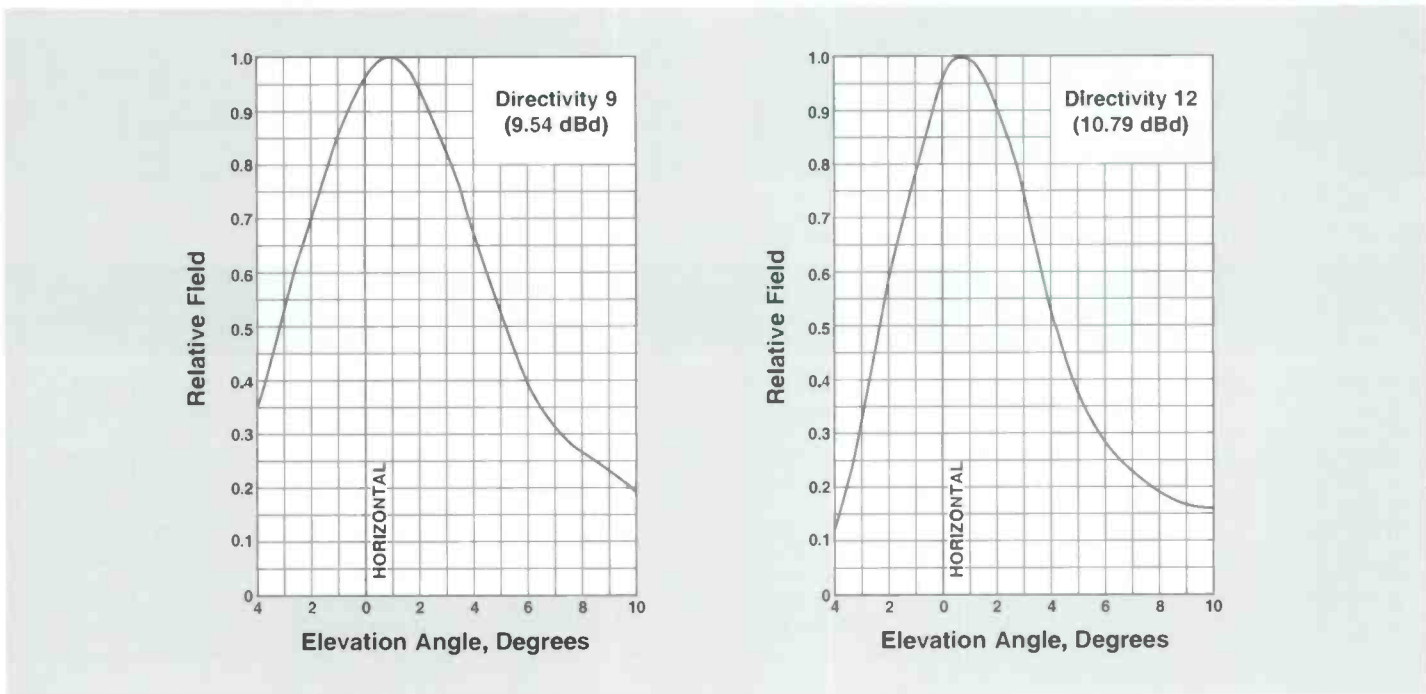
Elevation Patterns

Shown below are typical elevation patterns for 9, 12 and 16 gain V-series antennas with 0.75° beam tilt.

Standard Elevation Patterns



Smooth Elevation Patterns

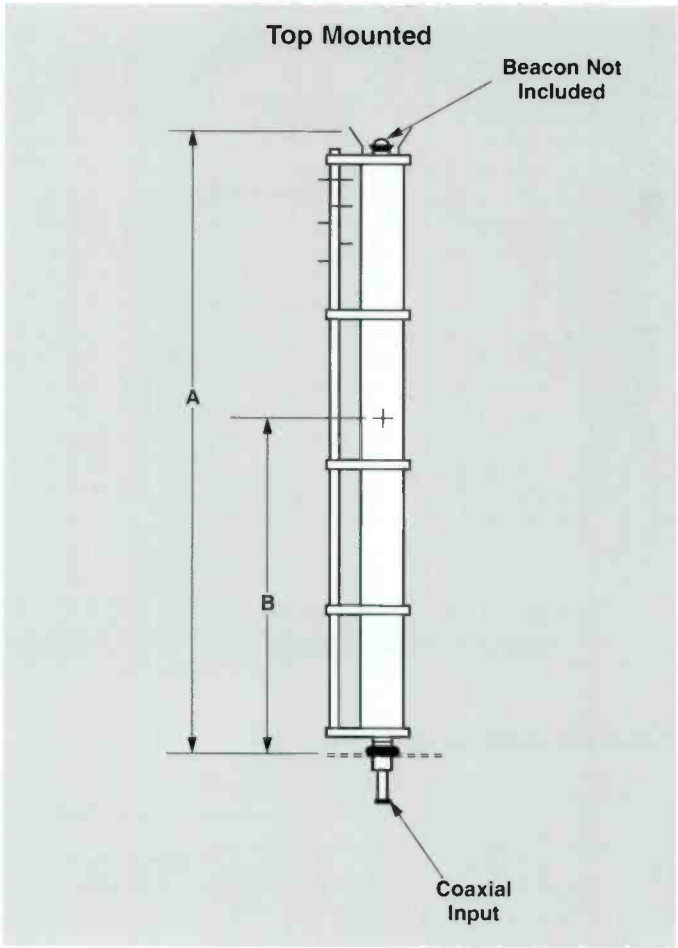


Broadcast Antenna Systems

TRASAR® V-Series antenna KNTV for channel 11 features pressurizable radome to withstand salt air coastal environment.

Mechanical Data

Mechanical data presented on this page are typical and may vary depending on specific channel, pattern required and structural design criteria. For further information, call our **Broadcast Systems Department at 1-800-DIAL-4-RF.**



Typical Mechanical Data for Horizontally Polarized Antennas

Antenna Series	Channel No.	A Antenna Height* ft (m)	B Radiation Center Above Base ft (m)	Nominal Weight lb (kg)	Wind Load** (Shear) lb (N)	Overturning Moment** lb-ft (N-m)
ATW6V3	7	41.11 (12.53)	19.05 (5.81)	5600 (2600)	2700 (12000)	56400 (76400)
	13	34.67 (10.57)	15.83 (4.82)	4800 (2200)	2300 (10000)	39600 (53700)
ATW9V3	7	57.45 (17.51)	27.22 (8.30)	7600 (3200)	3800 (16900)	112200 (152100)
	13	48.25 (14.71)	22.62 (6.89)	6500 (3000)	3200 (14100)	78400 (106300)
ATW12V3	7	73.79 (22.49)	35.35 (10.79)	9600 (4400)	4900 (21700)	187500 (254100)
	13	61.82 (18.84)	29.41 (8.96)	8100 (3700)	4100 (18200)	130400 (176800)
ATW16V3	7	95.57 (29.13)	46.28 (14.11)	19100 (8700)	6400 (28300)	316500 (429100)
	13	79.93 (24.36)	38.46 (11.72)	12200 (5500)	5300 (23600)	220100 (298400)

* Total height including 3 ft (1 m) lightning rods.
** Loads and weights are typical for wind pressure of 50 lb/ft² (2.4 kPa) for flat surfaces and 33 lb/ft² (1.6 kPa) for cylindrical surfaces. Designs per EIA RS-222-C. EIA RS-222-D or other design criteria are available.

GUIDELINER® UHF Waveguide Antennas

GUIDELINER UHF television transmitting antennas are offered for U.S. FCC Channels 14 through 69 and CCIR Bands IV and V.

GLIDELINER antenna for WTIU channel 30 undergoing inspection.

Specifications

VSWR, maximum, 6 MHz Channel	
Visual Carrier +0.5 MHz	1.05
Color Subcarrier	1.08
Remainder of Channel	1.10

Power Rating. 240 kW, nominal.

Deicing. Full radome enclosure.

Antenna Selection. Antennas are selected on the basis of:

- *Azimuth pattern*
- *Elevation gain*
- *Beam tilt 0.75, 1.0 or 1.25° typical, others available*
- *Horizontal or elliptical polarization, See Table*
- *Top or side mount*

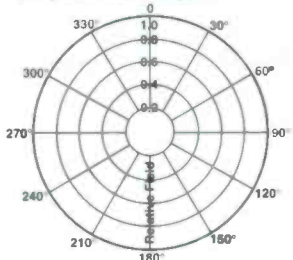
Type numbers are listed in the table for top mounted omnidirectional antennas. Specify channel number and, for elliptically polarized antennas, specify ERP split. Other patterns, gains and beam tilts are available.

Typical Elevation Patterns are shown on page 300.

Weights, Dimensions and Wind Loading Data are available upon request.

Call our Broadcast Systems Department at 1-800-DIAL-4-RF.

Top Mounted Omnidirectional Antennas

Azimuth Pattern Relative Field	Beam tilt Degrees	Pol.	25 Elevation Gain Antennas† Type No.	25 Elevation Gain Antennas† Peak Power Gain	15 Elevation Gain Antennas† Type No.	15 Elevation Gain Antennas† Peak Power Gain
Omnidirectional ±1 dB (Top Mount Only)						
	0.75	Horiz.	AGW25H3-HTO1-(*)	25.0 (13.98 dBd)	AGW15H3-HTO1-(*)	15.0 (11.76 dBd)
	0.75	Ellipt.	AGW25H3-ETO1-(*)	**	AGW15H3-ETO1-(*)	**
	1.00	Horiz.	AGW25H4-HTO1-(*)	25.0 (13.98 dBd)	AGW15H4-HTO1-(*)	15.0 (11.76 dBd)
	1.00	Ellipt.	AGW25H4-ETO1-(*)	**	AGW15H4-ETO1-(*)	**
	1.25	Horiz.	AGW25H5-HTO1-(*)	25.0 (13.98 dBd)	AGW15H5-HTO1-(*)	15.0(11.76 dBd)
	1.25	Ellipt.	AGW25H5-ETO1-(*)	**	AGW15H5-ETO1-(*)	**
Directivity 1.00 (0.00 dB)						

* Specify UHF-TV channel number.
** Horizontal and vertical gains depend on power split. Specify power split.
† Elevation patterns are shown on page 300.

Elliptically polarized TRASAR antenna custom designed with trilobe pattern for WJYS channel 62, Hammond, Indiana.

TRASAR® High Power UHF-TV Transmitting Antennas

Specifications

VSWR, maximum (6 MHz Channel)	
Visual Carrier +0.5 MHz	1.05
Color Subcarrier	1.08
Remainder of Channel	1.10

Deicing. Full radome enclosure.

Antenna Selection. Antennas are selected on the following parameters:

- *Azimuth pattern*
- *Elevation gain*
- *Input power rating 240, 120 or 60 kW nominal*
- *Beam tilt 0.75, 1.0 or 1.25° typical, others available*
- *Horizontal or elliptical polarization*
- *Top or side mount*

Specify channel number and, for elliptically polarized antennas, specify ERP split. Other patterns, gains and beam tilts are available on request. Note that patterns shown are typical and will vary depending on channel, structural design criteria and tower mounting configuration.

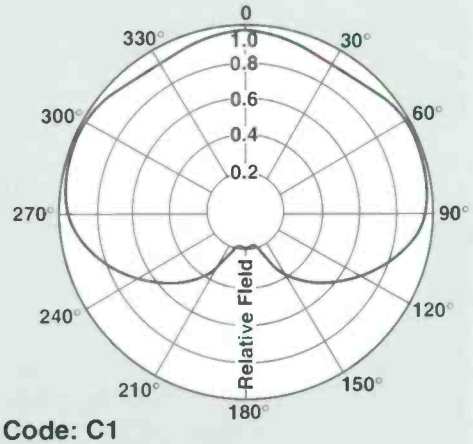
The Andrew Broadcast Sales Team is prepared to help meet your needs wherever you are located. Call for complete information on **Andrew Broadcast Antenna Products at 1-800-DIAL-4-RF**

Elevation Patterns are shown on page 300.

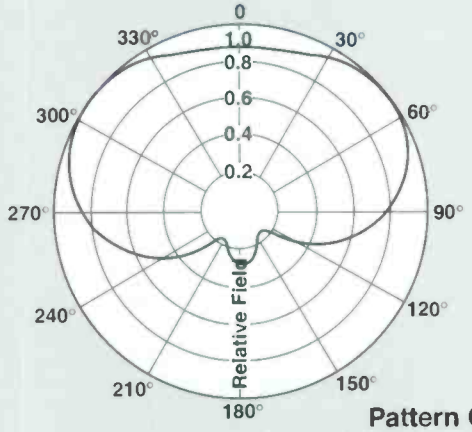
Typical Mechanical Characteristics are shown on page 299.

Other Typical Azimuth Patterns

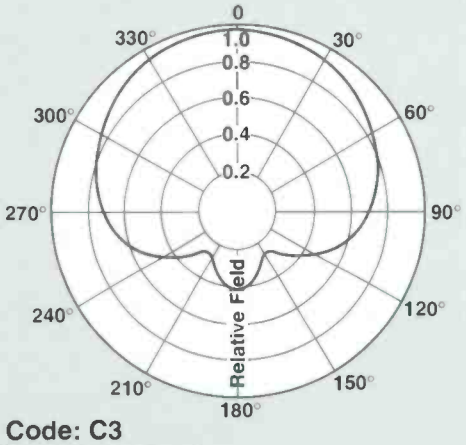
As shown below, a wide variety of Azimuth patterns can be selected or customized for TRASAR® antennas. **Note:** These are typical and will vary depending on channel, structural design criteria and tower mounting configuration. For specific requests, call our **Broadcast Systems Department directly at 1-800-DIAL-4-RF.**



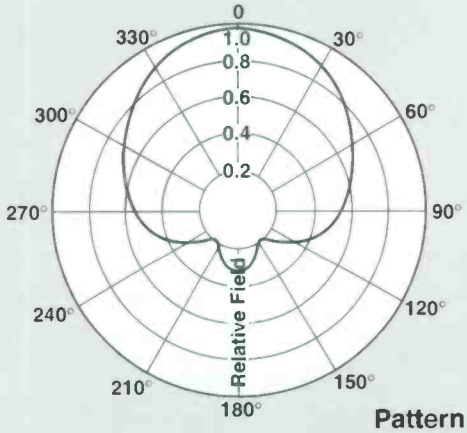
Pattern Code: C1
Directivity: 1.52 (1.82 dB)



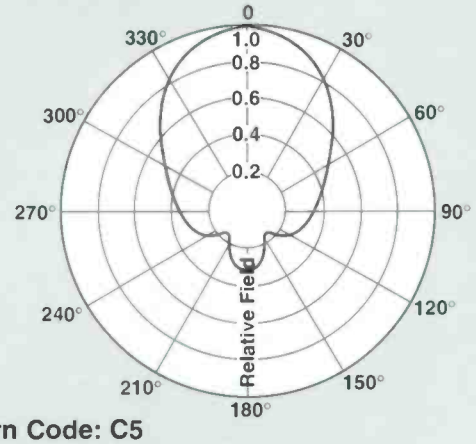
Pattern Code: C2
Directivity: 1.80 (2.55 dB)



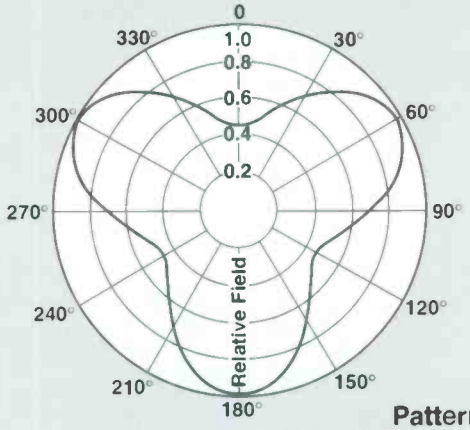
Pattern Code: C3
Directivity: 2.00 (3.01 dB)



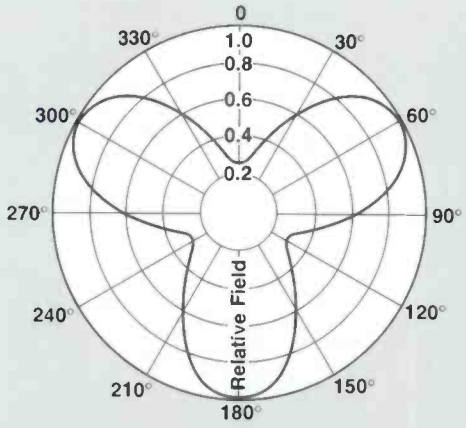
Pattern Code: C4
Directivity: 2.54 (4.05 dB)



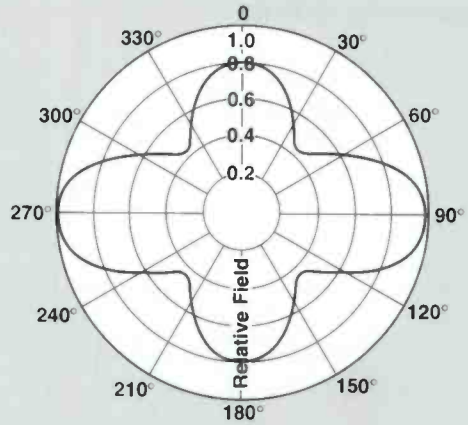
Pattern Code: C5
Directivity: 3.40 (5.31 dB)



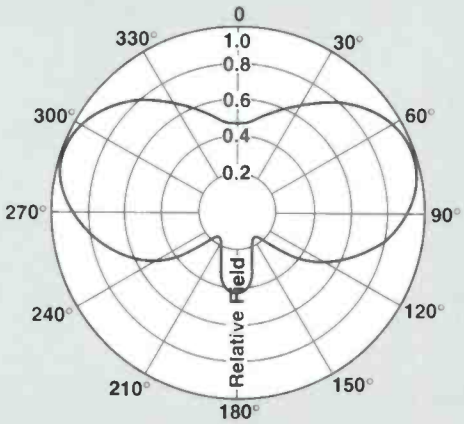
Pattern Code: T1
Directivity: 1.78 (2.50 dB)



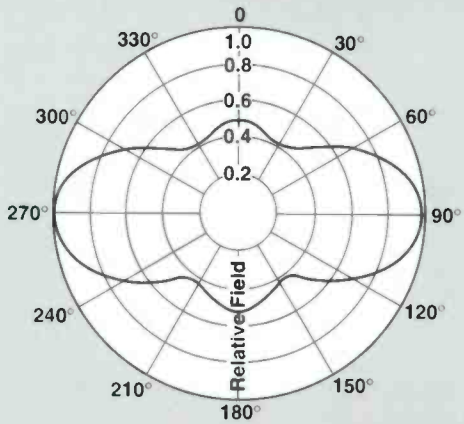
Pattern Code: T2
Directivity: 2.18 (3.38 dB)



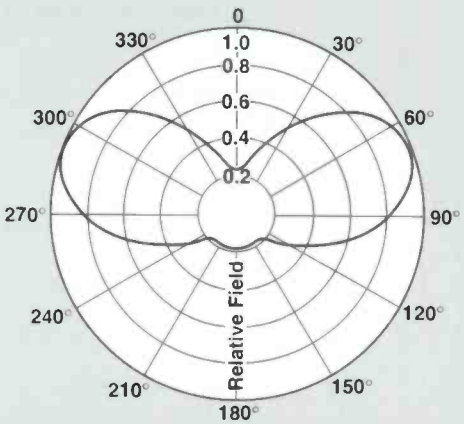
Pattern Code: P1
Directivity: 1.82 (2.83 dB)



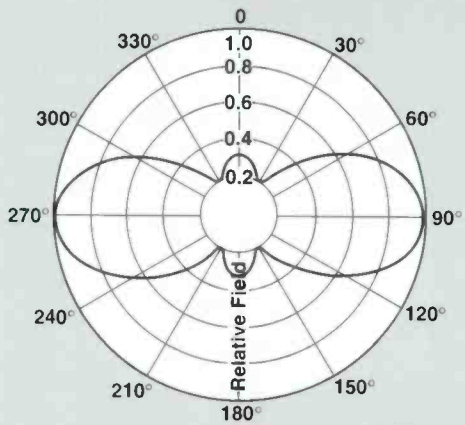
Pattern Code: P2
Directivity: 2.20 (3.42 dB)



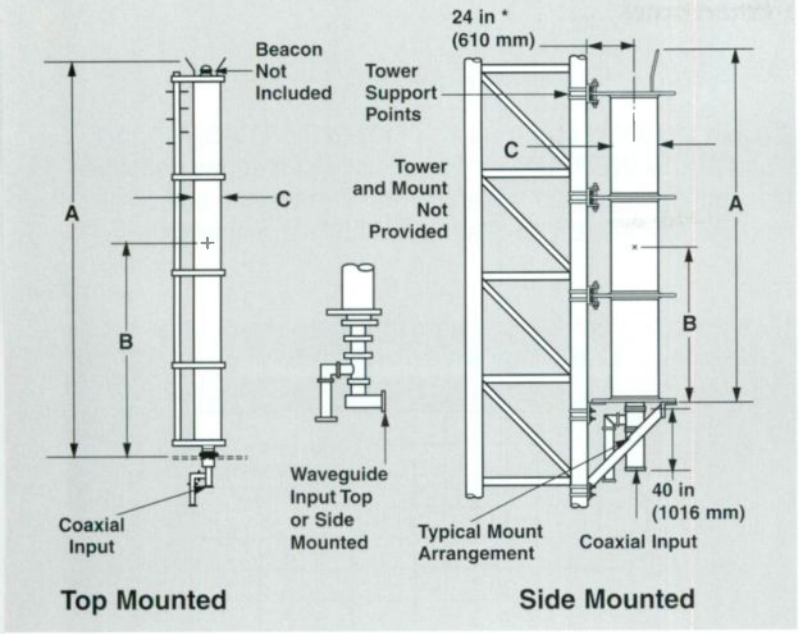
Pattern Code: P3
Directivity: 2.24 (3.50 dB)



Pattern Code: P4
Directivity: 2.85 (4.55 dB)



Pattern Code: P5
Directivity: 2.90 (4.62 dB)



* May vary depending on pattern requirements

The mechanical data presented below apply to the UHF TRASAR® transmitting antennas described on pages 296-298. Loads are typical for 50 lb/ft² (2.4 kPa) for flat surfaces and 33 lb/ft² (1.6 kPa) for cylindrical surfaces. For loading per other criteria, contact our **Broadcast Systems Department at 1-800-DIAL-4-RF.**

Typical Mechanical Data - TRASAR Horizontally Polarized Antennas

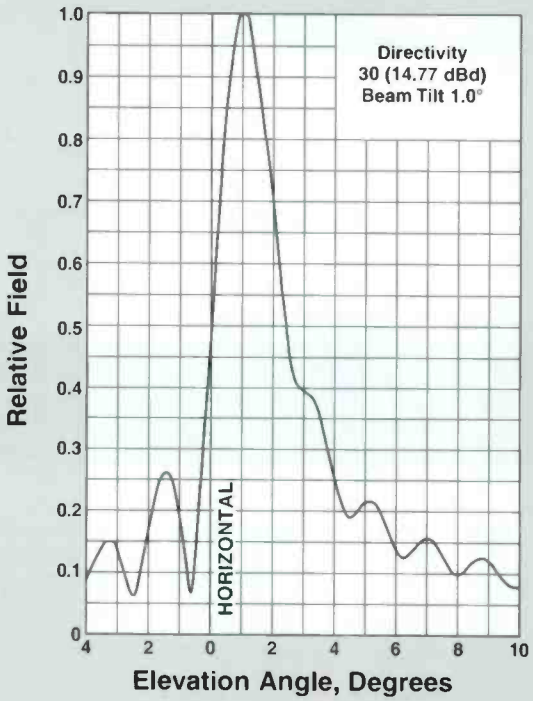
Channel Number	A Antenna Height* ft (m)	B Radiation Center Above Base ft (m)	C Radome Diameter in (mm)	Nominal Antenna Weight lb (kg)	Wind Load Shear** lb (N)	Overturning Moment lb-ft (N•m)
Top Mounted Antenna - Elevation Gain of 30						
14	73.0 (22.3)	35.0 (10.7)	16 (407)	12100 (5500)	4400 (19600)	154000 (209500)
22	66.7 (20.4)	31.9 (9.8)	16 (407)	11000 (5000)	4000 (17800)	127400 (173300)
30	61.5 (18.8)	29.3 (9.0)	16 (407)	10100 (4600)	3700 (16500)	108300 (147300)
38	57.1 (17.5)	27.1 (8.3)	16 (407)	9400 (4300)	3500 (15600)	94700 (128800)
46	53.3 (16.3)	25.2 (7.7)	14 (356)	6300 (2900)	2900 (12900)	73000 (99300)
54	50.1 (15.3)	23.6 (7.2)	14 (356)	5900 (2700)	2800 (12500)	66000 (89800)
62	47.3 (14.5)	22.2 (6.8)	14 (356)	5600 (2600)	2600 (11600)	57600 (78400)
69	45.1 (13.8)	21.1 (6.5)	14 (356)	5300 (2500)	2500 (11200)	52700 (71700)
Top Mounted Antenna - Elevation Gain of 25						
14	62.8 (19.2)	29.9 (9.2)	16 (407)	10300 (4700)	3800 (17000)	113620 (154600)
22	57.4 (17.5)	27.2 (8.3)	16 (407)	9400 (4300)	3500 (15600)	95200 (129500)
30	53.0 (16.2)	25.0 (7.7)	16 (407)	8600 (4000)	3200 (14300)	80000 (108800)
38	49.3 (15.1)	23.2 (7.1)	16 (407)	8000 (3700)	3000 (13400)	69450 (94500)
46	46.1 (14.1)	21.6 (6.6)	14 (356)	5400 (2500)	2600 (11600)	56030 (76300)
54	43.3 (13.2)	20.2 (6.2)	14 (356)	5100 (2400)	2400 (10700)	48360 (65800)
62	40.9 (12.5)	19.0 (5.8)	14 (356)	4800 (2200)	2300 (10300)	43585 (59300)
69	39.0 (11.9)	18.0 (5.5)	14 (356)	4500 (2100)	2200 (9800)	39600 (53900)
Side Mounted Antenna - Elevation Gain of 30						
14	71.7 (21.9)	34.4 (10.5)	18 (458)	2200 (1000)	4200 (18700)	–
22	65.5 (20.0)	31.3 (9.6)	18 (458)	2000 (1000)	3800 (17000)	–
30	60.3 (18.4)	28.7 (8.8)	18 (458)	1800 (900)	3600 (16100)	–
38	55.9 (17.1)	26.5 (8.1)	18 (458)	1700 (800)	3300 (14700)	–
46	52.2 (16.0)	24.6 (7.5)	18 (458)	1600 (800)	3100 (13800)	–
54	49.0 (15.0)	23.0 (7.1)	18 (458)	1500 (700)	2900 (12900)	–
62	46.2 (14.1)	21.6 (6.6)	18 (458)	1400 (700)	2800 (12500)	–
69	44.0 (13.50	20.5 (6.3)	18 (458)	1300 (600)	2700 (12100)	–
Side Mounted Antenna - Elevation Gain of 25						
14	61.5 (18.8)	29.3 (9.0)	18 (458)	1900 (900)	3600 (16100)	–
22	56.2 (17.2)	26.6 (8.2)	18 (458)	1700 (800)	3300 (14700)	–
30	51.8 (15.8)	24.4 (7.5)	18 (458)	1600 (800)	3100 (13800)	–
38	48.1 (14.7)	22.6 (6.9)	18 (458)	1400 (700)	2900 (12900)	–
46	44.9 (13.7)	21.0 (6.4)	18 (458)	1300 (600)	2700 (12100)	–
54	42.2 (12.9)	19.6 (6.0)	18 (458)	1300 (600)	2600 (11600)	–
62	39.8 (12.2)	18.4 (5.7)	18 (458)	1200 (600)	2400 (10700)	–
69	37.9 (11.6)	17.5 (5.4)	18 (458)	1100 (500)	2300 (10300)	–

* Typical height including 3-foot long (1 m) lightning rods.
** 50 lb/ft² (2.4 kPa) for flat surfaces and 33 lb/ft² (1.6 kPa) for cylindrical surfaces.

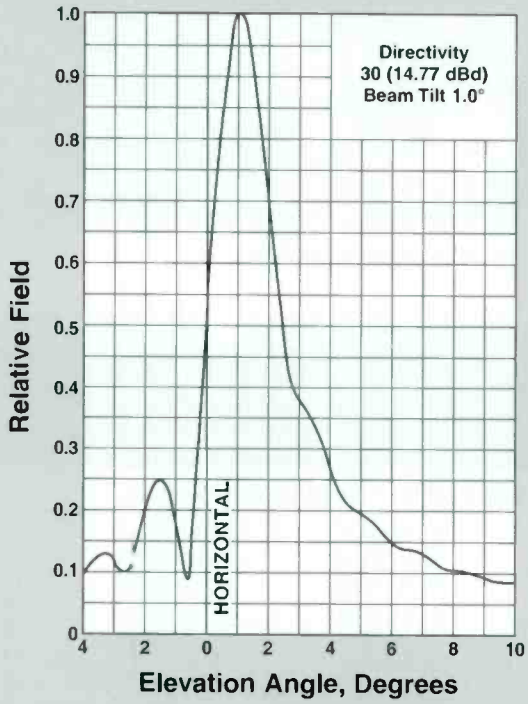
Typical Elevation Patterns

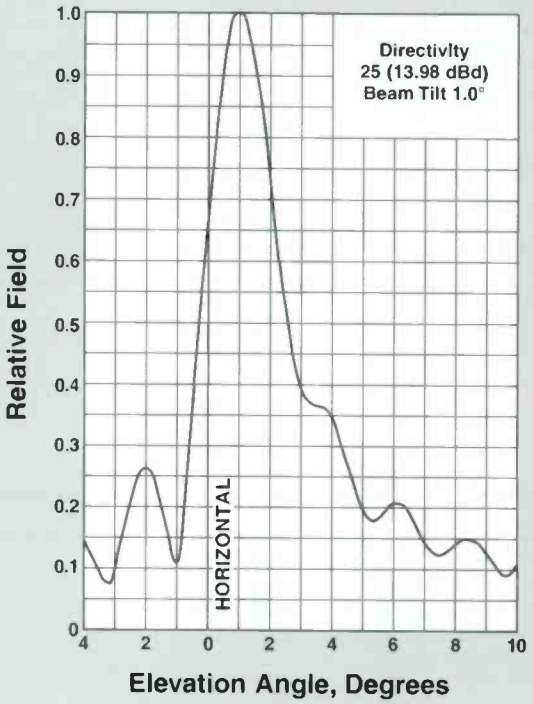
The patterns on this page apply to the TRASAR® and GUIDELINER® UHF-TV transmitting antennas described on pages 295-298. The patterns are typical; other Directivities, Beam tilts and Null Fills are available.

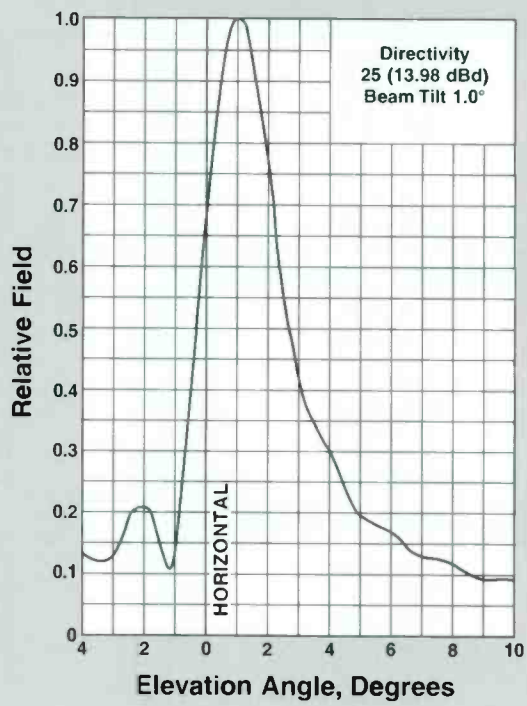
Standard Elevation Patterns



Smooth Elevation Patterns

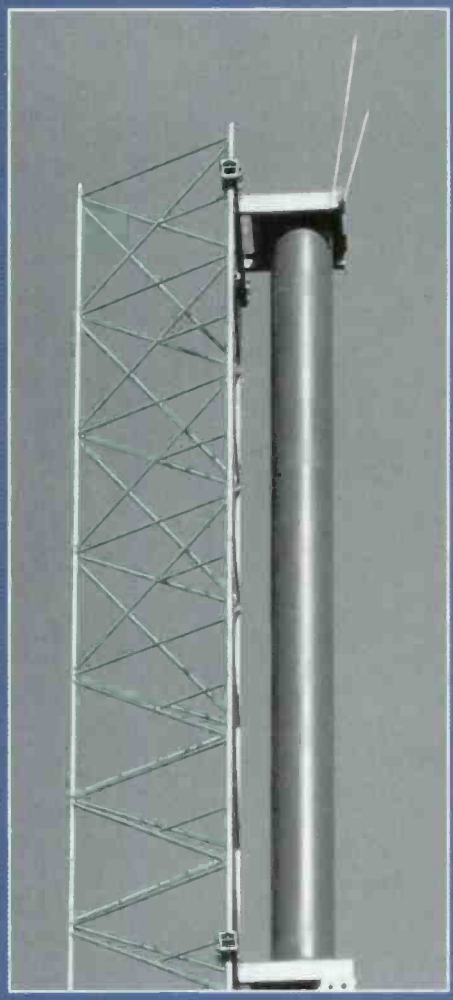




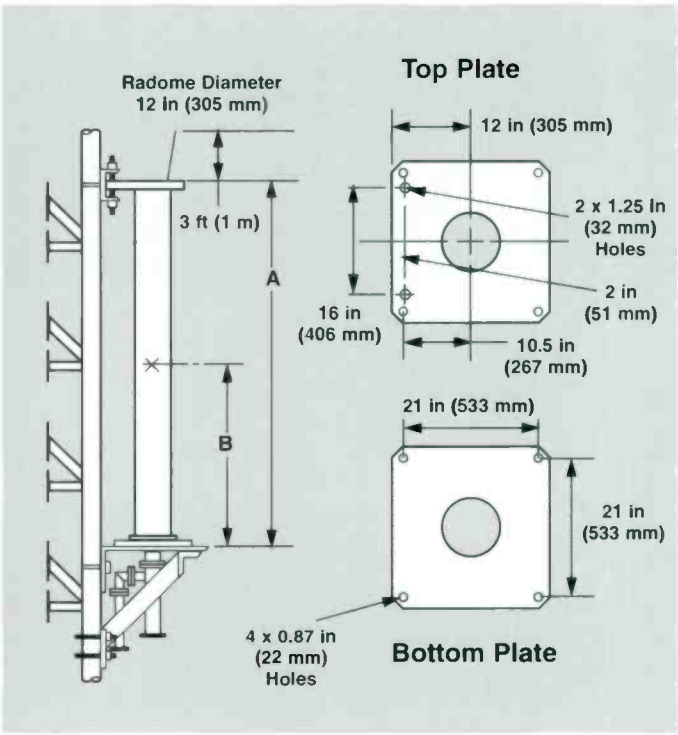


TRASAR®
Emergency and Standby Antennas

Andrew offers a line of lower gain (G-Series) TRASAR antennas for standby and emergency service. The antennas feature a full 60 kW power handling capability and provide excellent assurance against revenue losses in the event of catastrophic main antenna failure.



Antenna Dimensions



Electrical and Mechanical Characteristics

Type Number	ATW2G1(†)-HSS-(*)	ATW8G4(†)-HSS-(*)	ATW16G4(†)-HSS-(*)	ATW24G4(†)-HSS-(*)
Number of Bays	2	8	16	24
Peak Power Gain (dBd)	4 (6.02)	16 (12.04)	32 (15.05)	48 (16.8)
Standard Beam tilt, degrees	0	1.0	1.0	1.0
Input Power, kW (dBk), Peak Visual +20% Aural: 60 kW Nominal				
Antenna Height, Less Lightning Rods, ft (m) - Dimen. A				
Channel 14	5.1 (1.6)	17.6 (5.4)	33.7 (10.3)	50.0 (15.2)
Channel 69	5.1 (1.6)	11.5 (3.5)	21.0 (6.4)	30.0 (9.1)
Radiation Center Above Base, ft (m) - Dimen. B				
Channel 14	2.5 (0.8)	8.8 (2.7)	16.9 (5.1)	25.0 (7.6)
Channel 69	2.5 (0.8)	5.7 (1.7)	10.5 (3.2)	15.0 (4.5)
Antenna Weight, lb (kg)				
Channel 14	300 (140)	500 (230)	800 (370)	1200 (544)
Channel 69	300 (140)	400 (190)	600 (280)	900 (408)
Wind Load (Shear), lb (N)**				
Channel 14	200 (890)	700 (3200)	1300 (5800)	2000 (9000)
Channel 69	200 (890)	500 (2300)	800 (3600)	1200 (5400)

* Specify channel number. ** Loads are typical for 50 lb/ft² (2.4 kPa) for flat surfaces and 33 lb/ft² (1.6 kPa) for cylindrical Surfaces.
† Specify 50 (50 ohm input) or 75 (75 ohm input).

High Reliability and Dependable Service

The antennas are fully radome enclosed for maximum environmental protection. Lightning rods are standard.

The skull-shaped azimuth pattern provides coverage appropriate for nearly all emergency situations. The broad elevation pattern ensures a good signal throughout the market area.

Built for Permanent Installation

G-Series antennas can be permanently mounted to the tower for use during emergencies or during routine maintenance on the main antenna system. They are designed and manufactured to the same high standards as the high gain TRASAR antennas featured on pages 296-300.

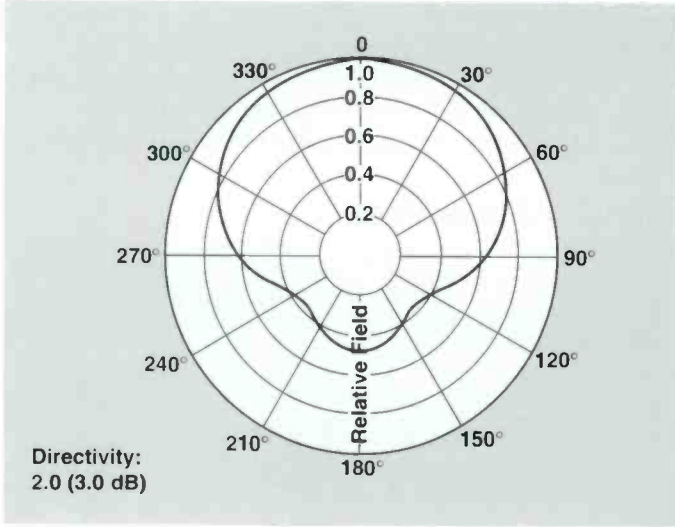
Input is 6-1/8" EIA, 50 or 75 ohm. Specify in Type Number per table on page 301.

VSWR is maximum of 1.05 at the visual carrier and 1.10 across the channel.

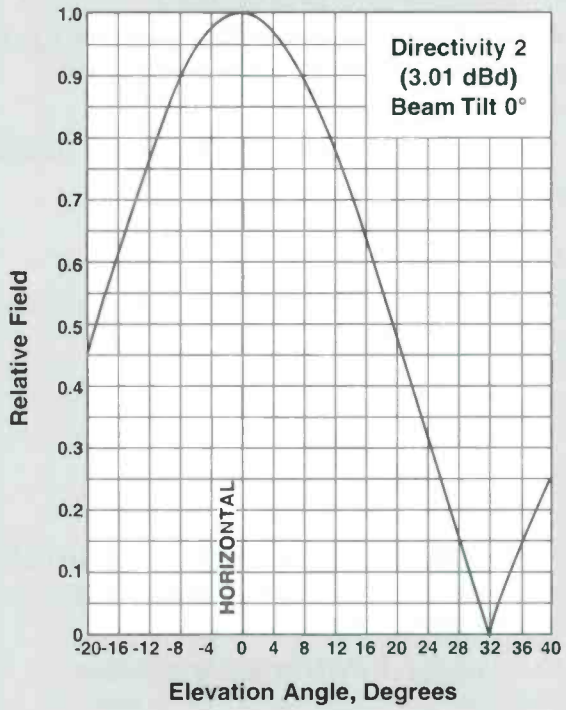
24 Hour Emergency Service Available

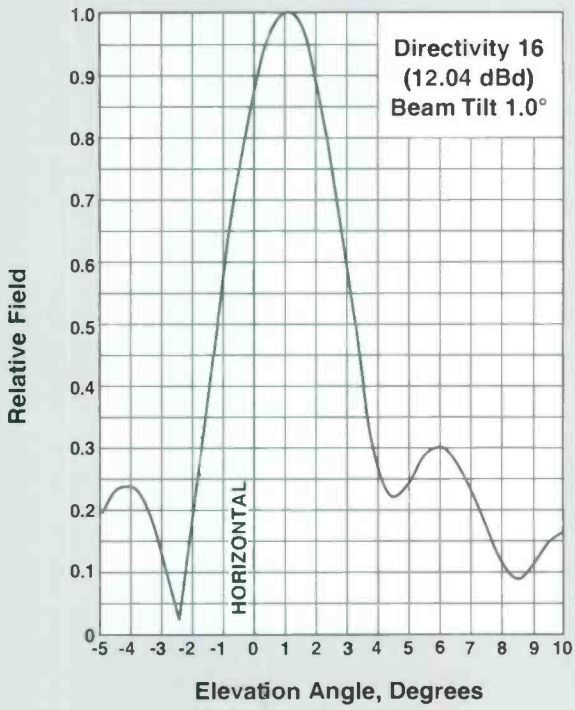
In the U.S.A., Type ATW2G antenna can normally be provided within 24 hours.

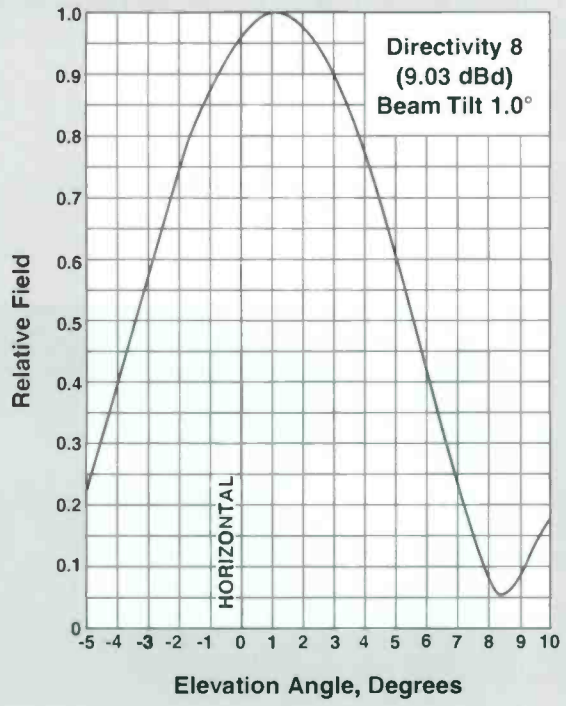
Azimuth Pattern - Skull

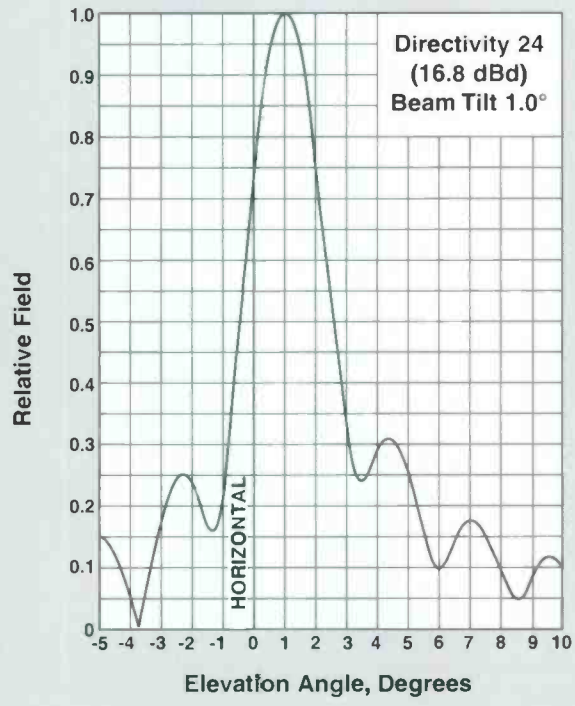


Elevation Patterns









Broadcast Antenna Systems

Distributed by leading transmitter manufacturers and system integrators nationwide

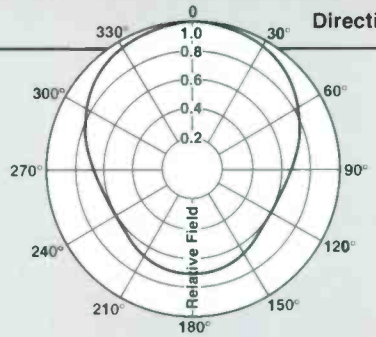
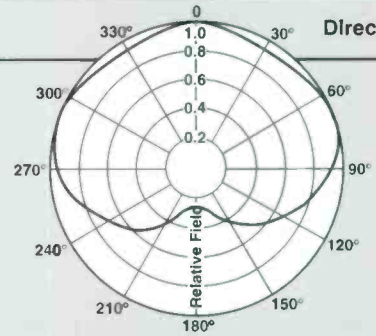
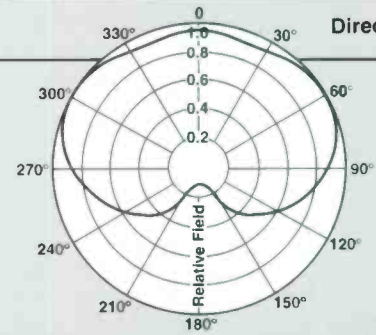
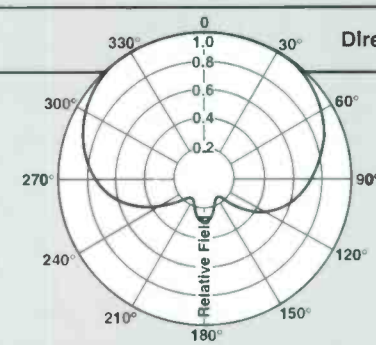
ALP Series Antennas

The Advantages of an ALP Series Antenna are clear

- ***Field Tested for HDTV Compatibility***
  Available for immediate implementation of ATV channels
- ***All CCIR Bands IV/V Channels Available***
- ***Lightweight/Low Windload***
  Easy to install with less expense
  Easier to lease tower space
- ***Radome enclosed for environmental protection***
  Long Life
  Low Maintenance
  Reliable
- ***No Pressurization Required***
  On standard 1 kW design
- ***Power Ratings up to 28 kW Available***
  when used with Andrew Air Dielectric Cable and DryLine Dehydrator.
- ***Customized Patterns Available***
  Optimized coverage of your market area
- ***Wide Selection of "Off The Shelf" Patterns***
  Simplified application process
- ***Patterns Measured at Factory***
  Reliable performance in the field
  Great coverage
- ***Special Designs Available***
  Circular Polarization (Low power only)
  Wide Band Versions

ALP Series
Azimuth Patterns

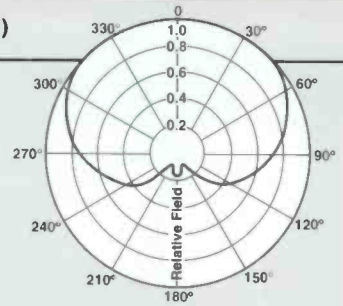
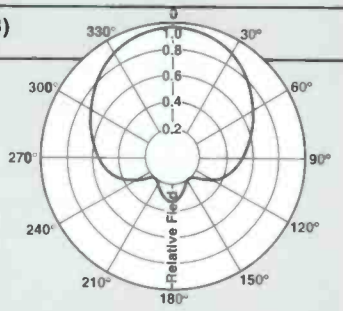
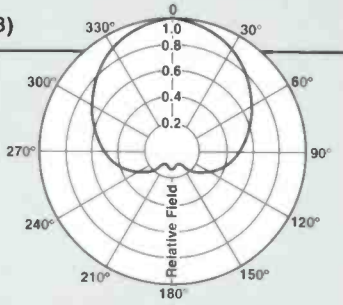
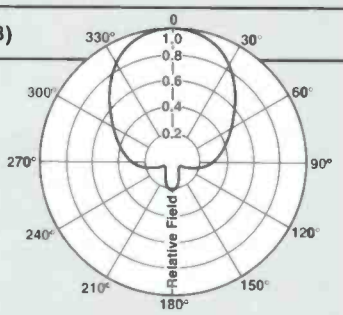
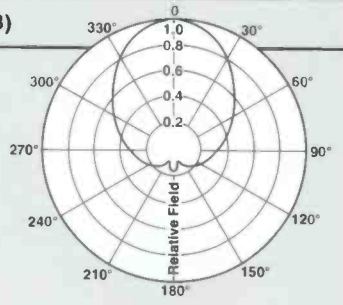
UHF Low and Medium Power Antenna Systems

Number of Bays	Antenna Type Number	Power Gain (dBd)	
Omnioid **			Directivity 1.70 (2.30 dB)
4	ALP4†1-HSOC-(*)	7.79 (8.91)	
8	ALP8†1-HSOC-(*)	15.39 (11.87)	
12	ALP12†2-HSOC-(*)	21.49 (13.32)	
16	ALP16†2-HSOC-(*)	28.20 (14.50)	
24	ALP24†3-HSOC-(*)	42.86 (16.32)	
32	ALP32†3-HSOC-(*)	54.28 (17.35)	
Wide Cardioid			Directivity 1.56 (1.93 dB)
4	ALP4†1-HSW-(*)	7.14 (8.54)	
8	ALP8†1-HSW-(*)	14.12 (11.50	
12	ALP12†2-HSW-(*)	19.72 (12.95)	
16	ALP16†2-HSW-(*)	25.88 (14.13)	
24	ALP24†3-HSW-(*)	39.33 (15.95)	
32	ALP32†3-HSW-(*)	49.81 (16.97)	
Wide Cardioid - Reduced Rear			Directivity 1.69 (2.28 dB)
4	ALP4†1-HSWR-(*)	7.74 (8.89)	
8	ALP8†1-HSWR-(*)	15.29 (11.85)	
12	ALP12†2-HSWR-(*)	21.36 (13.30)	
16	ALP16†2-HSWR-(*)	28.04 (14.48)	
24	ALP24†3-HSWR-(*)	42.60 (16.30)	
32	ALP32†3-HSWR-(*)	53.96 (17.32)	
Extended Cardioid			Directivity 1.86 (2.70 dB)
4	ALP4†1-HSE-(*)	8.52 (9.30)	
8	ALP8†1-HSE-(*)	16.83 (12.26)	
12	ALP12†2-HSE-(*)	23.51 (13.71)	
16	ALP16†2-HSE-(*)	30.86 (14.89)	
24	ALP24†3-HSE-(*)	46.89 (16.71)	
32	ALP32†3-HSE-(*)	59.39 (17.74)	

† Insert "L" for low power or "M" for medium power. (See page 310 for power ratings.)
* Insert channel number (14 to 69).
** Can be considered omnidirectional for filing purposes.

ALP Series Azimuth Patterns

UHF Low and Medium Power Antenna Systems

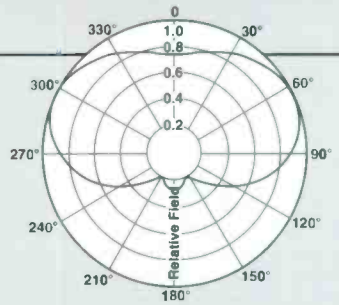
	Number of Bays	Antenna Type Number	Power Gain (dBd)
Directivity 1.93 (2.86 dB) 	**Extended Cardioid - Reduced Rear**		
	4	ALP4†1-HSER-(*)	8.84 (9.46)
	8	ALP8†1-HSER-(*)	17.47 (12.42)
	12	ALP12†2-HSER-(*)	24.40 (13.87)
	16	ALP16†2-HSER-(*)	32.02 (15.05)
	24	ALP24†3-HSER-(*)	48.66 (16.87)
	32	ALP32†3-HSER-(*)	61.62 (17.90)
Directivity 2.54 (4.05 dB) 	**Medium Cardioid**		
	4	ALP4†1-HSM-(*)	11.63 (10.66)
	8	ALP8†1-HSM-(*)	22.99 (13.61)
	12	ALP12†2-HSM-(*)	32.11 (15.07)
	16	ALP16†2-HSM-(*)	42.14 (16.25)
	24	ALP24†3-HSM-(*)	64.03 (18.06)
	32	ALP32†3-HSM-(*)	81.10 (19.09)
Directivity 2.82 (4.50 dB) 	**Medium Cardioid - Reduced Rear**		
	4	ALP4†1-HSMR-(*)	12.92 (11.11)
	8	ALP8†1-HSMR-(*)	25.52 (14.07)
	12	ALP12†2-HSMR-(*)	35.64 (15.52)
	16	ALP16†2-HSMR-(*)	46.78 (16.70)
	24	ALP24†3-HSMR-(*)	71.09 (18.52)
	32	ALP32†3-HSMR-(*)	90.04 (19.54)
Directivity 3.77 (5.76 dB) 	**Narrow Cardioid**		
	4	ALP4†1-HSN-(*)	17.27 (12.37)
	8	ALP8†1-HSN-(*)	34.12 (15.33)
	12	ALP12†2-HSN-(*)	47.65 (16.78)
	16	ALP16†2-HSN-(*)	62.54 (17.96)
	24	ALP24†3-HSN-(*)	95.04 (19.78)
	32	ALP32†3-HSN-(*)	120.38 (20.81)
Directivity 3.80 (5.80 dB) 	**Extended Cardioid - Reduced Rear**		
	4	ALP4†1-HSNR-(*)	17.40 (12.41)
	8	ALP8†1-HSNR-(*)	34.39 (15.36)
	12	ALP12†2-HSNR-(*)	48.03 (16.82)
	16	ALP16†2-HSNR-(*)	63.04 (18.00)
	24	ALP24†3-HSNR-(*)	95.80 (19.81)
	32	ALP32†3-HSNR-(*)	121.33 (20.84)

† Insert "L" for low power or "M" for medium power. (See page 310 for power ratings.) * Insert channel number (14 to 69)

ALP Series Azimuth Patterns

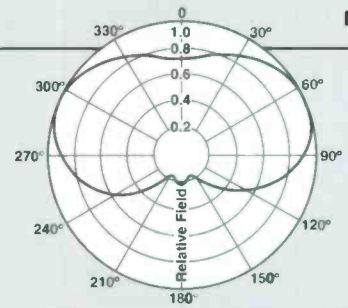
UHF Low and Medium Power Antenna Systems

Number of Bays	Antenna Type Number	Power Gain (dBd)
Peanut		
4	ALP4†1-HSP-(*)	8.61 (9.35)
8	ALP8†1-HSP-(*)	17.01 (12.31)
12	ALP12†2-HSP-(*)	23.76 (13.76)
16	ALP16†2-HSP-(*)	31.19 (14.94)
24	ALP24†3-HSP-(*)	47.39 (16.76)
32	ALP32†3-HSP-(*)	60.03 (17.78)



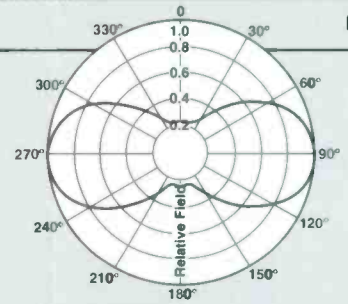
Directivity 1.88 (2.74 dB)

Peanut - Reduced Rear		
4	ALP4†1-HSPR-(*)	8.79 (9.44)
8	ALP8†1-HSPR-(*)	17.38 (12.40)
12	ALP12†2-HSPR-(*)	24.27 (13.85)
16	ALP16†2-HSPR-(*)	31.85 (15.03)
24	ALP24†3-HSPR-(*)	48.40 (16.85)
32	ALP32†3-HSPR-(*)	61.31 (17.88)



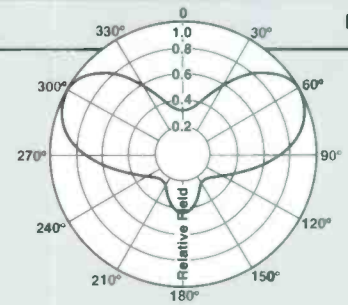
Directivity 1.92 (2.83 dB)

H-Pattern Peanut		
4	ALP4†1-HSH-(*)	11.27 (10.52)
8	ALP8†1-HSH-(*)	22.26 (13.48)
12	ALP12†2-HSH-(*)	31.09 (14.93)
16	ALP16†2-HSH-(*)	40.81 (16.11)
24	ALP24†3-HSH-(*)	62.02 (17.93)
32	ALP32†3-HSH-(*)	78.55 (18.95)



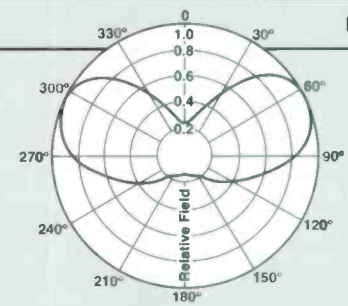
Directivity 2.46 (3.91 dB)

Butterfly		
4	ALP4†1-HSB-(*)	12.23 (10.87)
8	ALP8†1-HSB-(*)	24.16 (13.83)
12	ALP12†2-HSB-(*)	33.75 (15.28)
16	ALP16†2-HSB-(*)	44.30 (16.46)
24	ALP24†3-HSB-(*)	67.31 (18.28)
32	ALP32†3-HSB-(*)	85.25 (19.31)



Directivity 2.67 (4.27 dB)

Butterfly - Reduced Rear		
4	ALP4†1-HSBR-(*)	12.60 (11.00)
8	ALP8†1-HSBR-(*)	24.89 (13.96)
12	ALP12†2-HSBR-(*)	34.76 (15.41)
16	ALP16†2-HSBR-(*)	45.62 (16.59)
24	ALP24†3-HSBR-(*)	69.33 (18.41)
32	ALP32†3-HSBR-(*)	87.81 (19.44)



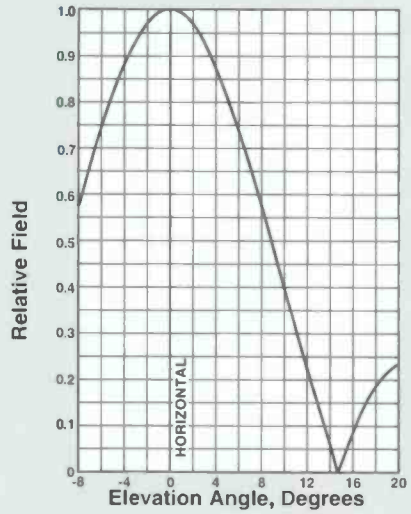
Directivity 2.75 (4.39 dB)

† Insert "L" for low power or "M" for medium power. (See page 310 for power ratings.) * Insert channel number (14 to 69).

ALP Series Elevation Patterns

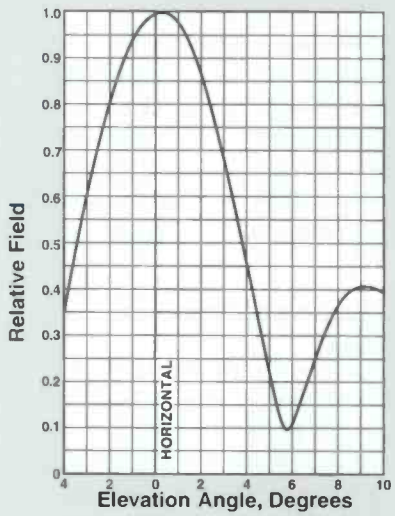
ALP 4

Directivity 4.58
(6.61 dBd)
Beam Tilt 0°



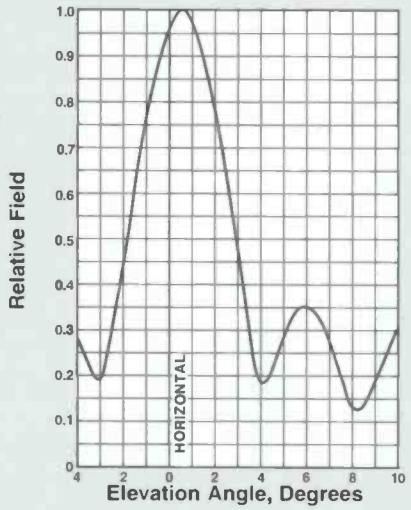
ALP 8

Directivity 9.05
(9.57 dBd)
Beam Tilt 0.25°



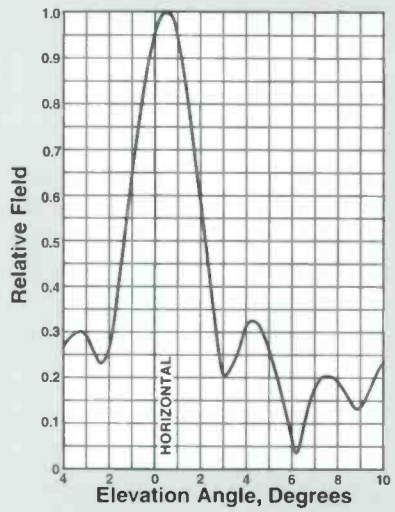
ALP 12

Directivity 12.64
(11.02 dBd)
Beam Tilt 0.5°



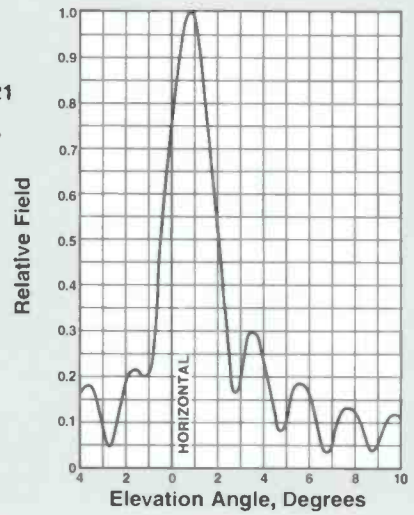
ALP 16

Directivity 16.59
(12.20 dBd)
Beam Tilt 0.5°



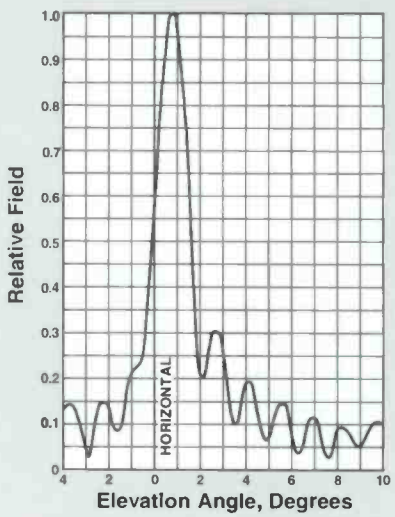
ALP 24

Directivity 25.21
(14.02 dBd)
Beam Tilt 0.75°



ALP 32

Directivity 31.93
(15.04 dBd)
Beam Tilt 0.75°



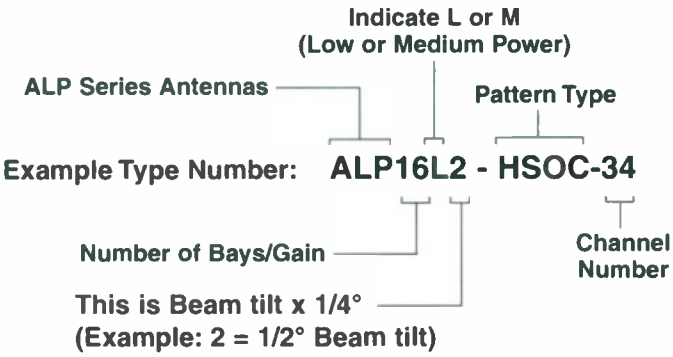
Antenna Selection and Ordering Information for ALP Series

VSWR. All single channel antennas listed meet the following maximum VSWR specifications:

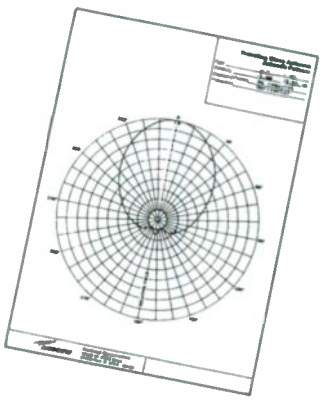
Visual Carrier + 0.5 MHz	1.05:1
Color Subcarrier	1.08:1
Remainder of channel	1.10:1

Mounting. The antennas listed on pages 305-307 are for side mounting as indicated in the illustration. Andrew does not supply the interface between mount and tower.

To Order



The example antenna is a low power version of a 16 bay omnidirectional antenna for channel 34.



To help with interference calculations, full size patterns are available to system planners upon request.
Call 1-800-DIAL-4-RF.

Bays	Mounting Brackets Required
4	2
8	3
12	4
16	5
24	7
32	9

Channel	"L" in (mm)
14-24	120.0 (3048)
25-30	114.0 (2896)
31-37	108.0 (2743)
38-45	102.0 (2591)
46-53	96.0 (2438)
54-61	90.0 (2286)
62-69	84.0 (2134)

Wide Band Antennas are specified similar to standard single channel antennas, except the applicable channels and bandwidth of the antenna are specified in the final three digits as follows:

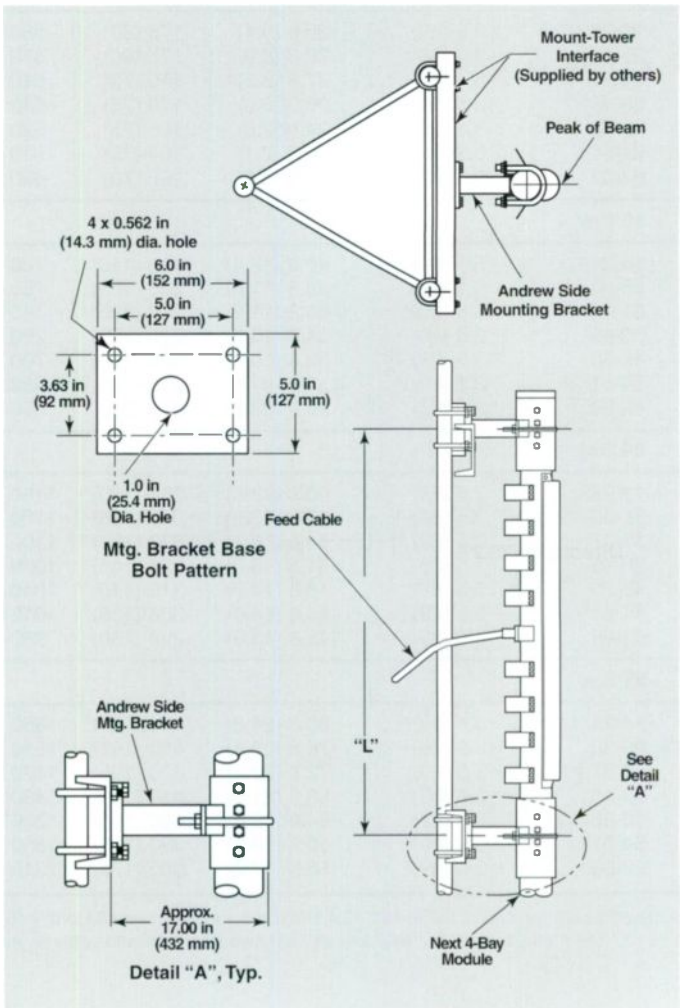
The first two digits represent the number of the UHF channel at the bottom of the band requested.

The third digit represents the number of 6 MHz channels covered (5 for 30 MHz bandwidth or 3 for 18 MHz bandwidth).

For example: ALP16L2-HSOC-425

The example antenna is a low power version of a 16 bay omnidirectional antenna which covers channels 42 through 46 (30 MHz).

For complete specifications on wide band versions, call **1-800-DIAL-4RF**.



Mechanical Data

Channel Number	Diameter Inches (mm)	Height ft (m)	Weight* lb (kg)	Windload*† lb (N)	L-Series Power Rating	L-Series Input	M-Series Power Rating	M-Series Input
4 Bay								
14-24	3.5 (89)	10.8 (3.3)	60 (27)	200 (890)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
25-30	3.5 (89)	10.3 (3.1)	60 (27)	200 (890)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
31-37	3.5 (89)	9.8 (2.9)	60 (27)	190 (845)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
38-45	3.5 (89)	9.3 (2.8)	55 (25)	190 (845)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
46-53	3.5 (89)	8.8 (2.7)	55 (25)	180 (800)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
54-61	3.5 (89)	8.3 (2.5)	55 (25)	180 (800)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
62-69	3.5 (89)	7.8 (2.4)	50 (23)	170 (755)	1 kW	7/8" EIA, 50 ohm	3 kW	7/8" EIA, 50 ohm
8 Bay								
14-24	3.5 (89)	20.8 (6.3)	120 (55)	390 (1730)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
25-30	3.5 (89)	19.8 (6.0)	120 (55)	390 (1730)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
31-37	3.5 (89)	18.8 (5.7)	120 (55)	370 (1645)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
38-45	3.5 (89)	17.8 (5.4)	110 (50)	370 (1645)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
46-53	3.5 (89)	16.8 (5.1)	110 (50)	350 (1555)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
54-61	3.5 (89)	15.8 (4.8)	110 (50)	350 (1555)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
62-69	3.5 (89)	14.8 (4.5)	100 (45)	330 (1465)	1kW	1-5/8" EIA, 50 ohm	7 kW	1-5/8" EIA, 50 ohm
12 Bay								
14-24	3.5 (89)	30.8 (9.4)	175 (80)	580 (2580)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
25-30	3.5 (89)	29.3 (8.9)	175 (80)	570 (2535)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
31-37	3.5 (89)	27.8 (8.5)	170 (75)	550 (2445)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
38-45	3.5 (89)	26.3 (8.0)	170 (75)	540 (2400)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
46-53	3.5 (89)	24.8 (7.6)	165 (75)	520 (2310)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
54-61	3.5 (89)	23.3 (7.1)	164 (75)	510 (2265)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
62-69	3.5 (89)	21.8 (6.6)	160 (70)	490 (2180)	1kW	1-5/8" EIA, 50 ohm	17 kW	3-1/8" EIA, 50 ohm
16 Bay								
14-24	3.5 (89)	40.8 (12.4)	240 (110)	780 (3470)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
25-30	3.5 (89)	38.8 (11.8)	235 (105)	760 (3380)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
31-37	3.5 (89)	36.8 (11.2)	230 (105)	740 (3290)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
38-45	3.5 (89)	34.8 (10.6)	225 (100)	720 (3200)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
46-53	3.5 (89)	32.8 (10.0)	220 (100)	700 (3110)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
54-61	3.5 (89)	30.8 (9.4)	215 (100)	680 (3025)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
62-69	3.5 (89)	28.8 (8.8)	210 (95)	660 (2935)	1kW	1-5/8" EIA, 50 ohm	22 kW	3-1/8" EIA, 50 ohm
24 Bay								
14-24	3.5 (89)	60.8 (18.5)	350 (160)	1160 (5160)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
25-30	3.5 (89)	57.8 (17.6)	340 (155)	1130 (5025)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
31-37	3.5 (89)	54.8 (16.7)	330 (150)	1100 (4890)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
38-45	3.5 (89)	51.8 (15.8)	320 (145)	1070 (4760)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
46-53	3.5 (89)	48.8 (14.9)	310 (140)	1040 (4625)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
54-61	3.5 (89)	45.8 (14.0)	300 (135)	1010 (4490)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
62-69	3.5 (89)	42.8 (13.0)	290 (130)	980 (4360)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
32 Bay								
14-24	3.5 (89)	80.8 (24.6)	440 (200)	1550 (6895)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
25-30	3.5 (89)	76.8 (23.4)	430 (195)	1510 (6715)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
31-37	3.5 (89)	72.8 (22.2)	420 (190)	1470 (6535)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
38-45	3.5 (89)	68.8 (21.0)	410 (185)	1430 (6360)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
46-53	3.5 (89)	64.8 (19.8)	400 (180)	1390 (6180)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
54-61	3.5 (89)	60.8 (18.5)	390 (175)	1350 (6005)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm
62-69	3.5 (89)	56.8 (17.3)	380 (170)	1310 (5825)	1kW	1-5/8" EIA, 50 ohm	28 kW	3-1/8" EIA, 50 ohm

Notes: † Loads are typical for 50 lb/ft² (2.4 kPa) for flat surfaces and 33 lb/ft² (1.6 kPa) for cylindrical surfaces.
* For wide Cardioid, Butterfly and all "Reduced Rear" azimuth patterns, multiply weight values by 1.05 and windload values by 1.25.

System Planning Worksheet for ALP Series Antennas

Use this worksheet to plan your material list for an efficient, cost-effective ALP antenna and HELIAX® coaxial cable system.
Duplicate this page or call Broadcast Systems at **1-800-DIAL-4-RF** for additional copies of the worksheet.

Item No.	Description	Type No.	Qty.	Unit Price	Extended Price
	Antenna and Accessories				
1	Antenna				
	Other				
	Transmission Line System				
2	HELIAX Coaxial Cable				
3	HELIAX Connector, Top				
4	HELIAX Connector, Bottom				
5	Hanger Kit of 10				
	Hardware Kit of 10				
	Adaptor Kit of 10				
	Threaded Rod Support				
6	Grounding Kit				
7	Wall/Roof Feed-Thru				
8	Miter Elbow				
9	Hoisting Grip				
	Pressurization Equipment				
10	Dehydrator (if required)				
11					
	Total Antenna System Estimate				

Channel(s)_____

Location_____

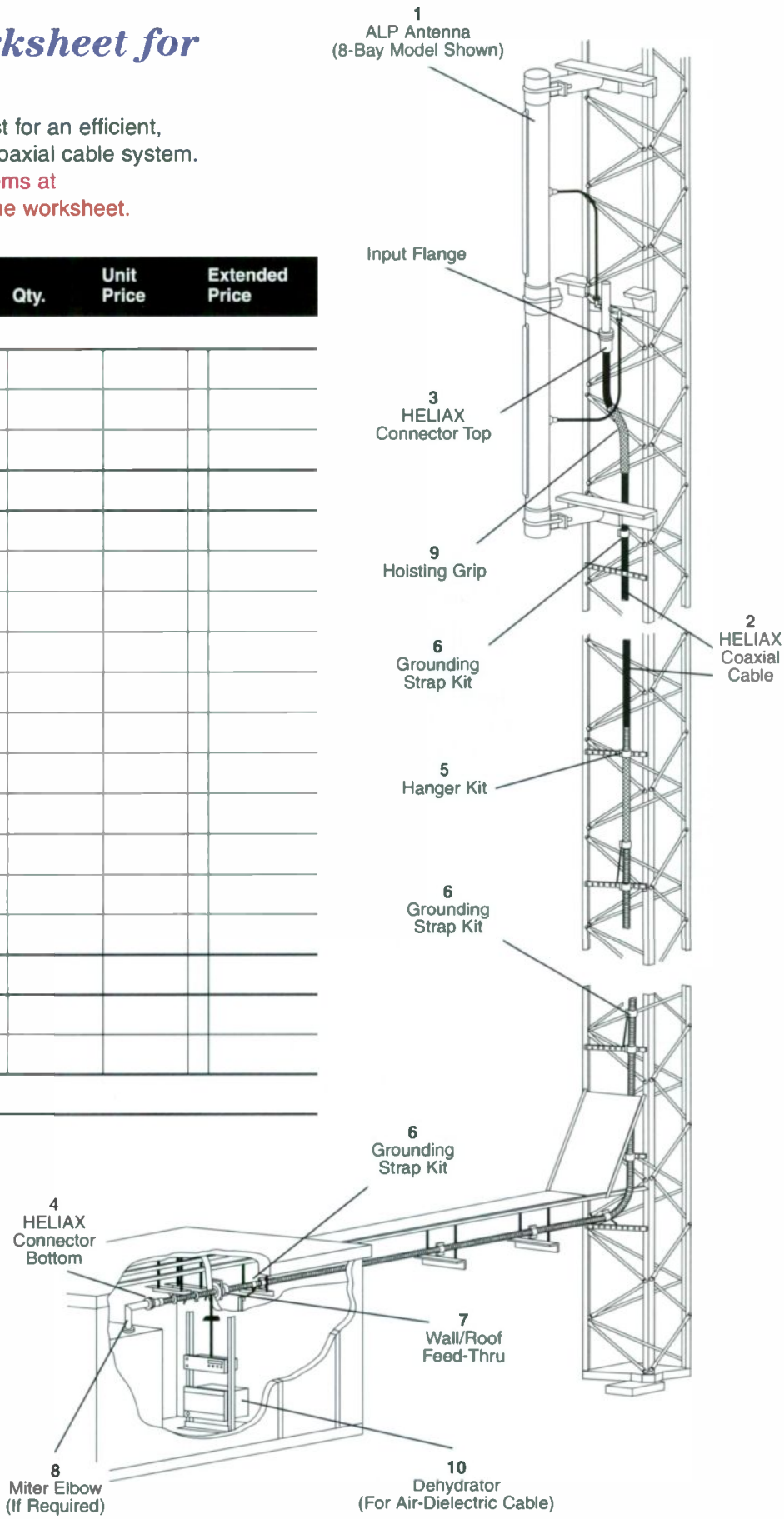
Owner_____

Prepared By_____

Date_____

Telephone _____

Notes_____



Broadcast Antenna Systems

AL8 Series Antennas

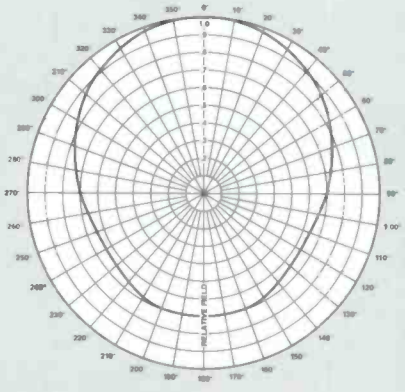
The Andrew AL8-Series Television Transmit Antenna will Give the Clear Picture.

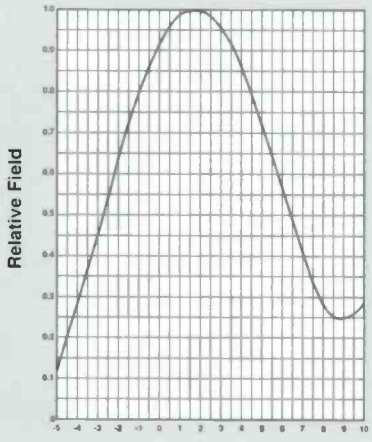
The Andrew Low-Power AL8 Series (CCIR Band IV/V) television transmitting antenna designed for UHF translator and low power applications offers a combination of quality, reliability, performance and economy.

Our engineering staff uses a state-of-the-art manufacturing and testing facility for the development of antenna designs and the production of broadcast antennas. Every Andrew antenna has been individually designed and engineered to meet or exceed customer specifications.

Here are some of the outstanding features that make the AL8-Series antennas from Andrew the very best.

- *8-Bay (one module) antenna*
- *Single Channel and Wide Band Antennas available for U.S., Australia and European frequencies*
- *Omnioid Pattern (other patterns available on application)*
- *1 kW input power rating standard*
- *7/8 in EIA Flange standard*
- *1.75 degrees of Electrical Beam tilt*
- *Structural Survival rating of 125 mph (201 Km/h) Plus 1/4 in (6.4 mm) Radial Ice*
- *Hardware Furnished for Pipe or Flush mounting*
- *Radome Enclosed for Environmental Protection*
- *Lightweight, cost effective shipping containers. Wood crate export packing available.*





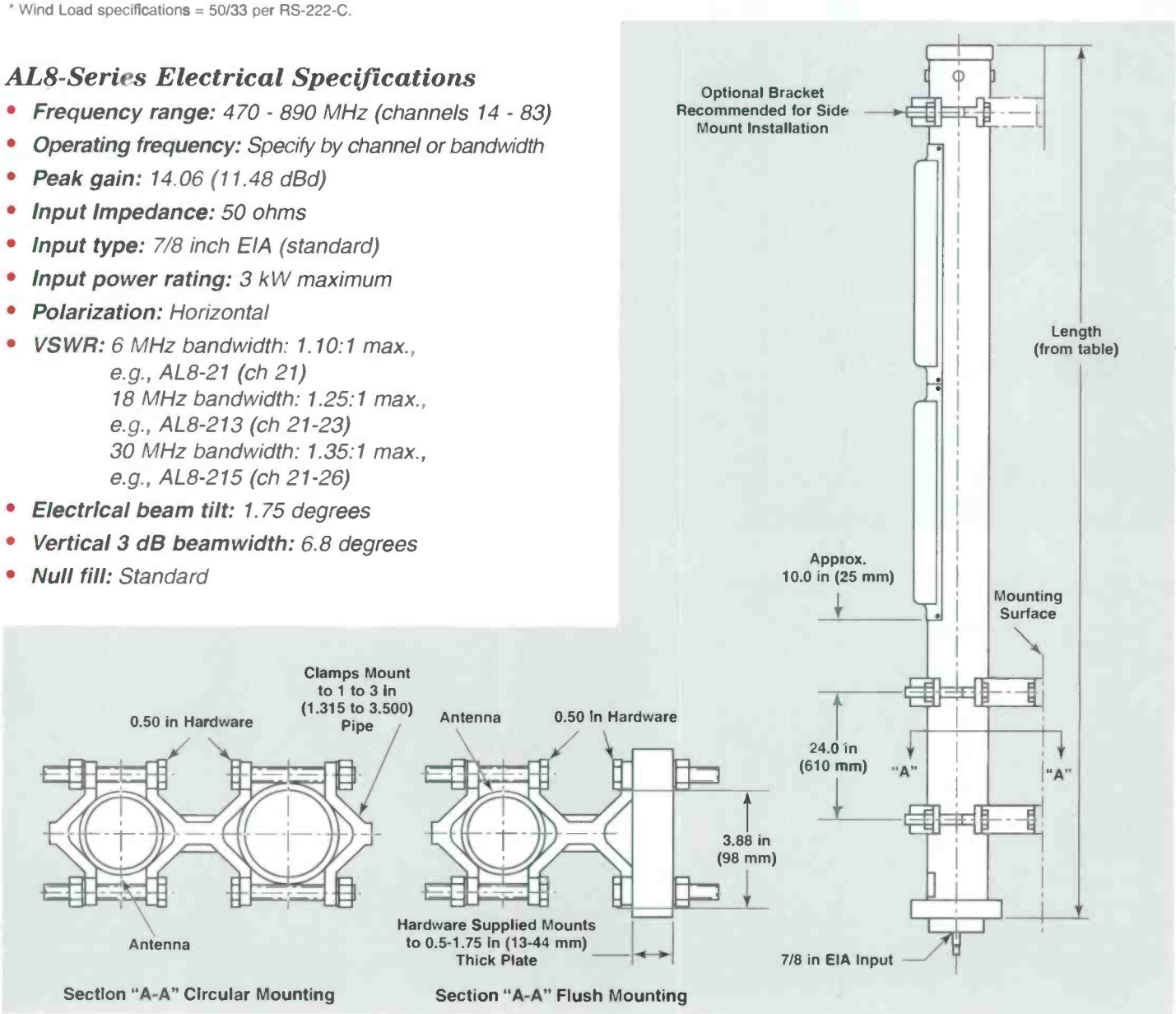
AL8-Series Mechanical Specifications

U.S 6 MHz	Channels European 8 MHz	Australian 7 MHz	Diameter In (mm)	Length ft (m)	Weight lb (kg)	Wind Load* lb (N)
14-19	21E-24E	–	3.5 (89)	20.0 (6.1)	110 (49.9)	230 (1025)
20-25	25E-29E	28A-29A	3.5 (89)	18.6 (5.7)	105 (47.7)	215 (960)
26-31	30E-33E	30A-34A	3.5 (89)	17.6 (5.4)	100 (45.4)	205 (915)
32-38	34E-38E	35A-40A	3.5 (89)	16.6 (5.1)	95 (43.1)	195 (870)
39-49	39E-47E	41A-49A	2.875 (73)	15.6 (4.8)	90 (40.9)	160 (715)
50-60	48E-55E	50A-59A	2.875 (73)	14.6 (4.5)	85 (38.6)	150 (670)
61-69	56E-62E	60A-67A	2.875 (73)	13.6 (4.2)	80 (36.3)	140 (625)
70-83	63E-69E	68A-69A	2.875 (73)	12.6 (3.9)	75 (34.0)	130 (580)

* Wind Load specifications = 50/33 per RS-222-C.

AL8-Series Electrical Specifications

- ***Frequency range:*** *470 - 890 MHz (channels 14 - 83)*
- ***Operating frequency:*** *Specify by channel or bandwidth*
- ***Peak gain:*** *14.06 (11.48 dBd)*
- ***Input Impedance:*** *50 ohms*
- ***Input type:*** *7/8 inch EIA (standard)*
- ***Input power rating:*** *3 kW maximum*
- ***Polarization:*** *Horizontal*
- ***VSWR:*** *6 MHz bandwidth: 1.10:1 max., e.g., AL8-21 (ch 21)*
  18 MHz bandwidth: 1.25:1 max., e.g., AL8-213 (ch 21-23)
  30 MHz bandwidth: 1.35:1 max., e.g., AL8-215 (ch 21-26)
- ***Electrical beam tilt:*** *1.75 degrees*
- ***Vertical 3 dB beamwidth:*** *6.8 degrees*
- ***Null fill:*** *Standard*



Broadcast Antenna Systems

NEW!

ALPac System

Antenna/Tower System for Top-Mounted LPTV Applications

Andrew Corporation and Electronic Research Inc., working together have made possible a unique solution for Low-and Medium-Power, Top-Mounted Antenna Applications.

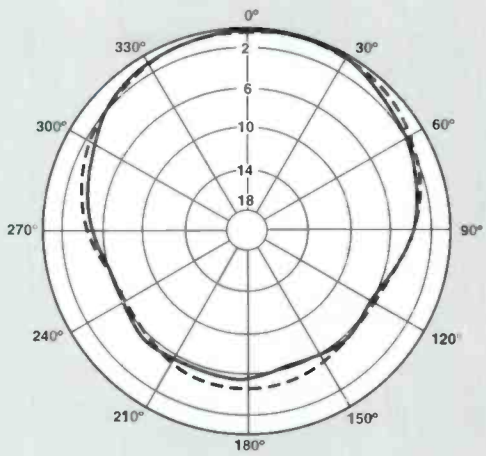
The New ALPac System was developed to overcome antenna pattern distortion caused by the support structure. The advantage...performance nearly identical to a free-space condition. This allows you to choose top-mounted antennas for tower or roof-top applications.

Intended for economical, high quality community broadcast stations, this system is also available for immediate implementation of ATV channels.

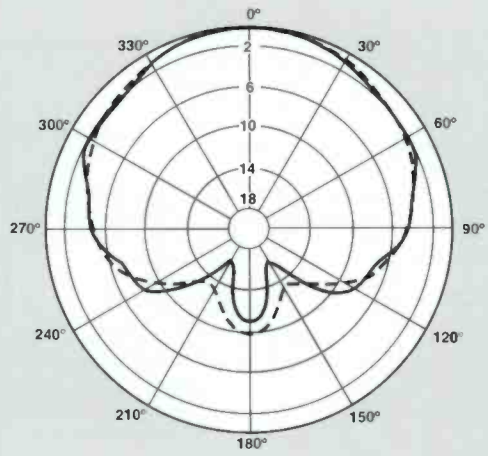
Andrew ALP-Antennas are built with high quality materials to ensure maximum reliability to the broadcaster. Patterns measured in the factory using state of the art equipment allow for reliable performance in the field.

Like all Andrew Broadcast Products, ALPac systems are supported by a complete selection of system products including HELIAX® transmission line and the follow-up support for which Andrew has been known for more than 50 years.

The range test data below demonstrates performance nearly identical to free space condition. The dotted line indicates free space pattern. The solid line indicates ALPac range test data.



Andrew Omnioid ALPac System



Andrew Cardioid ALPac System

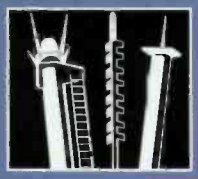
Broadcast Antenna Systems

HMD Series Antenna Systems

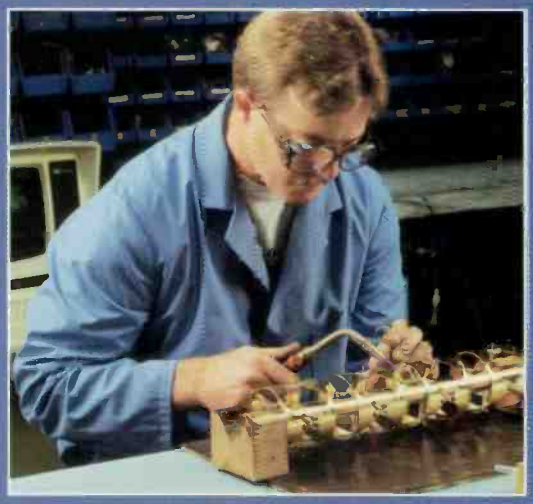
For Global MMDS/ITFS Systems and Wireless Cable Applications

• U.K. 0800-250055 • Republic of Ireland 1-800-535358 • Australia 1800-803 219 • New Zealand 0800-441-747

ANDREW. 315



Broadcast Antenna Systems



Features

Pressurized Radome Enclosures for Long, Trouble-Free Life

- *Environmentally sealed in a pressurizable fiberglass radome.*
- *Self contained and easy to mount.*

Superb Performance

- *Low VSWR... 1.35:1, maximum, for W-Band; 1.50:1, maximum, for other bands.*
- *Optimized Beam tilt ... 0.5° standard for 8, 12 and 16 bay; 0.75° standard for 24 and 32 bay. Others available on request.*
- *High Power Handling... 800 watts typical. Higher ratings available on application.*
- *Input Flange... 7/8" EIA, 50 ohm is standard.*
- *Frequency bands for most global services are available.*
- *Choose from an extensive selection of azimuth and elevation patterns.*
- *Horizontal or vertical polarization.*
- *Transmits analog or digital signals.*

HELIAX® Elliptical Waveguide and Coaxial Cable Ensure Maximum Performance

- *Use Type EW20 HELIAX elliptical waveguide for maximum efficiency.*
- *HELIAX coaxial cables are available for shorter feeder runs.*

Easy System Design with dB Freebie™ Software

- *The MMDS/ITFS System Design Software Tool.*
- *dB Freebie program features:*

  Complete system design from transmitter to antenna.

  Optimized signal strength characteristics with on-screen graphics for carrier-to-noise vs. distance.

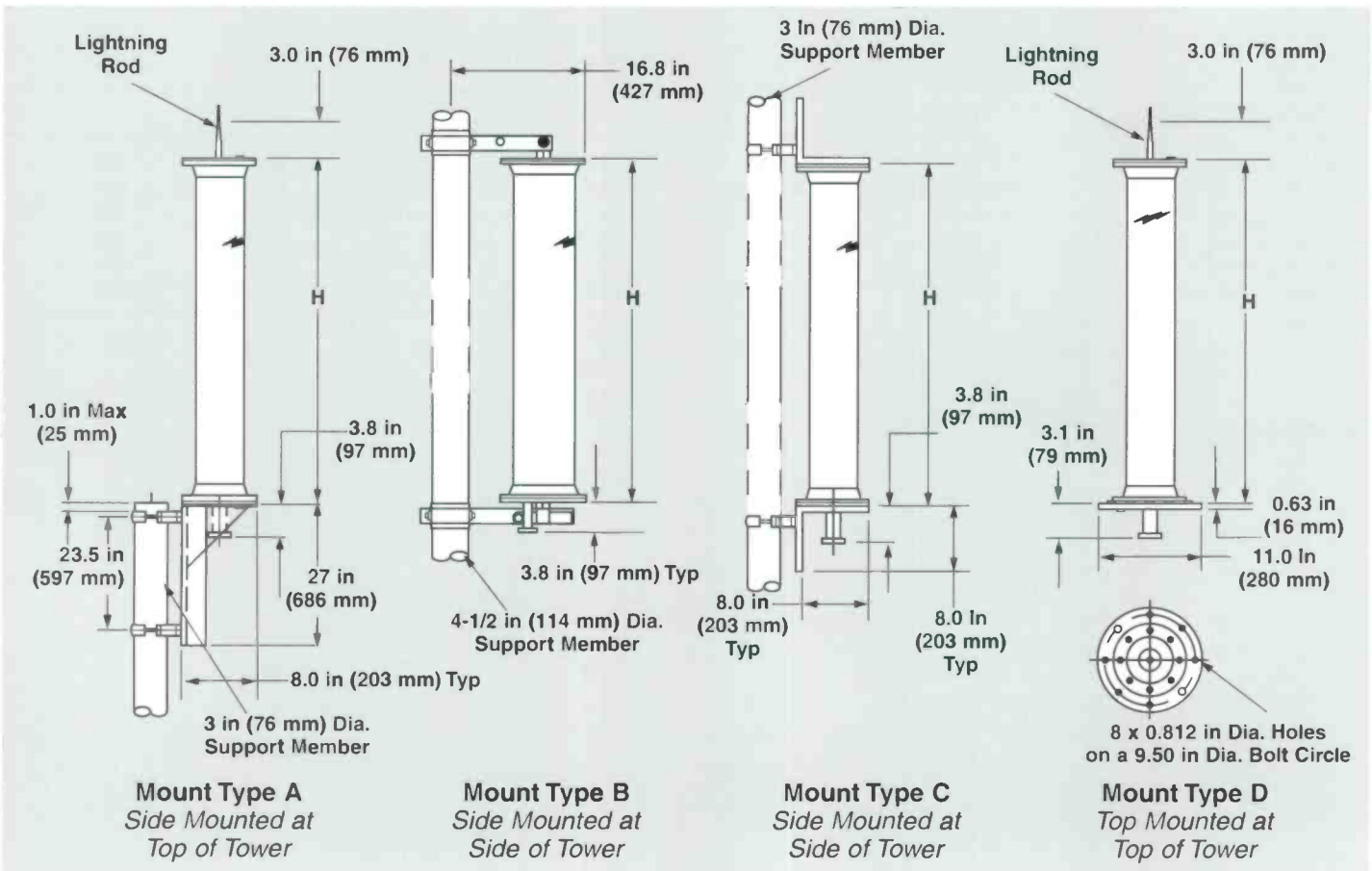
  DOS Based.

Mechanical Data

2500-2686 MHz (W Band)

Antenna Type	Mount Type	Shear lb (N)	Overturning Moment lb-ft (N-m)	Height (H) in (cm)	Radome Dia in (cm)	Weight lb (kg)	Power Rating** Watts
HMD8HO-W	A	135 (600)	386 (525)	41 (104)	5 (13)	45 (20)	500
HMD12HO-W	A	155 (689)	553 (752)	58 (147)	5 (13)	55 (25)	800
HMD16HO-W	A	180 (801)	814 (1108)	81 (206)	5 (13)	60 (27)	800
HMD24HO-W	D*	140 (623)	676 (920)	116 (295)	5 (13)	45 (20)	800
HMD8HC-W	B	80 (356)	–	39 (99)	8 (20)	70 (32)	500
HMD12HC-W	B	115 (512)	–	61 (155)	8 (20)	80 (43)	800
HMD16HC-W	B	155 (689)	–	73 (185)	8 (20)	95 (43)	800
HMD24HC-W	B	205 (912)	–	108 (274)	8 (20)	110 (50)	800
HMD32HC-W	B	275 (1223)	–	145 (368)	8 (20)	130 (59)	800
HMD8VO-W	A	135 (600)	386 (525)	41 (104)	5 (13)	45 (20)	500
HMD12VO-W	A	155 (689)	553 (752)	58 (147)	5 (13)	55 (25)	800
HMD16VO-W	A	180 (801)	814 (1108)	81 (206)	5 (13)	65 (30)	800
HMD24VO-W	D*	140 (623)	676 (920)	116 (295)	5 (13)	50 (23)	800
HMD8VC-W	C	92 (409)	–	41 (104)	5 (13)	40 (18)	500
HMD12VC-W	C	112 (498)	–	58 (147)	5 (13)	45 (20)	800
HMD16VC-W	C	138 (613)	–	81 (206)	5 (13)	55 (65)	800
HMD24VC-W	C	179 (796)	–	116 (295)	5 (13)	65 (30)	800
HMD32VC-W	B	275 (1223)	–	145 (368)	8 (20)	110 (50)	800

Notes: 1) Windloads are based on 50/33 psf loading. 2) For Mount Type A, overturning moments are taken about the center of the mounting bracket.
3) HC parameters cover the HW and HN patterns. 4) VC parameters cover VW and VN patterns. 5) 44.5 lb (198N) included in shear for Type C mount.
6) Other mount types available on request.
* Mounting hardware not included with "D" mount.
** Peak of sync for analog systems (NTSC, PAL, etc.)



Mount Type A
Side Mounted at Top of Tower

Mount Type B
Side Mounted at Side of Tower

Mount Type C
Side Mounted at Side of Tower

Mount Type D
Top Mounted at Top of Tower

Mechanical Data

Antenna Type	Mount Type	Shear lb (N)	Overturning Moment lb-ft (N-m)	Height (H) in (cm)	Radome Dia in (cm)	Weight lb (kg)	Power Rating Watts
1900 - 2100 MHz (P Band)*							
HMD8VO-P	A	175 (779)	543 (736)	47 (119)	8 (20)	55 (25)	500
HMD12VO-P	A	212 (943)	835 (1132)	67 (170)	8 (20)	65 (30)	800
HMD16VO-P	A	260 (1157)	1305 (1769)	93 (236)	8 (20)	75 (34)	800
* When specifying the Australian Band 2076-2111 MHz use P Band.							
2100 - 2300 MHz (Q Band)							
HMD8HO-Q	A	148 (659)	490 (664)	52 (132)	5 (13)	50 (23)	500
HMD12HO-Q	A	173 (770)	732 (992)	74 (188)	5 (13)	55 (25)	800
HMD16HO-Q	A	204 (908)	1092 (1481)	101 (257)	5 (13)	65 (30)	800
HMD8HC-Q	C	105 (467)	–	52 (132)	5 (13)	45 (20)	500
HMD12HC-Q	C	129 (573)	–	73 (185)	5 (13)	50 (23)	800
HMD16HC-Q	B	260 (1157)	–	92 (234)	8 (20)	70 (32)	800
HMD8VO-Q	A	175 (779)	543 (736)	47 (119)	5 (13)	55 (25)	500
HMD12VO-Q	A	212 (943)	835 (1132)	67 (170)	5 (13)	65 (30)	800
HMD16VO-Q	A	260 (1157)	1305 (1769)	93 (236)	5 (13)	75 (34)	800
HMD8VC-Q	C	112 (498)	–	52 (132)	5 (13)	45 (20)	500
HMD12VC-Q	C	129 (573)	–	73 (185)	5 (13)	50 (23)	800
HMD16VC-Q	C	162 (720)	–	101 (257	5 (13)	55 (25)	800
2300 - 2500 MHz (R Band)							
HMD8HO-R	A	138 (614)	411 (557)	44 (112)	5 (13)	50 (23)	500
HMD12HO-R	A	157 (699)	572 (776)	60 (152)	5 (13)	55 (25)	800
HMD16HO-R	A	187 (832)	884 (1199)	86 (218)	5 (13)	60 (27)	800
HMD8VO-R	A	138 (614)	411 (557)	44 (112)	5 (13)	55 (25)	500
HMD12VO-R	A	157 (699)	572 (776)	60 (152)	5 (13)	60 (27)	800
HMD16VO-R	A	187 (832)	884 (1199)	86 (218)	5 (13)	65 (30)	800

Wireless Cable Antenna Systems

Coverage of the Same Area by Two Antennas

When programming requirements necessitate the use of two antennas in close proximity, they should be mounted to minimize interference between them. Dual, side-mounted cardioids should be mounted one above the other.

Two antennas may be used:

- *For coverage of the same area, with additional programming, from a single location.*
- *To provide omnidirectional coverage when a single antenna cannot be used because of building or tower obstructions*

Recommended Antenna Spacings

Condition 1

Dual, top mounted omnidirectional antennas

Polarization of one or both of the antennas:

Vertical: 10 feet (3 m) apart
Horizontal: 5 feet (1.5 m) apart

Condition 2

Omnidirectional antenna mounted to side of tower.

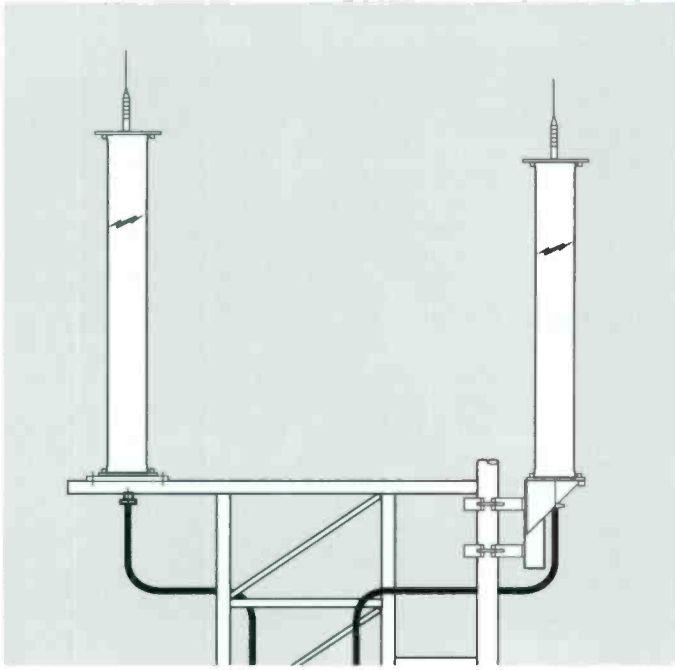
Polarization

Vertical: Not recommended for omnidirectional requirements
Horizontal: Minimum of 3.5 feet (1 m) with base of antenna located at tower horizontal member.

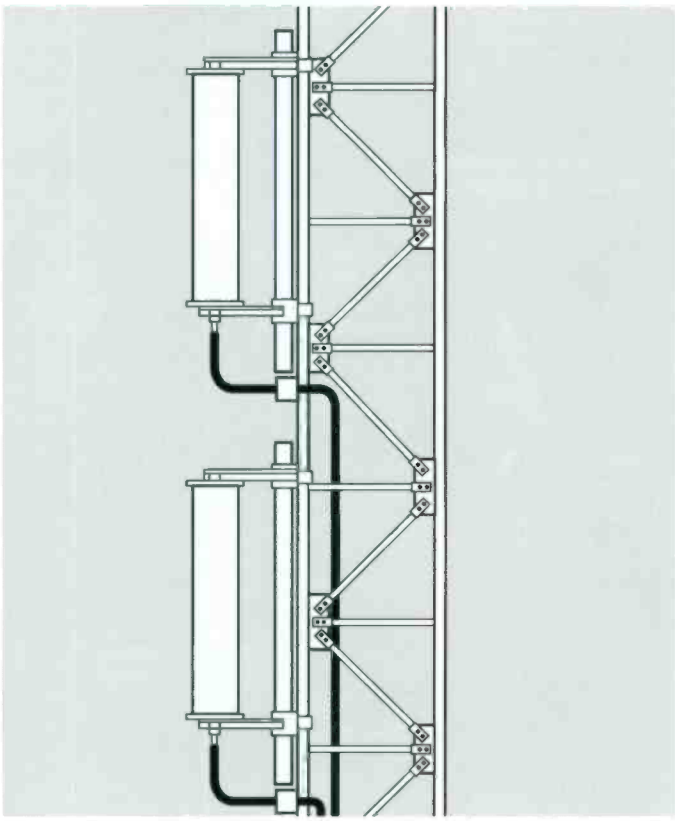
Note

These suggestions are general in nature. Basis for the spacing is to prevent nulls greater than 5 dB in azimuth pattern. For specific cases, model studies can be performed to determine optimum location for antenna mounting. Andrew accepts no responsibility for antenna performance other than those specifications stated on pages 317-318 and 321-322 of this catalog.

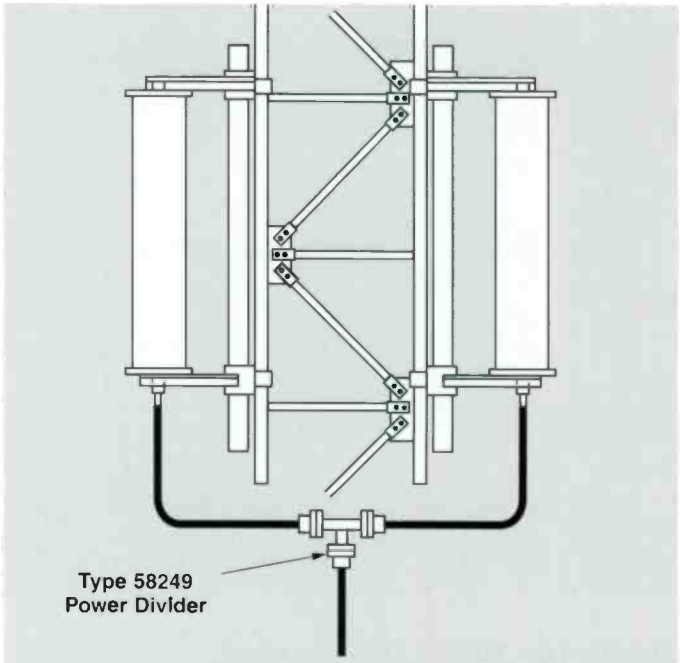
Dual Top Mounted Omni Antennas



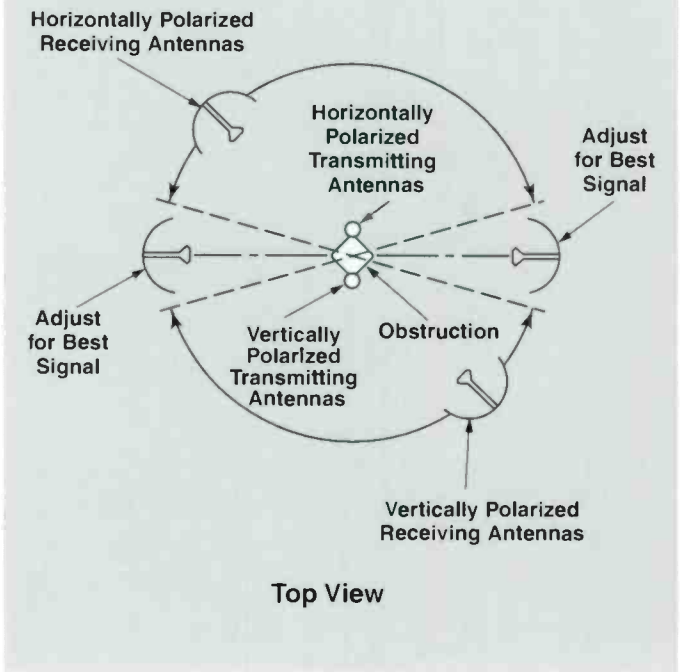
Dual Side Mounted Antennas



Dual Side Mounted Cardioid Antennas for Omnidirectional Coverage



Side View



Top View

To Provide Omnidirectional Coverage

When an omnidirectional antenna cannot be used because of building or tower obstructions, two directional antennas can be used as shown.

Andrew pioneered the concept of using antennas with opposite polarizations to minimize deep nulls and interference at the pattern crossover points. The phase relationship between transmitting antennas is not important when opposite polarizations are used. Receive antennas positioned in the crossover areas can be adjusted on-site for maximum receive signal. A power divider is used to feed both transmitting antennas.

Power Dividers

Power dividers allow two antennas to be fed from one transmitter with equal or unequal power division as required. The units are air dielectric, have 7/8" EIA flanges, and are designed for operation over the 2.5 - 2.686 GHz band with 1.1 maximum input VSWR. Units for other bandwidths are also available (see detail numbers below).

Type Number	Power Division-%	Insertion Loss, dB
58247 - (*)	10/90	10.0/0.5
58248 - (*)	25/75	6.0/1.2
58249 - (*)	50/50	3.0/3.0

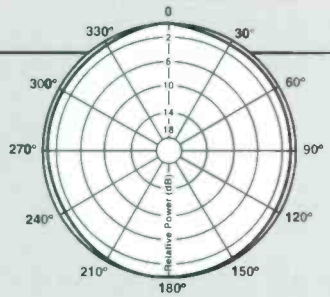
* Insert detail number:

None	2.5-2.686 GHz
-2	2.3-2.5 GHz
-3	2.1-2.3 GHz
-4	1.9-2.1 GHz

Azimuth Patterns

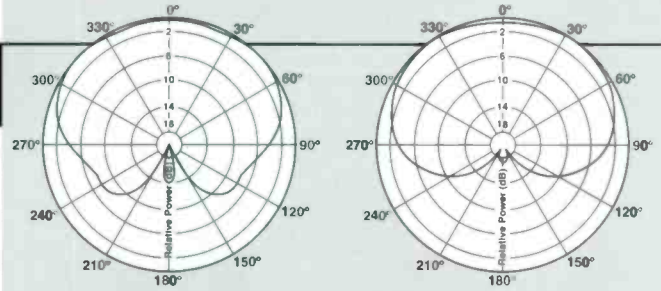
Omnidirectional

Horizontal	Vertical	Number of Bays	Power Gain (dBi)†
HMD8HO-(*)	HMD8VO-(*)	8	11.5
HMD12HO-(*)	HMD12VO-(*)	12	13.0
HMD16HO-(*)	HMD16VO-(*)	16	14.0
HMD24HO-W	HMD24VO-W	24	16.0



Cardioid

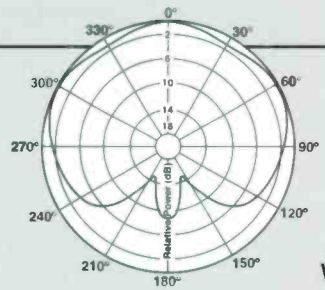
Horizontal	Vertical	Number of Bays	Power Gain (dBi)†
HMD8HC-(**)	HMD8VC-(**)	8	14.5
HMD12HC-(**)	HMD12VC-(**)	12	16.0
HMD16HC-(**)	HMD16VC-(**)	16	17.0
HMD24HC-W	HMD24VC-W	24	19.0
HMD32HC-W	HMD32VC-W	32	20.0



Horizontal Vertical

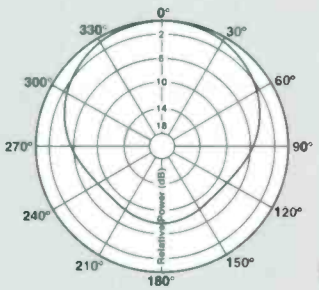
Horizontal Cardioid

Wide	Number of Bays	Power Gain (dBi)†
HMD8HW-(*)	8	13.8
HMD12HW-(*)	12	15.3
HMD16HW-(*)	16	16.3
HMD24HW-(*)	24	18.3



Wide

Narrow	Number of Bays	Power Gain (dBi)†
HMD8HN-(*)	8	15.1
HMD12HN-(*)	12	16.6
HMD16HN-(*)	16	17.6
HMD24HN-(*)	24	19.6

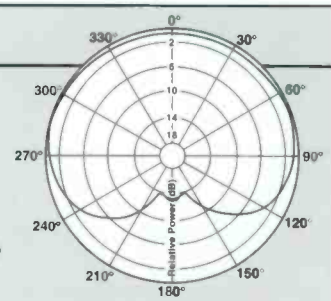


Narrow

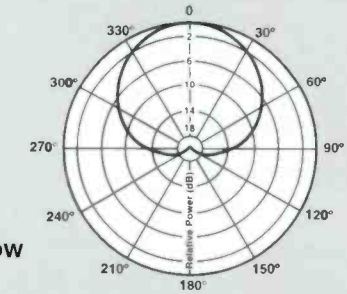
Footnotes: * Insert one of the following letters: P=1900-2100 MHz, Q=2100-2300 MHz, R=2300-2500 MHz, W=2500-2686 MHz. ** Insert one of the following letters: Q = 2100-2300 MHz or W = 2500-2686 MHz. For W sufflx antennas, VSWR is 1.35:1, max; for other bands VSWR is 1.50:1 Max. Narrow band specifications are available for ITFS channels. † To convert power gains to dBd, subtract 2.14. All patterns shown in relative power (dB). Other gains and patterns available on request.

Azimuth Patterns

Wide



Narrow



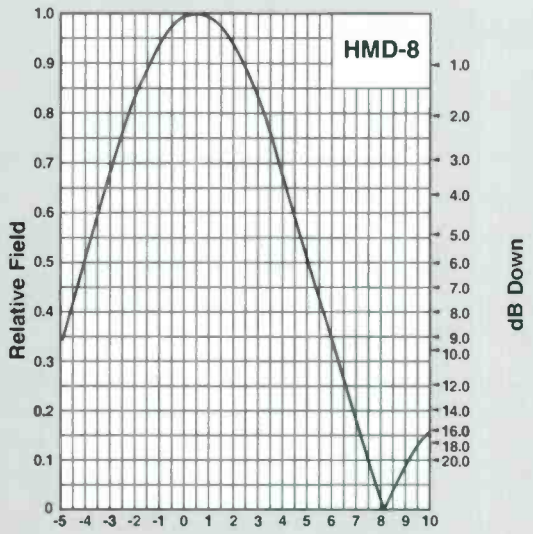
Vertical Cardioid

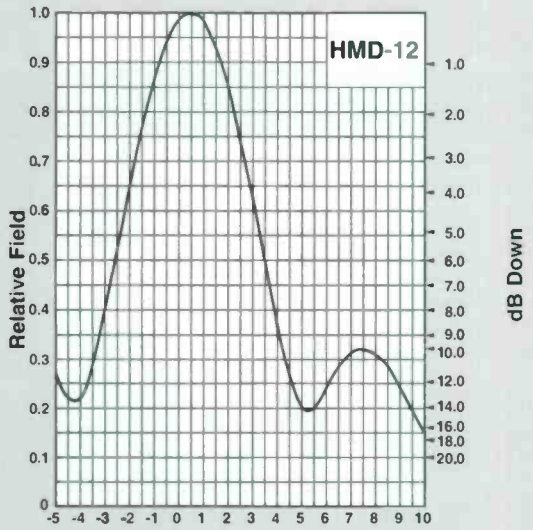
Wide	Number of Bays	Power Gain (dBi)†
HMD8VW-W	8	13.7
HMD12VW-W	12	15.2
HMD16VW-W	16	16.2

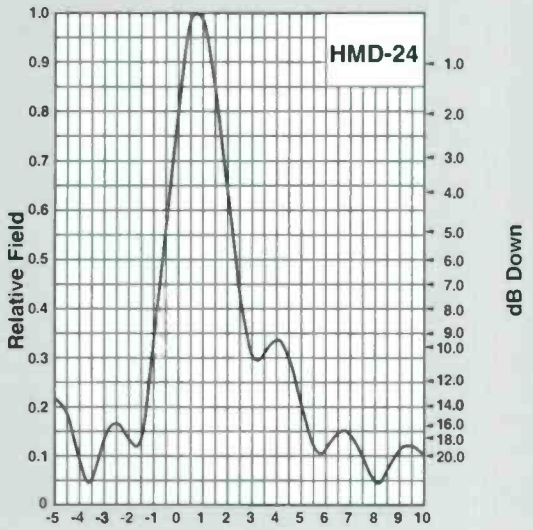
Narrow	Number of Bays	Power Gain (dBi)†
HMD8VN-W	8	17.5
HMD12VN-W	12	19.5
HMD16VN-W	16	20.5
HMD24VN-W	24	21.5
HMD32VN-W	32	23.5

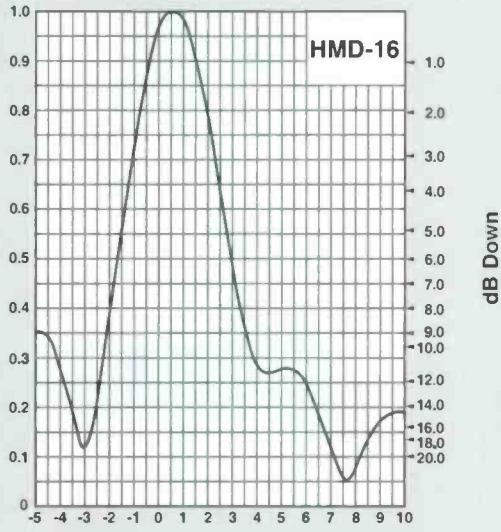
Footnotes: * Insert one of the following letters: P=1900-2100 MHz, Q=2100-2300 MHz, R=2300-2500 MHz, W=2500-2686 MHz. ** Insert one of the following letters: Q = 2100-2300 MHz or W = 2500-2686 MHz. For W suffix antennas, VSWR is 1.35:1, max; for other bands VSWR is 1.50:1 Max. Narrow band specifications are available for ITFS channels. † To convert power gains to dBd, subtract 2.14. All patterns shown in relative power (dB). Other gains and patterns available on request.

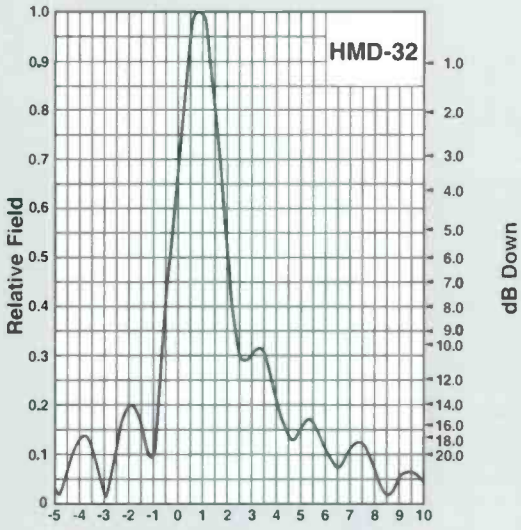
Elevation Patterns











NEW!

Broadband HMD Series Antennas for MMDS/MDS Systems

This new broadband antenna operates in both the 2150 - 2163 MHz and 2500 - 2686 MHz bands allowing construction of a complete MMDS system using two instead of four antennas.

The broadband feature eliminates the costs of two antennas when building your 33-channel MMDS system, requires only two runs of transmission line and less tower space.

Broadband HMD MMDS antennas are available with omnidirectional and directional patterns and either vertical or horizontal polarization. All HMD Series antennas are VSWR tested prior to shipment. Optional pattern testing is available.

Electrical Specifications

WNQ Band 2500-2686 (W)/2150-2163 (NQ)

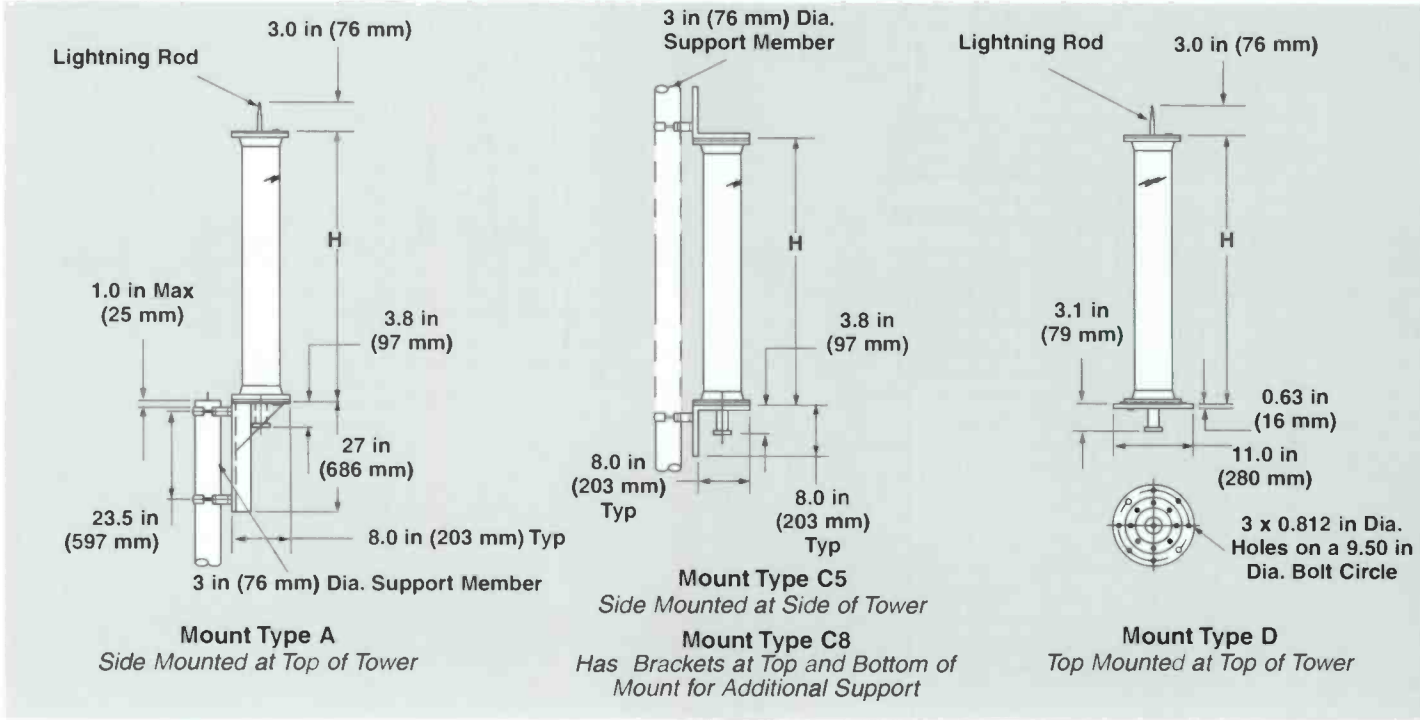
Antenna Type	Omnidirectional	Cardioid
Polarization	Vertical or Horizontal	Vertical or Horizontal
Gain (dBi)		
8-Bay	10.6 (W) 8.8 (NQ)	13.4 (W) 11.6 (NQ)
12-Bay	12.4 (W) 10.6 (NQ)	15.2 (W) 13.4 (NQ)
16-Bay	13.6 (W) 11.8 (NQ)	16.4 (W) 14.6 (NQ)
24-Bay	15.4 (W) 13.6 (NQ)	18.2 (W) 16.4 (NQ)
Input Power	500 W (8-Bay)	500 W (8-Bay)
Rating (Max)†	800 W (12, 16, 24-Bay)	800 W (12, 16, 24-Bay)
Frequency	2150-2163 (NQ)/	2150-2163 (NQ)/
Band, MHz	2500-2686 (W)	2500-2686 (W)
Beam tilt	0.5° standard	0.5° standard
Input Type	7/8" EIA	7/8" EIA
Input VSWR	1.35:1 (W)	1.35:1 (W)
(Max)	2:1 (NQ)	2:1 (NQ)

† Peak of sync for analog systems (NTSC, PAL, etc.)

Mechanical Specifications

Antenna Type	Mount Type	Shear lb (N)	Overturn lb-ft (N-m)	Height "H" in (cm)	Radome In (cm)	Weight lb (kg)
8VO-WNQ	A	135 (600)	386 (525)	41 (104)	5 (13)	45 (20)
12VO-WNQ	A	155 (689)	553 (752)	58 (147)	5 (13)	55 (25)
16VO-WNQ	A	180 (801)	814 (1108)	81 (206)	5 (13)	65 (30)
24VO-WNQ	D	140 (623)	676 (920)	116 (295)	5 (13)	50 (23)
8HO-WNQ	A	138 (614)	411 (557)	44 (112)	5 (13)	55 (25)
12HO-WNQ	A	157 (699)	572 (776)	60 (152)	5 (13)	60 (27)
16HO-WNQ	A	180 (801)	600 (810)	81 (206)	5 (13)	65 (30)
24HO-WNQ	D	143 (636)	709 (957)	119 (302)	5 (13)	50 (23)

Antenna Type	Mount Type	Shear lb (N)	Overturn lb-ft (N-m)	Height "H" in (cm)	Radome In (cm)	Weight lb (kg)
8HC-WNQ	C8	130 (579)	—	46 (116)	8 (20)	55 (25)
12HC-WNQ	C8	167 (743)	—	66 (167)	8 (20)	60 (27)
16HC-WNQ	C8	215 (957)	—	92 (233)	8 (20)	65 (30)
24HC-WNQ	C8	258 (1148)	—	115 (292)	8 (20)	70 (32)
8VC-WNQ	C5	92 (409)	—	41 (104)	5 (13)	50 (23)
12VC-WNQ	C5	114 (507)	—	60 (152)	5 (13)	55 (25)
16VC-WNQ	C5	138 (614)	—	81 (206)	5 (13)	60 (27)
24VC-WNQ	C5	183 (814)	—	119 (302)	5 (13)	65 (30)



Mount Type A
Side Mounted at Top of Tower

Mount Type C5
Side Mounted at Side of Tower

Mount Type C8
Has Brackets at Top and Bottom of Mount for Additional Support

Mount Type D
Top Mounted at Top of Tower

NEW!

Dual Input HMD Series Antennas for MMDS/MDS Systems

This dual input antenna is actually two omnidirectional antennas enclosed in a single radome. It saves space and the cost of installing and maintaining two separate antennas. The antenna reduces windloading and weight, compared with two antennas, potentially creating further savings when considering tower costs. The antenna design also prevents pattern distortion caused by mounting two vertically polarized antennas side by side.

Available in dual 8- or 12-bay configurations, Andrew HMD Series antennas offer global wireless cable operators simultaneous operation covering bands from 1900 – 2686 MHz.

Electrical Specifications

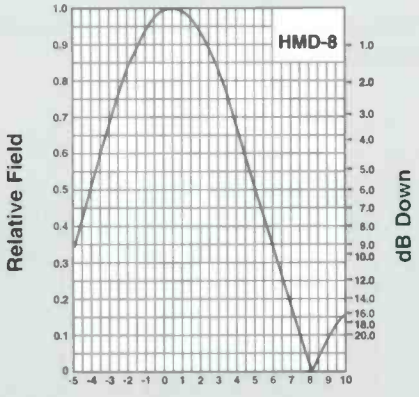
Antenna Type	Omnidirectional
Polarization	Vertical
Gain (dBi)	11.5 (8-Bay) 13.0 (12-Bay)
Input Power Rating (Max)†	500 W (8-Bay) 800 W (12-Bay)
Frequency Band, (MHz)	1900-2100 (P) 2300-2500 (R) 2100-2300 (Q) 2500-2686 (W)
Beam tilt	0.5° standard
Input Type	7/8" EIA
Input VSWR (Max)	1.50:1 for P, Q, R; 1.35:1 for W

† Peak of sync for analog systems (NTSC, PAL, etc.)

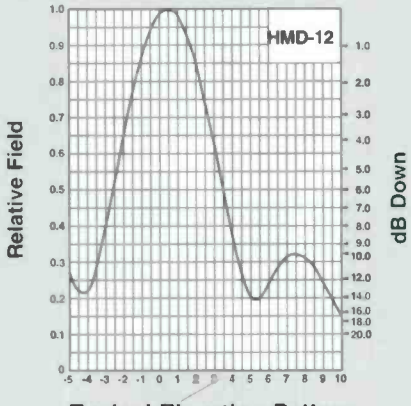
Mechanical Specifications 8 Bay/12 Bay Dual Input

Antenna Type	Mount Type	Shear lb (N)	Overturn lb-ft (N-m)	Height "H" in (cm)	Radome in (cm)	Weight lb (kg)
DHMD8V0-W	A	180 (801)	455 (617)	81 (206)	5 (13)	45 (20)
DHMD12VO-W	D	135 (600)	653 (885)	116 (295)	5 (13)	55 (25)
DHMD8VO-R	A	260 (1157)	1305 (1769)	93 (236)	8 (20)	50 (23)
DHMD12VO-R	A	222 (986)	1328 (1801)	116 (295)	5 (13)	60 (27)
DHMD8VO-Q	A	260 (1157)	1305 (1769)	93 (236)	8 (20)	50 (23)
DHMD12VO-Q	A*	326 (1452)	2126 (2880)	129 (328)	8 (20)	65 (30)
DHMD8VO-P	A	260 (1157)	1305 (1769)	93 (236)	8 (20)	50 (23)
DHMD12VO-P	A*	326 (1452)	2126 (2880)	129 (328)	8 (20)	65 (30)

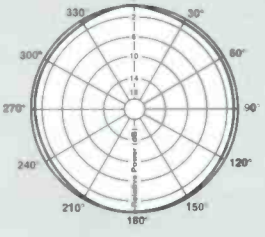
* Includes guy wires (customer to supply anchor points)



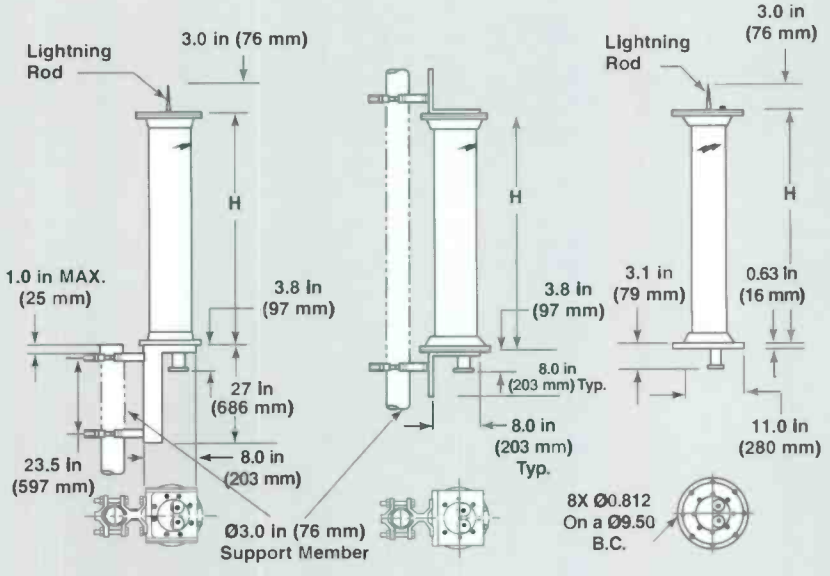
Typical Elevation Pattern



Typical Elevation Pattern



Azimuth Pattern Omni



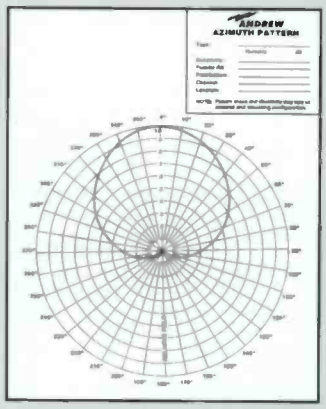
SHADOWMASTER™

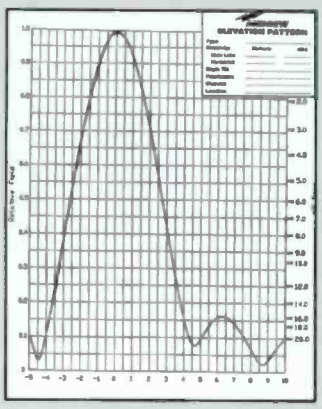
The SHADOWMASTER Booster Antenna for 2.5 to 2.7 GHz

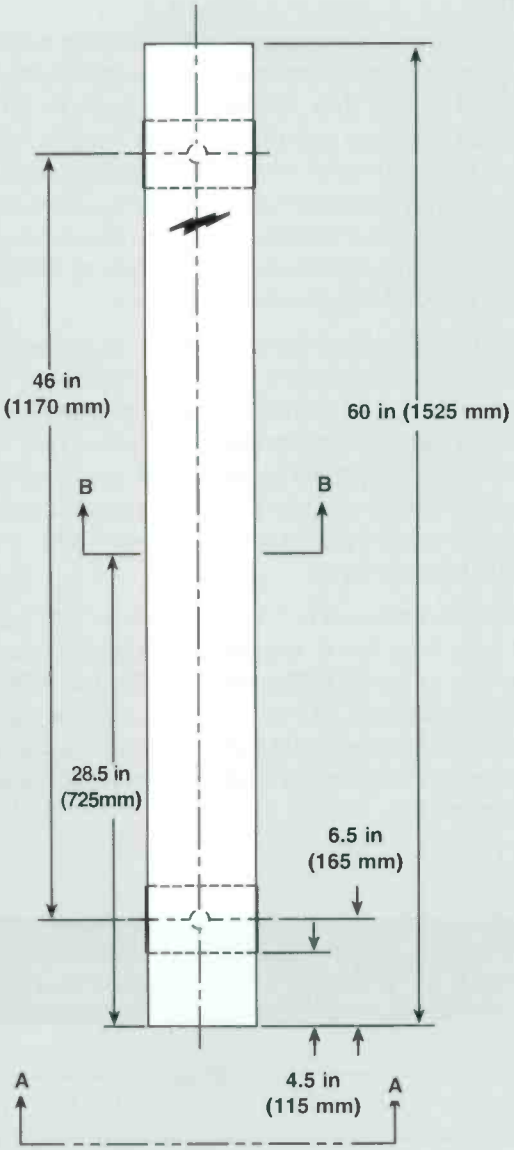
Designed to enhance coverage for line-of-sight microwave frequencies, the SHADOWMASTER is the ideal translator antenna that provides the added quality wireless operators need to maintain and increase viewership and revenues.The sleek and lightweight antenna is just 60 inches tall, 7 inches wide and 6 inches deep for minimum windloading on the support structure and easy installation.

The SHADOWMASTER provides 16 dBi of signal gain as well as an improved vertical pattern with null fill for coverage at all angles.

The durable SHADOWMASTER transmit MMDS antenna is vertically polarized and mounts using a universal mounting system.



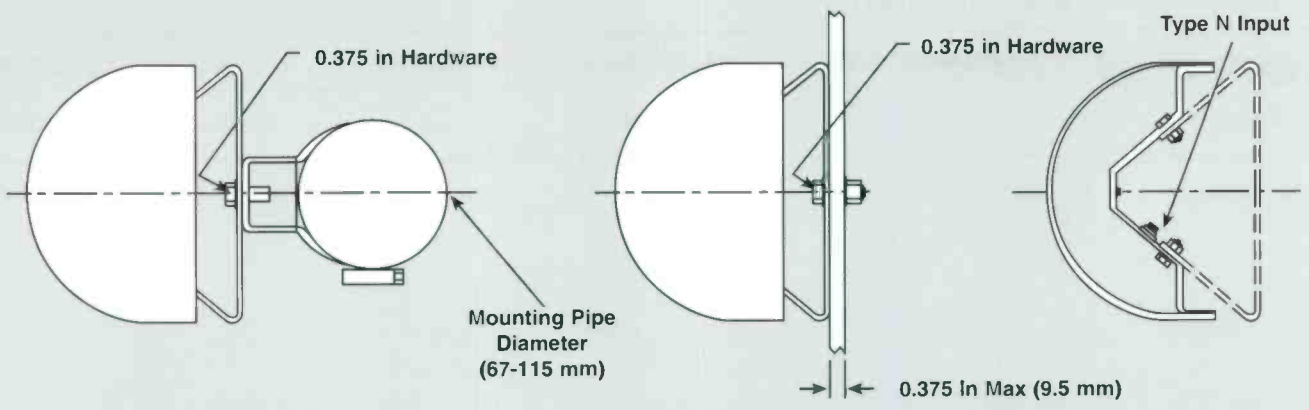




Andrew SHADOWMASTER Antennas are built to the same high quality standards as our internationally acclaimed HMD Series of MMDS/ITFS antennas.

Like all Andrew Broadcast products, HMD and SHADOWMASTER antennas are supported by a complete selection of system products including HELIAX® transmission lines and the follow-up support for which Andrew has been known for more than 50 years.

Type Number – HMD16SM-V	
Electrical	
Frequency	2500 - 2700 MHz
Gain	16 dBi (nominal)
VSWR	1.5:1 maximum
Polarization	Vertical
Half-Power Beamwidth	Azimuth: 100° typical Elevation: 5° typical
Front-to-Back Ratio	20 dB typical
Input Power Rating	100 watts
Input Connector	Type N Female
Pressurization	Not required
Mechanical	
Windloading at 112 mph (180 km/h), lb (N)	100 (445)
Length, in (mm)	60 (1525)
Weight, lb (kg)	13 (5.9)



View A-A
Pipe Tower Mount

View A-A
Flush Tower Mount

View B-B

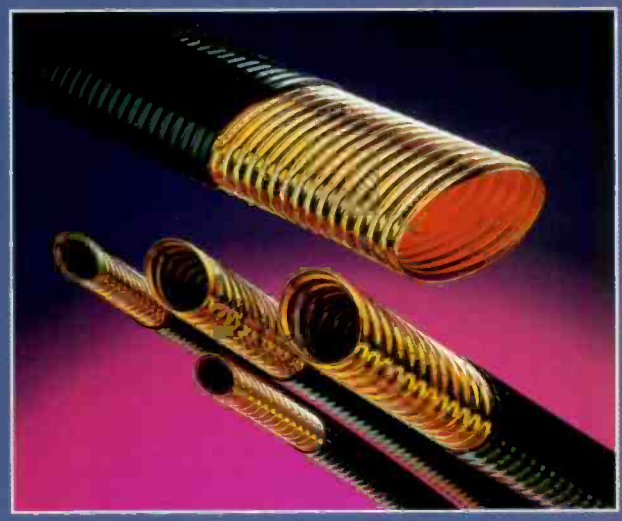
Pressurization Equipment

Andrew pressurization equipment maintains the performance of your present antenna system components and saves you money. The constant supply of dry air under pressure assures you of high signal quality, low VSWR and reduced risk of component damage from voltage breakdown and corrosion. Operating costs are less because of lower maintenance costs. Mean time between failure is double the industry standard allowing a three-year or 3000 hour runtime warranty.

Dehydrators are available as either manually regenerative or fully automatic membrane and meet the regulatory requirements of UL/CSA/CE/VDE. They are manufactured by an ISO 9001 supplier and are backed by a 24-hour Customer Service line. A complete line of accessories complement the dehydrator. HELIAX® elliptical waveguide and air dielectric coaxial cables provide a convenient pressure path to the antenna.

For transmission line runs of EW20 less than 166 ft and HJ7P-50A less than 714 ft, choose the MTH-050 model dehydrator. For runs of EW20 between 166 and 1090 ft and HJ7P-50A between 714 and 4714 ft, choose the MT-300 or XT-300 model dehydrators. Contact Andrew for information on other transmission lines and pressurization equipment.

Dehydrator Series	Output Pressure Range lb/in² (kPa)	Maintenance Type of Regeneration	Electric Power	Output Capacity ft³/min (l/min)	Meets Regulatory Requirements
System Volume 0 to 10 ft³ (0-283 l)					
MTH-050-10x	5 (34)	Auto Membrane	ac and dc	0.05 (1.4)	UL/CSA/CE
System Volume 10 to 66 ft³ (283-1869 l)					
MT-300-x2x	2 (14) on, 5 (34) off	Auto Membrane	ac	0.3 (8.5)	UL/CSA/CE
XT-300 (XH or XL)	Programmable	Auto Membrane	ac	0.3 (8.5)	UL/CSA/CE



*HELIAX® Elliptical Waveguide System Components, 2.1-2.7 GHz**

Description	Type No.
Elliptical Waveguide	**EW20**
Connector, 7/8" EIA	
with gas barrier	**E20MB-014**
without gas barrier	**E20MP-014**
Elliptical Waveguide Accessories	
Hanger Kit of 10	**31766A-10**
Hoisting Grip	**34759**
Wall/Roof Feed Thru	**35849-9**
Grounding Kit	
with factory attached lug	**204989-6**
with field attachable screw-on lug	**204989-36**

For more information on EW20 elliptical waveguide and accessories, see page 180.

* Contact Andrew for information on other frequency bands.

HELIAX® Coaxial Cable System Components

Air Dielectric 1-5/8" Frequency Band, GHz	Mid Band, GHz	Attenuation dB/100 ft	Attenuation dB/100 m	Cable Type No.	7/8" EIA Connector no gas barrier	7/8" EIA Connector with gas barrier
1.9-2.1	2.0	1.05	3.44	**HJ7P-50A-19**	87ST	87SGT
2.1-2.3	2.2	1.11	3.63	**HJ7P-50A-19**	87ST	87SGT
2.3-2.5	2.4	1.17	3.83	**HJ7P-50A-23W**	87ST	87SGT
2.5-2.7	2.6	1.22	4.01	**HJ7P-50A-23W**	87ST	87SGT

Description	Type No.
Hanger Kit of 10	**42396A-2**
Insulated Hanger	**33948-3**
Angle Adapter for Insulated Hanger	**13555A**
Round Member Adapter for Insulated Hanger	
1-3 in dia members	**13550**
Grounding Strap Kit	
with factory attached lug	**204989-4**
3/8" Hardware and Hanger Adapters	
Hardware Kit of 10, 3/8" bolts, lockwashers, nuts	
Angle Adaptor Kit of 10	**31768A**
3/4" (19 mm) long	**31769-5**
1" (25 mm) long	**31769-1**
Threaded Rod Support, 3/8" rod, nuts washers, ceiling bracket 12 in (305 mm) long, kit of 1	
3-4 (75-100)	**31771**
Tower Standoff Kit of 10. 1" (25 mm) standoff Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**

* Length in ft, up to 20 ft.

Description	Type No.
Other Accessories	
Jumper Cables. For other jumpers, contact Andrew.	
Top: 7/8" Air Dielectric	
7/8" EIA /7/8" EIA gas pass connectors	**220406-(*)**
Bottom: For bottom jumpers, contact Andrew.	
Snap-In Hanger Kit of 10	**206706-4**
Angle Adaptor for insulated hanger	**13555A**
Cable Hoisting Grip	**24312A**
Wall/Roof Feed Thru	
Single Cable	**40656-2**
Round Member Adaptor Kit of 10	
Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
Tower Standoff Kit of 10, 2.5 (60 mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

System Planning Worksheet

Item No.	Description	Type No.	Qty.	Unit Price	Extended Price
	Antenna and Accessories				
1	Antenna				
	Power Divider				
	Other				
	Transmission Line System				
2	HELIAX® Elliptical Waveguide				
3	HELIAX Coaxial Cable				
4	HELIAX Connector, Top				
5	HELIAX Connector, Bottom				
6	Hanger Kit of 10				
	Hardware Kit of 10				
	Adapter Kit of 10				
	Threaded Rod Support				
7	Grounding Strap Kit				
8	Wall/Roof Feed-Thru				
9	Jumper Cable				
	Pressurization Equipment				
10	Dehydrator				
	Total Antenna System Estimate				

Location _____

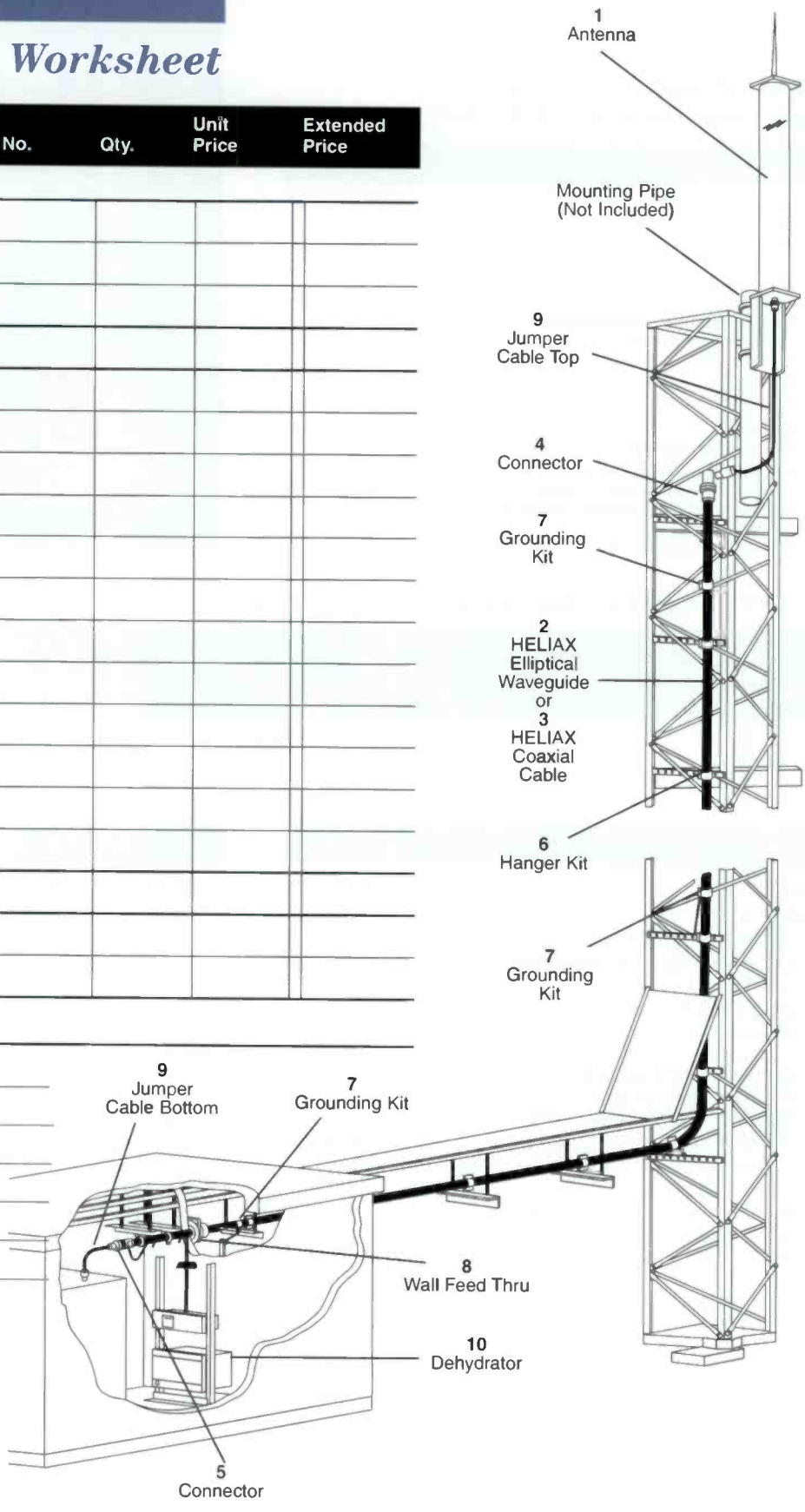
Owner _____

Prepared By _____

Date _____

Telephone _____

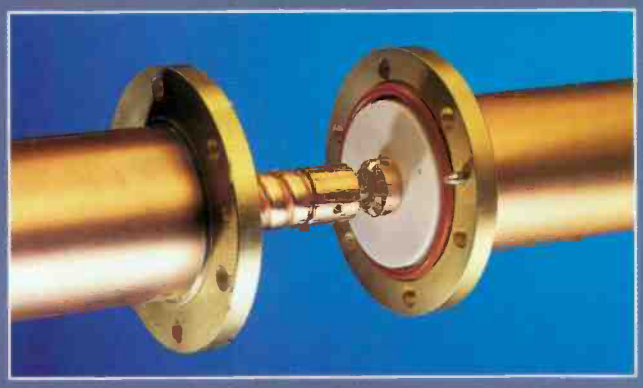
Notes _____



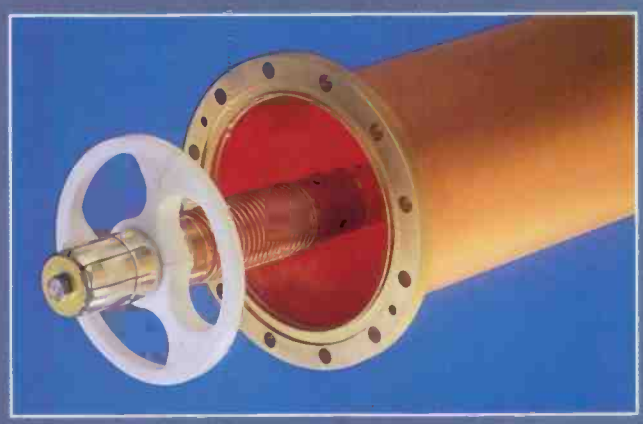
Rigid Transmission Lines

Reduce the Risk of Burnout with HRLine® and MACXLine®

Andrew offers two innovative, patented, rigid transmission line products: HRLine and MACXLine. Each reduces the risk of burnout which causes downtime and loss of revenue. For new installations, HRLine is the most cost-effective solution. MACXLine provides the same longevity as HRLine, while offering greater ease of installation and damage repair.



HRLine rigid coaxial line doubles the life of your transmission line system because it eliminates bullet-type inner conductor assemblies which are susceptible to failure due to wear caused by thermal expansion and contraction. A semi-flexible corrugated inner conductor with a bolted inner joint absorbs differential thermal expansion uniformly along the length of each section. HRLine is available in 3-1/8" and 6-1/8" sizes for VHF and UHF television and medium-to high-power FM applications.



MACXLine rigid coaxial line uses a bellows in the inner conductor to compensate for thermal expansion and contraction. Though standard bullet-type connections are used, they do not slide once put in service and never wear out. MACXLine is also furnished in 3-l/8" and 6-l/8" sizes (75 ohm only for 6-l/8") for VHF and UHF television and medium-to high-power FM stations.

Both HRLine and MACXLine use PTFE dielectric disc insulators for superior electrical performance over PTFE dielectric pegs. For a permanent, trouble-free rigid transmission line, specify HRLine or MACXLine.

In addition to thermally-compensated HRLine and MACXLine, Andrew provides standard rigid line in sizes of 6-1/8" (50 ohm), 3-1/8" and 1-5/8". Some 7/8" rigid line components and accessories are also available.

For more information on any Andrew rigid transmission line products call our Broadcast Systems Department at **1-800-DIAL-4-RF**.

Inners Only™ Inner Conductors

The Inexpensive Alternative to Transmission Line Replacement

Both MACXLine® and HRLine® transmission lines are available as Inners Only replacements. Since MACXLine lengths are identical to those of standard rigid line, MACXLine is an excellent choice for any application. HRLine Inners Only is also ideal for certain situations.

Despite tight capital budgets, you can't afford to go off the air! Conventional rigid transmission line systems require maintenance after just ten years to avoid premature burnout of bullet-style connectors. By upgrading with Andrew Inners Only before your existing 3-1/8" or 6-1/8" transmission line fails, you avoid the disaster of dead air.

MACXLine and HRLine Inners Only replacements provide the ultimate in operational dependability at half the cost of a new installation. You swap your worn-out, failure-prone bullets and inner conductors for the most dependable components in the industry while reusing your expensive outer conductors, which are normally good for many more years of service.

MACXLine Inners Only inner conductors install quickly since they are similar to your old ones, except for the bellows. HRLine Inners Only eliminate bullets forever and are more economical.

Get like-new performance and extended service life, at half the cost, with MACXLine or HRLine Inners Only.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

6-1/8" HRLine®

Rigid Coaxial Transmission Line for High Power Broadcast Applications

- *Twice the Life of Standard Rigid Line*
- *No Bullets to Burn Out*
- *Permanent Mechanical and Electrical Bond*

HRLine rigid coaxial line combines the handling benefits and high power capabilities of traditional rigid line with the longer life expectancy of a coaxial cable. It is a new class of transmission line for high-power applications that more than doubles the life of your system. HRLine marries a rigid outer conductor to a continuous, semi-flexible, corrugated inner conductor, using a highly-reliable, patented,* bolted inner joint at the flange interface.

Thermal expansion and contraction compensation is provided by the flexible inner conductor. There are no sliding inner contact bullets to wear out.

Should vandals or hunters damage your HRLine, the fix is as simple as bolting a new section into place. Compared with standard rigid line, HRLine offers a virtually permanent and trouble-free life expectancy of more than 20 years.

HRLine rigid coaxial line has an impedance of 67.7 ohms, permitting it to be used in either 50 ohm or 75 ohm applications by including an appropriate connector at each end of the run to transform the impedance as desired. It has excellent VSWR, typically 1.02 maximum per component and 1.07 maximum per system. Attenuation and average power ratings are given on page 339.

* Patent number 4,831,346

Specifications – 6-1/8" HRLine

Type Number - HRL600A	
Impedance, ohms	50 or 75
Maximum Frequency, MHz	850
Velocity, percent	98.9
Peak Power Rating, kW*	2260
Dimensions Outer Conductor	
Outside Diameter, in (mm)	6.081 (154)
Inside Diameter, in (mm)	5.981 (152)
Flange Dimensions	
Flange, Overall Diameter, in (mm)	8.13 (206.5)
Bolt Circle Diameter, in (mm)	7.375 (187.3)
Number of Bolts	12
Bolt Size	3/8"
Net Weight, lb/ft (kg/m)	4.32 (6.43)

* Based on production test voltage of 35kV

6-1/8" HRLine® Recommended Section Lengths

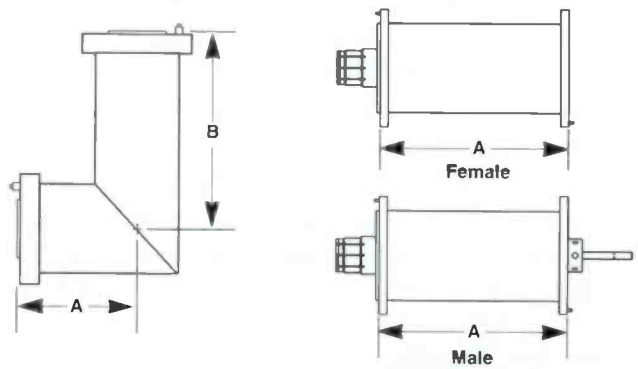
20 ft Section (6.096 m)	19.75 ft Section (6.020 m)	19.5 ft Section (5.944 m)	18.75 ft Section (5.715 m)	16 ft Section (4.877 m)
Television Channels - North/South America				
2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 18, 19, 22, 23, 26, 27, 30, 31, 34, 35, 38, 39, 43, 47, 51, 55, 59, 63, 64, 67, 68	20, 24, 28, 32, 36, 40 44, 48, 52, 56, 57, 60, 61, 65, 69	4, 9, 10, 13, 16, 17, 21, 25, 29, 33, 41, 42, 45, 46, 49, 50, 53, 54, 58, 62, 66	–	–
FM Radio Frequencies				
88.1 - 93.9 MHz 101.1 - 107.9 MHz	–	–	94.1 - 100.9 MHz	–
Television Channels - Europe and Africa (except as noted)†				
3, 4, 5, 9, 12, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 49, 52, 55, 58, 61, 64, 67, 69	6, 22, 25, 28, 31, 34, 37, 40, 43, 46, 50, 53, 56, 59, 62, 65, 68	7, 10, 23, 26, 29, 32, 35, 38, 41, 44, 47, 51, 54, 57, 60, 63, 66	8, 11	2, 2A

† For Australia, Italy, Ireland, France, South Africa, Japan, New Zealand, China (P.R.), Morocco, Eastern European "R" Channels and French Overseas Territories, contact Andrew for required lengths.

Elbow and Connector Dimensions

Description	A, in (mm)	B, In (mm)
90° HR Elbow	7 (178)	14 (356)
50 Ohm		
EIA Elbow, 90°	5.5 in (140)	5.5 in (140)
75 Ohm		
EIA Elbow, 90°	7 (178)	14 (356)
50 Ohm EIA Connector	12 (305)†	
75 Ohm EIA Connector	12 (305)†	

† For UHF channels. For VHF channels, connector length based on channel.



Ordering Information

Straight Line Sections*	Type Numbers
20 ft	**HRL600A-1**
19.75 ft	**HRL600A-2**
19.5 ft	**HRL600A-3**
18.75 ft	**HRL600A-6**
16 ft	**HRL600A-7**
Variable Length	**HRL600A-40-VAR**
Field Cut Sections**	
5 ft Field Cut	**HRL600A-41**
20 ft Field Cut	**HRL600A-39**
Standard tolerance is ± 0.050 in (1.3 mm)	

Components	Type Numbers
50 Ohm (EIA) Connector	
Male	**HRL600-M650-(***)**
Female	**HRL600-F650-(***)**
75 Ohm (EIA) Connector	
Male	**HRL600-M675-(***)**
Female	**HRL600-F675-(***)**
90° HRLine Elbow	
With drive rings	**HRL600-10DR-(***)**

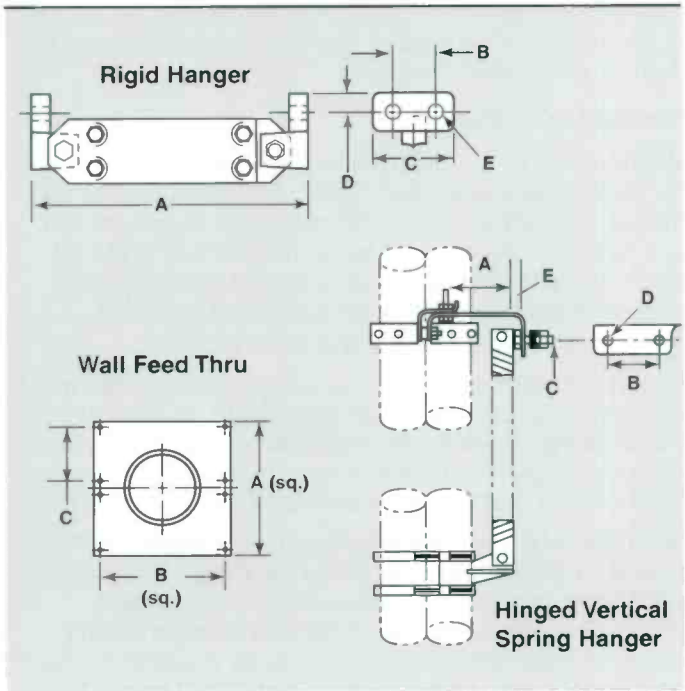
Accessories	Type Numbers
Hinged Vertical Spring Hanger‡	**RLA600-11-H**
3-Point Suspension Hanger	**RLA600-12**
Rigid Hanger‡‡	**RLA600-13-SW**
Lateral Brace	**RLA600-14**
Wall Feed Thru	**RLA600-15**
Gas Barrier, 50 Ohm (EIA)	**RLA650-16**
Gas Barrier, 75 Ohm (EIA)	**RLA675-16**

Other Components	Type Numbers
5 ft - 20 ft Field Cut, 75 Ohm	**MACX675A-39**
Up to 5 ft Field Cut, 75 Ohm	**MACX675A-41**
Variable Length, 50 Ohm	**STD650-40-VAR**
Variable Length, 5 ft - 20 ft, 75 Ohm	**MACX675A-42-VAR**
Variable Length, Up to 5 ft, 75 Ohm	**MACX675A-40-VAR**
Installation Tool Kit	**HRL600-T**
Separation Tool Kit	**HRL600-ST**
Installation Manual	**237256**

* Straight sections supplied with O-ring, silicone grease and hardware.
** Field Cut sections supplied with flange kit, hardware kit, and installation instructions.
*** Specify television channel or frequency. Use E Suffix for Europe and Africa. Ex: (21E for Channel 21 Europe)
‡ Use at 10 ft (3m) intervals. ‡‡ One for every 1000 ft (300m).

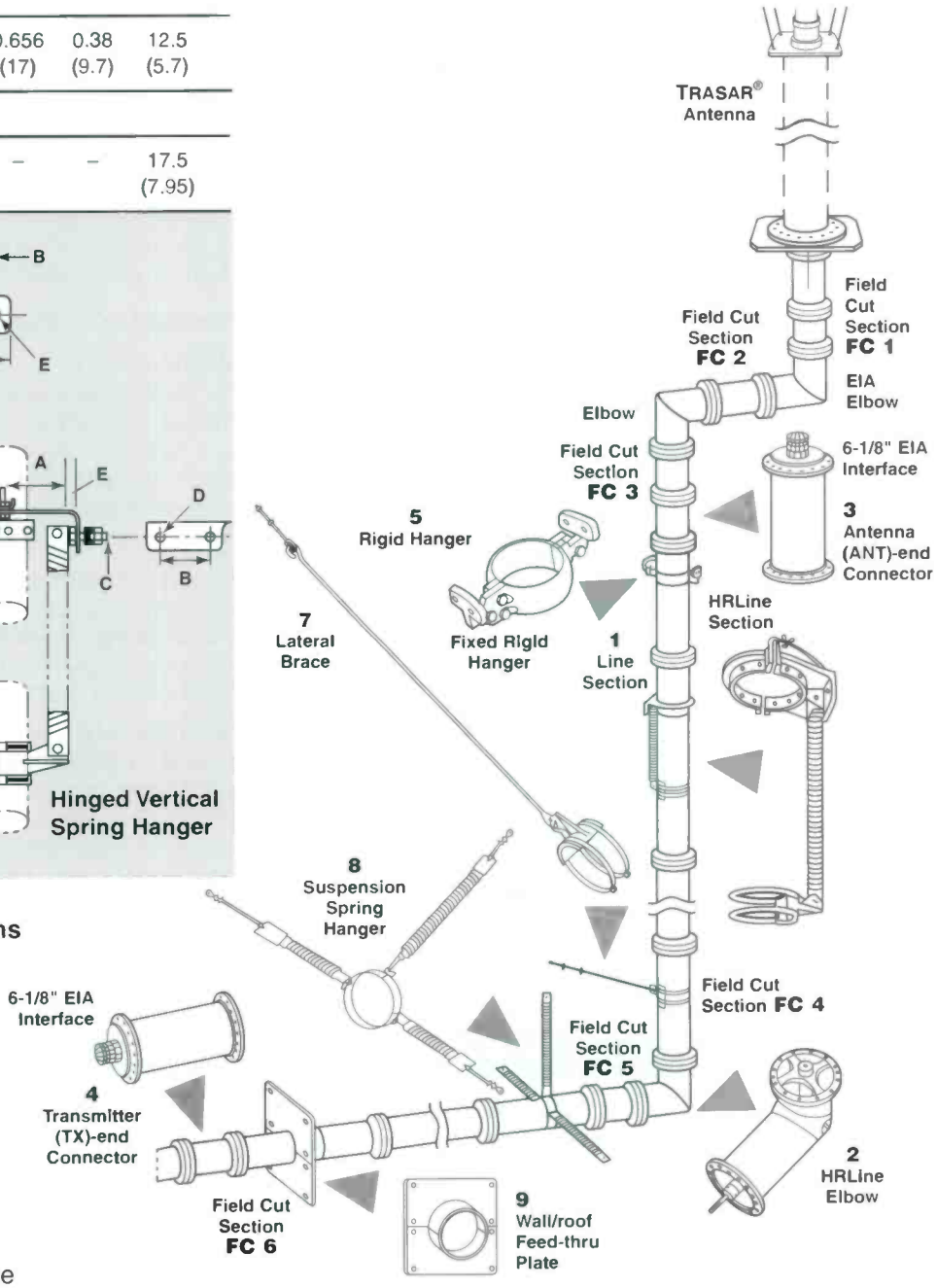
Typical System using 6-1/8" HRLine™ Rigid Coax

Type Number	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	Weight lb (kg)
Rigid Hanger						
RLA600-13-SW	14.50 (368.3)	2.25 (57.2)	4.25 (108)	1.0 (25.4)	0.68 (17.6)	21.6 (9.82)
Hinged Vertical Spring Hanger						
RLA600-11-H	6.25 (159)	2.38 (60)	1.50 (38)	0.656 (17)	0.38 (9.7)	12.5 (5.7)
Wall Feed Thru						
RLA600-15	14.0 (355.6)	12.8 (325.1)	5.8 (147.3)	–	–	17.5 (7.95)



Caution:

The simplified transmission line system shown in this diagram is intended only as a guide to the components which may be required. Each installation should be engineered individually.



Notes on Field-Determined Lengths

FC 1,2 -
Use STD650 (50 ohm)
or MACX675A (75 ohm)

FC 3,5 -
If installed from transmitter up

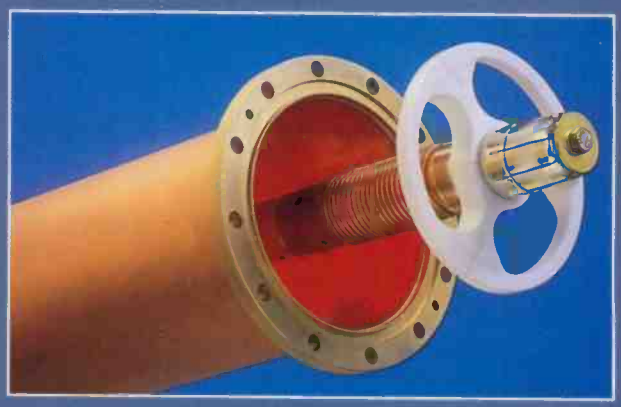
FC 4,6 -
If installed from antenna down

Note:

Always start installation with a female HRLine Connector.

Broadcast
Antenna Systems

6-1/8", 75-ohm MACXLine® Rigid Line



High Reliability and Long Life

MACXLine rigid line is a high performance coaxial line designed for exceptional reliability and long life. It is ideal for high power VHF and UHF television transmit applications.

Bellows Inner Conductor. A unique patented* bellows section incorporated into each inner conductor compensates for differential expansion between the inner and outer conductors. Mechanical wear from sliding contacts is thus eliminated. This means no shaving dust to arc at the flange and insulator areas. The result is extremely long life, no routine maintenance, and no planned replacement cycles. Also, the need for a redundant run or space for a backup run is eliminated.

PTFE Disk Insulators. Extra-strength, custom PTFE dielectric disk insulators maintain precise mechanical alignment between inner and outer conductors at the high operating temperatures involved. This ensures minimum VSWR and maximum power transfer to your antenna, resulting in full utilization of transmitted power in high ambient temperature environments.

Inner Connectors are captivated and use tension springfingers for maximum contact force. This ensures efficient transmission of power and eliminates overheating which can lead to catastrophic failure. The result is longer life and increased cost effectiveness of the system.

* Patented United States 4,543,548

Description

MACXLine rigid line is manufactured from high conductivity copper tubing for low attenuation. Electrical and mechanical characteristics are listed on page 337.

All sections come complete with one captivated inner connector, a set of stainless steel flange hardware and a pressure sealing gasket. They are packed in easy to handle cardboard containers.

Selection Criteria

Attenuation of a transmission line varies with frequency, temperature and load VSWR. A table of attenuation versus frequency is given on page 339. Values shown are based on an ambient temperature of 75°F (24°C) and unity VSWR. The values obtained from this table can be corrected for other temperatures and load VSWRs using Figures 1 and 2 on page 588.

Power Handling. Average power ratings are dependent on frequency, pressurization and VSWR. A table of power ratings is shown on page 339. Peak power ratings do not vary with frequency, but can be significantly increased by pressurization as described on page 590.

VSWR. MACXLine rigid line features excellent VSWR, typically 1.02 maximum per component and 1.07 maximum per system to ensure maximum delivered transmitter power. Optimized systems having 1.05 or better VSWR across the operating channel are usually available. Contact Andrew for information on guaranteed VSWR ratings for your application.

Recommended Rigid Line Section Lengths

20 ft (6.096 m) Sections	19.75 ft (6.020 m) Sections	19.5 ft (5.944 m) Sections	19.0 ft (5.791 m) Sections
Television Channels			
2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 18, 19, 23 27, 31, 35, 39, 40, 43, 44, 47, 48, 52, 56, 60, 64, 68	16, 20, 24, 28, 32, 33, 36, 41, 45, 49, 53, 57, 58, 61, 62, 65, 66, 69	4, 9, 10, 13, 17, 21, 22, 25, 26, 29, 30, 34, 38, 42, 46, 50, 51, 54, 55, 59, 63, 67	–
FM Radio Frequencies			
88.1 - 95.9 MHz 100.3 - 107.9 MHz	–	96.1 - 98.3 MHz	98.5 - 100.1 MHz

Typical System using 6-1/8", 75 ohm MACXLine® Rigid Coax

Specifications

	6-1/8" 75-ohm
Type No.	**MACX675A**
Impedance, ohms	75
Velocity, percent	99.8
Attenuation, see page 339	
Average power rating, see page 339	
Peak Power Rating, kW	2000
Dimensions	
Outer Conductor,	
Outside dia., in (mm)	6.081 (154)
Inside dia., in (mm)	5.981 (152)
Inner Conductor,	
Outside dia., in (mm)	1.711 (43)
Inside dia., in (mm)	1.631 (41)
Inner Cutback, in (mm)	1.200 (30)
Flange Dimensions	
Flange, Overall Diameter, in (mm)	8.13 (206.5)
Bolt Circle Diameter, in (mm)	7.375 (187.3)
Number of Bolts	12
Bolt Size	3/8"
Net Weight, lb/ft (kg/m)	4.52 (6.73)

MACXLine Premium Rigid Line Sections

	6-1/8" 75-ohm
20 ft	MACX675A-1
19.75 ft	MACX675A-2
19.5 ft	MACX675A-3
19.0 ft	MACX675A-6

Straight sections with bellows, flanged both ends. Includes captivated inner connector, hardware kit, disk insulators and instructions.

Standard tolerance is ±0.050 in (1.3 mm)

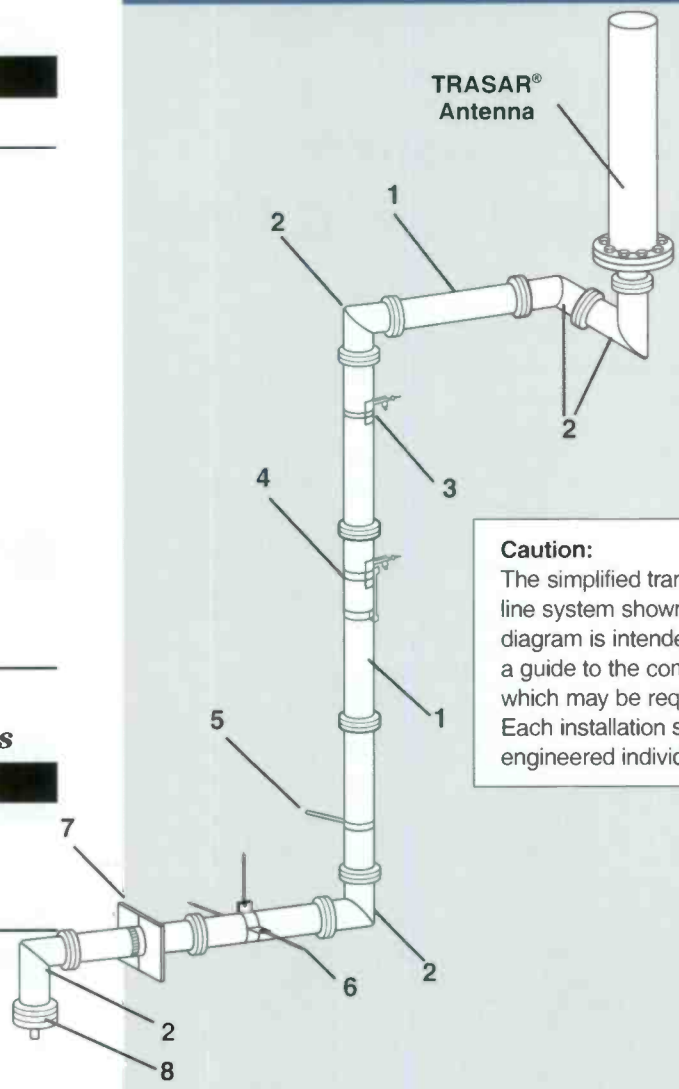
MACXLine Field Cut Section Kits

	6-1/8" 75-ohm
Field Cut Straight Section, 5 to 20 ft Includes bellows, captivated inner conductor, fixed field flange kit, hardware kit and installation instructions	MACX675A-39
Field Cut Straight Section, up to 5 ft No bellows. Includes captivated inner conductor, fixed field flange kit, hardware kit and installation instructions	MACX675A-41

MACXLine Variable Length Sections

	6-1/8" 75-ohm
Variable Length, 5 to 20 ft	MACX675A-42-VAR
Variable Length, up to 20 ft	MACX675A-40-VAR

Specify length in inches.



Caution:
The simplified transmission line system shown in this diagram is intended only as a guide to the components which may be required. Each installation should be engineered individually.

MACXLine Rigid Line System Components

Item No.	Description	6-1/8" 75-ohm
1	Straight Section	MACX675A Series
2	90° Miter Elbow	ACX675-10 (*)
3	Rigid Hanger††	RLA600-13-SW
4	Vertical Spring Hanger†	RLA600-11-H
5	Lateral Brace	RLA600-14
6	3-Point Suspension Hanger	RLA600-12
7	Wall Feed Thru	RLA600-15
8	Gas Barrier	RLA675-16
–	Fixed Field Flange Kit	ACX675-28
–	Hardware Kit	RLA600-21
–	75, 50-ohm Impedance Transformer	ACX675-17-(*)
–	Captivated Inner Connector	ACX675-19
–	6-1/8" Bellows Bullet Assembly	MACX675A-20
–	Installation Tool Kit Contains all tools necessary to assemble MACXLine	MACX675A-TK-1
–	Stub Field Adapter, rosin core solder and Emery Cloth for MACXLine field cuts	MACX675A-TK-2

* Specify television channel or frequency. † Use at 10 ft (3m) intervals.
†† One for every 1000 ft (3000m).

6-1/8", 50-ohm Standard Rigid line

Standard Coaxial Transmission Line, available in 6-1/8", 50-ohm size, is used as a component in HRLine® systems and in shorter systems where thermal expansion and contraction are less significant. It has PTFE dielectric insulators and welded flanges.

All flanged sections come complete with one inner connector, a set of stainless steel flange hardware and a pressure sealing gasket.

Electrical Characteristics

Attenuation of a transmission line varies with frequency, temperature, and load VSWR. A table of attenuation versus frequency is given on page 339. The figures are based on an ambient temperature of 24°C (75°F) and unity VSWR. The values can be corrected for other temperatures and load VSWRs using the curves in Figures 1 and 2 on page 588.

Power Handling. Peak power ratings do not vary with frequency, but can be significantly increased by pressurization. Average power ratings are dependent on frequency, pressurization and VSWR. Average power ratings are given on page 339.

Specifications

	6-1/8" 50-ohm
Type No.	**STD650**
Impedance, ohms	50
Velocity, percent	99.8
Attenuation, see page 339	
Peak Power Rating, kW	1500
Dimensions Outer Conductor,	
Outside dia., in (mm)	6.081 (154)
Inside dia., in (mm)	5.981 (152)
Dimensions Inner conductor,	
Outside dia., in (mm)	2.6 (66)
Inside dia., in (mm)	2.52 (64)
Inner Cutback, in (mm)	2.56 (65)
Net Weight, lb/ft (kg/m)	4.97 (7.40)

Standard Rigid Line Sections

	6-1/8" 50-ohm
20 ft	**STD650-1**
19.75 ft	**STD650-2**
19.5	**STD650-3**
19.0 ft	**STD650-6**

Standard Field Cut Section Kit

	6-1/8" 50-ohm
Field Cut Straight Section, 20 ft	**STD650-39**

Standard Variable Length Section

	6-1/8" 50-ohm
Variable Length, 2-20 ft, flanged both ends	**STD650-40-VAR**

Specify length in inches. Standard tolerance is ± 0.050 in (1.3 mm).

Standard Flange Dimensions

	6-1/8" 50-ohm
Flange, Overall Diameter, in (mm)	8.13 (206.5)
Bolt Circle Diameter, in (mm)	7.375 (187.3)
Number of Bolts	12
Bolt Size	3.8"

Recommended Rigid Line Section Lengths

20 ft (6.096 m) Sections	19.75 ft (6.020 m) Sections	19.5 ft (5.944 m) Sections	19.0 ft (5.791 m) Sections
Television Channels			
2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 18, 19, 23 27, 31, 35, 39, 40, 43, 44, 47, 48, 52, 56, 60, 64, 68	16, 20, 24, 28, 32, 33, 36, 41, 45, 49, 53, 57, 58, 61, 62, 65, 66, 69	4, 9, 10, 13, 17, 21, 22, 25, 26, 29, 30, 34, 38, 42, 46, 50, 51, 54, 55, 59, 63, 67	–
FM Radio Frequencies			
88.1 - 95.9 MHz 100.3 - 107.9 MHz	–	96.1 - 98.3 MHz	98.5 - 100.1 MHz

Attenuation and Average Power Ratings for 6-1/8" Rigid Line

Television Channel No. (MHz)	6-1/8" HRLine® Attenuation dB/100 ft (100 m)	6-1/8" HRLine® Average Power kW	6-1/8", 75-ohm MACXLine® Attenuation dB/100 ft (100 m)	6-1/8", 75-ohm MACXLine® Average Power kW	6-1/8", 50-ohm Standard Line Attenuation dB/100 ft (100 m)	6-1/8", 50-ohm Standard Line Average Power kW
* (1.00)	0.0047 (0.015)	1613.73	0.0046 (0.015)	2000.00	0.0049 (0.016)	1500.00
2 (55.25)	0.039 (0.129)	226.54	0.034 (0.112)	237.09	0.037(0.123)	200.00
3 (61.25)	0.042 (0.137)	214.98	0.036 (0.118)	224.45	0.040(0.130)	193.00
4 (67.25)	0.044 (0.144)	205.01	0.038 (0.124)	213.58	0.041 (0.136)	184.00
5 (77.25)	0.048 (0.156)	191.05	0.041 (0.133)	198.42	0.045 (0.146)	171.00
6 (83.25)	0.050 (0.163)	183.91	0.042 (0.138)	190.69	0.046 (0.152)	167.00
* (100.00)	0.055 (0.181)	167.49	0.046 (0.152)	173.00	0.051 (0.167)	157.00
7 (175.25)	0.077 (0.254)	125.68	0.063 (0.207)	126.26	0.068 (0.224)	113.00
8 (181.25)	0.079 (0.258)	123.53	0.064 (0.211)	123.83	0.069 (0.228)	109.00
9 (187.25)	0.080 (0.262)	121.48	0.066 (0.215)	121.53	0.071 (0.232)	107.00
10(193.25)	0.081 (0.267)	119.52	0.067 (0.219)	119.34	0.072 (0.235)	105.00
11(199.25)	0.083 (0.271)	117.66	0.068 (0.223)	117.25	0.073 (0.239)	103.00
12(205.25)	0.084 (0.275)	115.87	0.069 (0.226)	115.13	0.074 (0.243)	102.00
13(211.25)	0.085 (0.279)	114.17	0.070 (0.230)	113.08	0.075 (0.247)	100.00
14(471.25)	0.129 (0.423)	75.33	0.112 (0.369)	68.76	0.115 (0.378)	62.00
15(477.25)	0.130 (0.426)	74.84	0.113 (0.372)	68.23	0.116 (0.381)	61.00
16(483.25)	0.131 (0.429)	74.35	0.114 (0.375)	67.71	0.117 (0.383)	61.00
17(489.25)	0.132 (0.432)	73.87	0.115 (0.378)	67.20	0.118 (0.386)	60.00
18(495.25)	0.132 (0.434)	73.40	0.116 (0.381)	66.71	0.118 (0.388)	60.00
19(501.25)	0.133 (0.437)	72.94	0.117 (0.383)	66.22	0.119 (0.391)	59.00
20(507.25)	0.134 (0.440)	72.49	0.118 (0.386)	65.74	0.120 (0.393)	59.00
21(513.25)	0.135 (0.443)	72.05	0.119 (0.389)	65.27	0.121 (0.396)	58.00
22(519.25)	0.136 (0.445)	71.61	0.119 (0.392)	64.81	0.121 (0.398)	58.00
23(525.25)	0.137 (0.448)	71.18	0.120 (0.395)	64.35	0.122 (0.401)	57.00
24(531.25)	0.137 (0.451)	70.76	0.121 (0.398)	63.91	0.123 (0.403)	57.00
25(537.25)	0.138 (0.453)	70.34	0.122 (0.400)	63.47	0.124 (0.406)	56.00
26(543.25)	0.139 (0.456)	69.94	0.123 (0.403)	63.04	0.124 (0.408)	56.00
27(549.25)	0.140 (0.459)	69.54	0.124 (0.406)	62.62	0.125 (0.411)	55.00
28(555.25)	0.141 (0.461)	69.14	0.125 (0.409)	62.21	0.126 (0.413)	55.00
29(561.25)	0.141 (0.464)	68.75	0.125 (0.412)	61.80	0.127 (0.415)	54.00
30(567.25)	0.142 (0.466)	68.37	0.126 (0.414)	61.40	0.127 (0.418)	54.00
31(573.25)	0.143 (0.469)	68.00	0.127 (0.417)	61.01	0.128 (0.420)	54.00
32(579.25)	0.144 (0.471)	67.63	0.128 (0.420)	60.62	0.129 (0.423)	53.00
33(585.25)	0.144 (0.474)	67.26	0.129 (0.422)	60.24	0.130 (0.425)	52.60
34(591.25)	0.145 (0.477)	66.90	0.130 (0.425)	59.87	0.130 (0.427)	52.10
35(597.25)	0.146 (0.479)	66.55	0.130 (0.428)	59.50	0.131 (0.430)	51.70
36(603.25)	0.147 (0.482)	66.20	0.131 (0.430)	59.13	0.132 (0.432)	51.00
37(609.25)	0.148 (0.484)	65.86	0.132 (0.433)	58.78	0.132 (0.434)	50.20
38(615.25)	0.148 (0.487)	65.52	0.133 (0.436)	58.43	0.133 (0.437)	49.80
39(621.25)	0.149 (0.489)	65.19	0.134 (0.438)	58.08	0.134 (0.439)	49.50
40(627.25)	0.150 (0.492)	64.86	0.134 (0.441)	57.74	0.134 (0.441)	49.00
41(633.25)	0.151 (0.494)	64.54	0.135 (0.444)	57.41	0.135 (0.443)	48.60
42(639.25)	0.151 (0.497)	64.22	0.136 (0.446)	57.08	0.136 (0.446)	48.30
43(645.25)	0.152 (0.499)	63.90	0.137 (0.449)	56.75	0.137 (0.448)	47.90
44(651.25)	0.153 (0.501)	63.59	0.138 (0.452)	56.43	0.137 (0.450)	47.50
45(657.25)	0.154 (0.504)	63.29	0.138 (0.454)	56.12	0.138 (0.453)	47.10
46(663.25)	0.154 (0.506)	62.98	0.139 (0.457)	55.81	0.139 (0.455)	46.80
47(669.25)	0.155 (0.509)	62.69	0.140 (0.459)	55.50	0.139 (0.457)	46.50
48(675.25)	0.156 (0.511)	62.39	0.141 (0.462)	55.20	0.140 (0.459)	46.10
49(681.25)	0.156 (0.513)	62.10	0.142 (0.464)	54.90	0.141 (0.461)	45.80
50(687.25)	0.157 (0.516)	61.82	0.142 (0.467)	54.61	0.141 (0.464)	45.40
51(693.25)	0.158 (0.518)	61.54	0.143 (0.470)	54.32	0.142 (0.466)	45.10
52(699.25)	0.159 (0.521)	61.26	0.144 (0.472)	54.04	0.143 (0.468)	44.80
53(705.25)	0.159 (0.523)	60.98	0.145 (0.474)	53.74	0.143 (0.470)	44.20
54(711.25)	0.160 (0.525)	60.71	0.145 (0.476)	53.45	0.144 (0.472)	43.70
55(717.25)	0.161 (0.528)	60.44	0.146 (0.478)	53.17	0.145 (0.475)	43.20
56(723.25)	0.161 (0.530)	60.18	0.146 (0.480)	52.89	0.145 (0.477)	42.80
57(729.25)	0.162 (0.532)	59.92	0.147 (0.483)	52.61	0.146 (0.479)	42.50
58(735.25)	0.163 (0.534)	59.66	0.148 (0.485)	52.33	0.147 (0.481)	42.10
59(741.25)	0.164 (0.537)	59.40	0.148 (0.487)	52.06	0.147 (0.483)	41.80
60(747.25)	0.164 (0.539)	59.15	0.149 (0.489)	51.80	0.148 (0.485)	41.40
61(753.25)	0.165 (0.541)	58.90	0.150 (0.491)	51.53	0.149 (0.487)	41.10
62(759.25)	0.166 (0.544)	58.66	0.150 (0.493)	51.27	0.149 (0.490)	40.80
63(765.25)	0.166 (0.546)	58.41	0.151 (0.495)	51.02	0.150 (0.492)	40.30
64(771.25)	0.167 (0.548)	58.17	0.151 (0.497)	50.76	0.151 (0.494)	39.80
65(777.25)	0.168 (0.550)	57.94	0.152 (0.499)	50.51	0.151 (0.496)	39.30
66(783.25)	0.168 (0.533)	57.70	0.153 (0.501)	50.26	0.152 (0.498)	38.90
67(789.25)	0.169 (0.555)	57.47	0.153 (0.503)	50.02	0.152 (0.500)	38.50
68(795.25)	0.170 (0.557)	57.24	0.154 (0.505)	49.78	0.153 (0.502)	38.20
69(801.25)	0.170 (0.559)	57.01	0.154 (0.507)	49.54	0.154 (0.504)	37.80

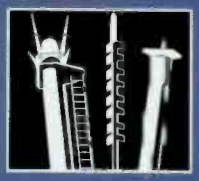
*Broadcast Radio Band

Standard conditions:

For Attenuation
VSWR 1.0
Ambient Temperature 24°C (75°F)
Atmospheric Pressure, Dry Air

For Average Power
VSWR 1.0
Ambient Temperature 40°C (140°F)
Inner Conductor Temperature 102°C (216°F)
Atmospheric Pressure, Dry Air

Attenuation and average power data guaranteed within ±5%.



Broadcast Antenna Systems

Accessories for 6-1/8" Rigid Line

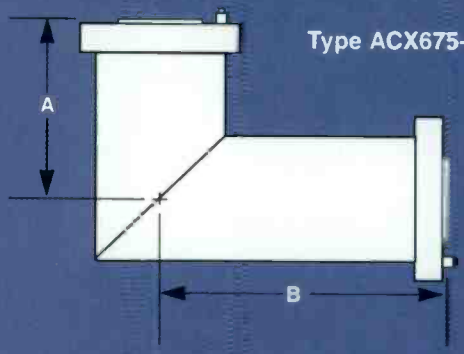
All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

90° Miter Elbow

Swivel flanges, brass construction, reinforced outer.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	**ACX675-10-(*)**	75	7.00 (178)	14.00 (356)	29.0 (13.2)
6-1/8"	**STD650-10**	50	5.50 (140)	5.50 (140)	25.0 (11.4)

* Specify Television Channel or Frequency

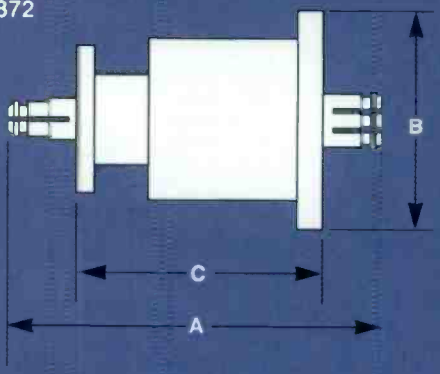


Type ACX675-10

Reducer 50-ohm

Includes two inner connectors. Not a gas barrier.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	Weight lb (kg)
6-1/8" to 3-1/8"	**1872**	11.69 (297)	8.13 (207)	7.13 (181)	20.0 (9.1)

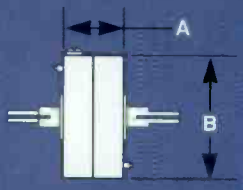


Type 1872

Gas Barrier

Fixed male inner connectors both ends. For 50 ohm, one side has a pressure port. For 75 ohm, both sides have a pressure port.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	**RLA650-16**	50	2.00 (51)	8.13 (206)	19.4 (8.8)
6-1/8"	**RLA675-16**	75	2.00 (51)	8.13 (206)	19.4 (8.8)



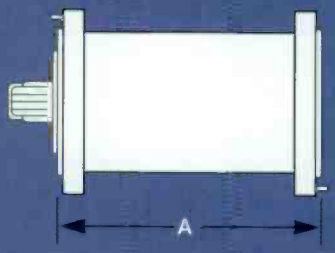
Type RLA650-16

6-1/8" Impedance Transformer

Connects 6-1/8", 75 ohm line to 6-1/8", 50-ohm line. Includes inner connector for 50-ohm. Not a gas barrier.

Type	Channel No.	A, in (mm)	Weight, lb (kg)
ACX675-17-2	2	56.28 (1430)	45 (20.0)
ACX675-17-3	3	51.35 (1304)	42 (19.1)
ACX675-17-4	4	47.28 (1201)	40 (18.2)
ACX675-17-5	5	43.86 (1114)	38 (17.3)
ACX675-17-6	6	40.95 (1040)	36 (16.4)
ACX675-17-7	7	21.19 (538)	25 (11.4)
ACX675-17-8	8	20.64 (524)	25 (11.4)
ACX675-17-9	9	20.13 (511)	25 (11.4)
ACX675-17-10	10	19.65 (499)	25 (11.4)
ACX675-17-11	11	19.20 (488)	25 (11.4)
ACX675-17-12	12	18.77 (477)	25 (11.4)
ACX675-17-13	13	18.37 (467)	25 (11.4)
ACX675-17(*)	14 thru 26	13.22 (336)	22 (10.0)
ACX675-17-(*)	27 thru 39	11.65 (296)	20 (9.1)
ACX675-17-(*)	40 thru 53	10.46 (266)	19 (8.7)
ACX675-17-(*)	54 thru 69	9.52 (242)	18 (8.2)

* Specify Channel No.



Type ACX675-17

Male-to-Male Adapter

Joins two components having captivated inner connectors. 6 in (150 mm) length. No inner connectors. Includes hardware. (Not illustrated)

Line Size	Type	Weight, lb (kg)
6-1/8"	31472	18 (8.16)

Inner Connector

Includes electrically compensated PTFE anchor disk.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	STD650-20	50	2.24 (57)	5.00 (127)	2.10 (0.96)
6-1/8"	ACX675-20	75	2.40 (61)	5.40 (137)	2.10 (0.96)
6-1/8"	ACX675-19†	75	2.40 (61)	5.40 (137)	2.10 (0.96)

† Captivated

Hardware Kit

Includes "O" ring, silicone lubricant, nuts, bolts and lockwashers for one flange joint.

Line Size	Type	Weight, lb (kg)
6-1/8"	RLA600-21	1.13 (0.52)

"O" Ring Gasket

For EIA flange.

Line Size	Type
6-1/8"	10683-10

Soft Solder Swivel Field Flange

For use on interior runs. Includes soft solder, swivel flange and sleeve with fixed ring. Order inner connector and hardware kit separately.

Line Size	Type	Weight, lb (kg)
6-1/8"	RLA600-37-SW*	4.4 (2.00)

Swivel Flange

Includes fixed ring, sliding ring, silver solder and flux. Order inner connector and hardware kit separately.

Line Size	Type	Weight, lb (kg)
6-1/8"	RLA600-27-SW*	3.34 (1.52)

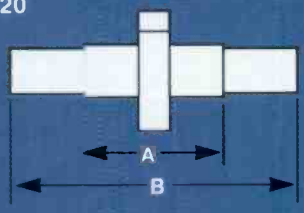
Fixed Flange

Includes silver solder and flux. Order inner connector and hardware kit separately.

Line Size	Type	Weight, lb (kg)
6-1/8"	RLA600-28-SW*	3.75 (1.70)

* Does not fit Andrew rigid line manufactured prior to 1994 or other manufacturers' products. Contact Andrew for flange kits for prior Andrew products.

Type ACX675-20



Type RLA600-21

Type 10683-10

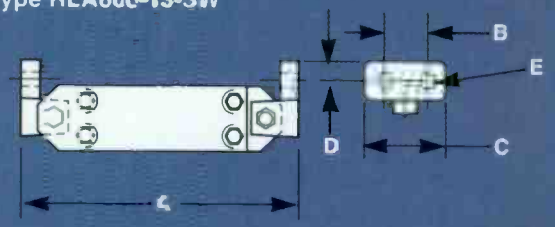
Type RLA600-37-SW

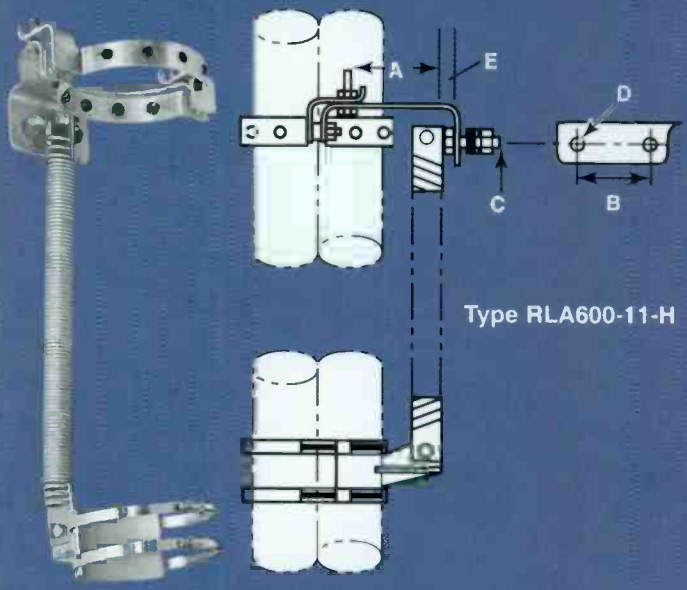
Type RLA600-27-SW

Type RLA600-28-SW

Broadcast Antenna Systems

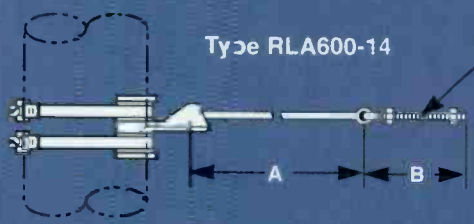
Type RLA600-13-SW



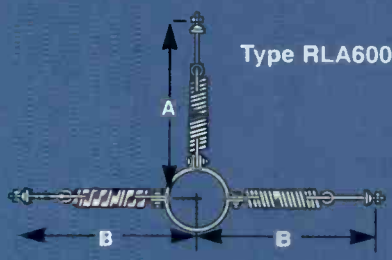


Type RLA600-11-H

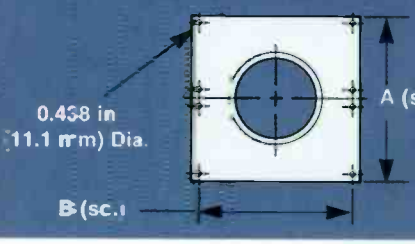
Type RLA600-14



Type RLA600-12



Type RLA600-15



6-1/8" Hangers

6-1/8" Rigid Hanger

Hangers attach to top section. Use one for up to 1000 ft (300 m) of line. Use two for up to 2000 ft (60 m) of line. Mounts to 11/16 in (18 mm) diameter holes with included 5/8" diameter hardware.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	Weight lb (kg)
6-1/8"	**RLA600-13-SW**	14.50 (368)	2.25 (57)	4.25 (108)	1.0 (25.6)	0.688 (17.5)	21.6 (9.82)

NEW! Hinged Hanger™

Vertical Spring Hanger

Use at 10 ft (3 m) intervals. Supports the transmission line. Prevents lateral motion, and accommodates differential expansion and contraction. Mounting hardware for "D" holes is included. Hardware for 5/8" diameters. Hinged to open from left or right side - saves installation labor.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E In (mm)	Weight lb (kg)
6-1/8"	**RLA600-11-H**	6.25 (159)	2.38 (60)	1.50 (38)	.656 (16.7)	.50 (13)	12.5 (5.7)

Lateral Brace

Mounts through single 7/16 in (11 mm) hole. Use one near bottom to restrict lateral motion of line while permitting vertical and horizontal movement.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	**RLA600-14**	40.0 (1016)	6.50 (165)	4.13 (1.88)

3-Point Suspension Hanger

Accommodates vertical movement in the horizontal run causd by differential expansion and contraction of the vertical run. Use at 10 ft (3 m) intervals.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	**RLA600-12**	26.0 (660)	17.75 (451)	9.38 (4.26)

Wall Feed Thru

Includes split mounting plate. Uses 3/8" mounting hardware (not included).

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
6-1/8"	**RLA600-15**	14.0 (356)	12.8 (325)	17.5 (7.95)

Retrofit Your Existing Rigid Line with Inners Only at Half the Cost!

Available in both MACXLine® and HRLine® Rigid Line

Despite tight capital budgets, you can't afford to go off the air! Transmission line systems require maintenance after just ten years to avoid premature burnout of bullet-style connectors. By upgrading with Inners Only before your transmission line fails, you avoid the disaster of dead air.

Andrew Inners Only connector replacement systems are completely compatible with other manufacturers' rigid lines.

HRLine Inners Only Conductor Replacement Systems (50 and 75 ohms)

Retrofit your existing 6-1/8" line with HRLine Inners Only and receive the ultimate in operational dependability at half the cost of a new installation. You no longer have to rely on sliding bullet assemblies when rebuilding your broadcast system, nor do you have to install a new transmission line to get like-new performance.

Inners Only™ Components

	Type Number
20 ft Inner Conductor	**HRL600A-25-240**
19.75 ft Inner Conductor	**HRL600A-25-237**
19.50 ft Inner Conductor	**HRL600A-25-234**
18.75 ft Inner Conductor	**HRL600A-25-225**
Installation Tool Kit, Inners Only	**HRL600-T-2**

HRLine connectors and elbows are also required; see page 334.

MACXLine Inners Only Replacement Systems (75 ohms)

MACXLine Inner Only inner conductors are preferred for two reasons: MACXLine lengths are identical to those of standard 6-1/8", 75-ohm rigid line, assuring that MACXLine can be used for every application. MACXLine inner conductors install quickly since they are similar to your old ones, except for the bellows; this allows retrofitting to be done in stages during the interval a station is off the air every night.

Broadcast Antenna Systems

6-1/8" Inners Only™ Inner Conductor Replacement Systems

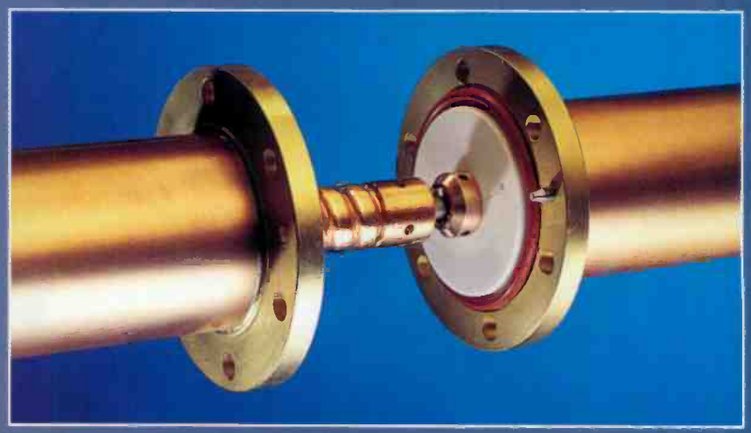
Inner Conductors for Straight Sections

	Type Number
Full Length Section	**MACX675A-25-(*)**
Field-Cut Section, 5 to 20 ft	**MACX675A-26**
Field-Cut Section, up to 5 ft	**MACX675A-24**
Inner Conductors Include:	
Captivated Inner Connector	**ACX675-19**
Hardware Kit for EIA flange	**RLA600-21**
Bellows section (sections longer than 5 ft)	
Two disk insulators (sections longer than 5 ft)	
Installation Instructions	

* Insert length of outer conductor, flange face to flange face in inches.

Broadcast Antenna Systems

New! 3-1/8", 50-ohm HRLine® Rigid Coaxial Line



Two Dependable 3-1/8", 50-ohm Transmission Lines...

- *Twice the Life of Standard Rigid Line*
- *No Bullets to Burn Out.*
- *Permanent Mechanical and Electrical Connection*
- *Now in 3-1/8" Size*
- *Inners Only™ Available*

HRLine rigid coax for medium-to-high-power broadcast applications more than doubles the life of your system because it is not susceptible to the damage resulting from thermal expansion and contraction that inevitably causes conventional rigid lines to fail.

By eliminating the troublesome bullet-type inner connectors used with standard broadcast rigid lines, Andrew has introduced a new class of transmission line that offers a virtually trouble-free lifespan of more than 20 years. Its continuous semi-flexible corrugated inner conductor and patented bolted inner joint at each section's flange connection accommodates expansion and contraction more reliably than standard rigid lines.

Impedance is 60.5 ohms, adjusted to 50 ohms by transformer connectors. Typical VSWR is 1.02 maximum per component and 1.07 maximum per system. HRLine is 745 kW. It is HDTV compatible. Attenuation and power ratings are given on page 346.

Specifications – 3-1/8" HRLine

Type No. – HRL300	
Impedance, ohms	50
Max, Frequency, MHz	1588
Velocity, percent	97.5
Peak Power Rating, kW*	745
Net Weight, lb/ft (kg/m)	2.12 (3.15)

* Based on production test voltage of 19 kV

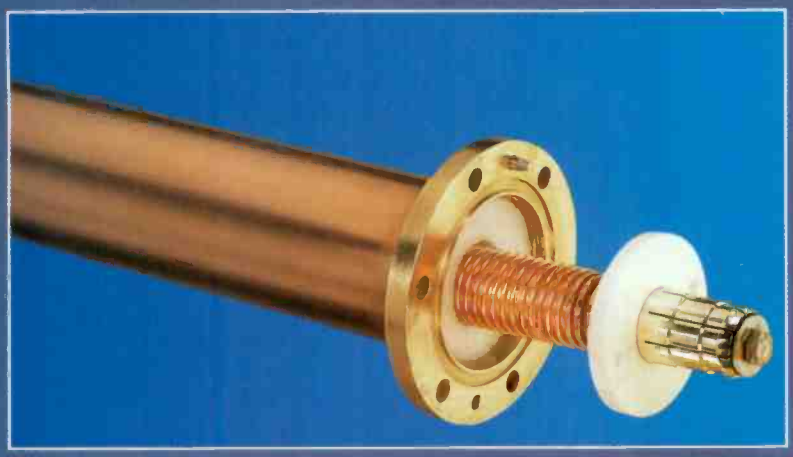
Ordering Information

Straight Line Sections	Type Numbers
20 ft*	**HRL300-1**
19.75 ft*	**HRL300-2**
19.5 ft*	**HRL300-3**
18.75 ft*	**HRL300-6**
Variable Length*	**HRL300-40-VAR**
Field Cut Section, Up to 5 ft**	**HRL300-41**
Field Cut Section, 5 ft to 20 ft**	**HRL300-39**
Inner Conductor Assembly	**HRL300-25-VAR†**
Components	
50-Ohm EIA Connector	
Male	**HRL300-M350*** **
Female	**HRL300-F350*** **
90° HR Elbow (with drive rings)	**HRL300-10DR*** **
Accessories	
Hinged Vertical Spring Hanger‡	**RLA300-11-H**
3-Point Suspension Hanger	**RLA300-12**
Rigid Hanger‡‡	**RLA300-13**
Lateral Brace	**RLA300-14**
Wall Feed Thru	**RLA300-15**
Gas Barrier	**RLA350-16**
Installation Tool Kit	**HRL300-T**
Separation Tool Kit	**HRL300-ST**
Installation Manual	**237326**

* Straight sections supplied with O-ring, silicone grease and hardware.
** Field Cut supplied with captivated inner connector, fixed flange kit, hardware kit, and installation instructions.
*** Specify television channel or frequency.
† Includes flange hardware and sealing gasket
‡ Use at 10 ft (3 m) intervals.
‡‡ One for every 300 ft (90 m).

Recommended Rigid Line Section Lengths

20 ft (6.096 m) Sections	19.75 ft (6.020 m) Sections	19.50 ft (5.944 m) Sections
Television Channels		
2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 18, 19, 22, 23, 26, 30, 31, 38, 39, 47, 51, 55, 56, 59, 63, 67, 68	20, 27, 32, 35, 36, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 52, 53, 54, 57, 58, 60, 61, 62, 64, 65, 66, 69	4, 9, 10, 13, 16, 17, 21, 24, 25, 28, 29, 33, 34
FM Radio Frequencies		
100.0 - 107.9 MHz	88.1 - 96.9 MHz	97.1 - 99.9 MHz



Broadcast
Antenna Systems

3-1/8", 50-ohm MACXLine® Rigid Coaxial Line

for Television and AM/FM Radio...Only from Andrew!

- *High Reliability*
- *Long Life*
- *Bellows Prevents Sliding of Bullet*
- *Ideal Inners Only™ Replacement*

MACXLine rigid line is a designed for exceptional performance and long life. It is ideal for high power VHF and UHF television transmit applications.

Fully compatible with both EIA Standard RS-225 and IEC Recommendations, 3-1/8" MACXLine flanges and inner connectors do not require adapters or special sections at flange interface locations.

Bellows Inner Conductor. A unique patented* bellows section incorporated into each inner conductor compensates for differential expansion between the inner and ouer conductors. Mechanical wear from sliding contacts is thus eliminated. This means no shaving dust to arc at the flange and insulator areas. The result is extremely long life, no routine maintenance, and no planned replacement cycles. Also, the need for a redundant run or space for a backup run is eliminated.

VSWR. MACXLine rigid line features excellent VSWR, typically 1.02 maximum per component and 1.07 maximum per system. Optimized systems having 1.05 or better VSWR across the operating channel are usually available. Contact Andrew for information on guaranteed VSWR ratings for your application. Attenuation and average power ratings are on page 346.

Specifications

Type Number	MACX350
Impedance, ohms	50
Max. Frequency, MHz	1588
Velocity, percent	99.7
Peak Power Rating, kW*	900
Net Weight, lb/ft (kg/m)	2.22 (3.30)

*Based on production test voltage of 19 kV.

Ordering Information

Straight Line Sections	Type Numbers
20 ft	MACX350-1
19.75 ft*	MACX350-2
19.5 ft*	MACX350-3
19.0 ft*	MACX350-6
Variable Length	MACX350-40-VAR
90° Miter Elbow	STD350-10
Inner Conductor Assembly	MACX350-25-VAR
Field Cut Straight Section, 5 to 20 ft**	MACX350-39
Field Cut Straight Section, up to 5 ft***	MACX350-41
Accessories	
Captivated Inner Connector	ACX350-19
Fixed Field Flange Kit	15840
Hardware Kit	69226-2
Hinged Vertical Spring Hanger†	RLA300-11-H
3-Point Suspension Hanger	RLA300-12
Rigid Hanger††	RLA300-13
Lateral Brace	RLA300-14
Wall Feed Thru	RLA300-15
Gas Barrier	RLA300-16

* Straight Sections with bellows, flanged both ends. Includes captivated inner connector, hardware kit, disk insulators and instructions.
** Includes bellows, captivated inner connector, fixed field flange kit, hardware kit and installation instructions.
*** No bellows. Includes captivated inner connector, fixed field flange kit, hardware kit and installation instructions.
† Use at 10 ft (3 m) intervals.
†† One for every 300 ft (90 m).

Recommended Rigid Line Section Lengths

20 ft (6.096 m) Sections	19.75 ft (6.020 m) Sections	19.5 ft (5.944 m) Sections	19.0 ft (5.791 m) Sections
Television Channels			
2, 3, 5, 6, 7, 8, 11, 12, 14, 15, 18, 19, 23, 27, 31, 35, 39, 40, 43, 44, 47, 48, 52, 56, 60, 64, 68	16, 20, 24, 28, 32, 33, 36, 41, 45, 49, 53, 57, 58, 61, 62, 65, 66, 69	4, 9, 10, 13, 17, 21, 22, 25, 26, 29, 30, 34, 38, 42, 46, 50, 51, 54, 55, 59, 63, 67	–
FM Radio Frequencies			
88.1 - 95.9 MHz 100.3 - 107.9 MHz	–	96.1 - 98.3 MHz	98.5 - 100.1 MHz

Broadcast Antenna Systems

3-1/8", 50-ohm Standard Rigid Line

Standard rigid coaxial transmission line is available in 3-1/8", 50-ohm size.

All flanged sections come complete with one inner connector, a set of stainless steel flange hardware and a pressure sealing gasket.

	3-1/8" 50-ohm
Standard Rigid Line Components	
20 ft, flanged both ends	**STD350-1**
19.75 ft, flanged both ends	**STD350-2**
19.5 ft, flanged both ends	**STD350-3**
19.0 ft, flanged both ends	**STD350-6**
20 ft, unflanged	**STD350-31**
Field Cut, 20 ft, flanged one end*	**STD350-39**
Field Cut, 20 ft, unflanged	**STD350-29-(**)**
Variable Length, flanged both ends	**STD350-40-(**)**
Specifications	
Type No.	**STD350**
Impedance, ohms	50
Max. Frequency, MHz	1588
Velocity, percent	99.8
Attenuation, see table	
Average Power Rating, see table	
Peak Power Rating, kW	900
Dimensions	
Outer Conductor, outside dia. in (mm)	3.125 (79)
inside dia., in (mm)	3.027 (77)
Inner Conductor, outside dia., in (mm)	1.315 (33)
inside dia, in (mm)	1.231 (31)
Inner Cutback, in (mm)	0.845 (21)
Net Weight, lb/ft (kg/m)	3.0 (4.5)
Standard Flange Dimensions	
Flange, Overall Diameter, in (mm)	5.19 (131.8)
Bolt Circle Diameter, in (mm)	4.375 (111.1)
Number of bolts	6
Bolt size	3/8"

* Order one flange or coupling separately.

** Specify length in inches. Standard tolerance is ± 1/8 in (3 mm)

Attenuation and Average Power Ratings for 3-1/8", 50-ohm Rigid Line

Television Channel No. (MHz)		3-1/8" HRLine Attenuation db/100 ft (100 m)	3-1/8" HRLine Average Power kW	3-1/8" MACXLine and STD350 Line Attenuation dB/100 ft (100 m)	3-1/8" MACXLine and STD350 Line Average Power kW
*	(1.00)	0.009 (0.031)	517.56	0.010 (0.033)	900.00
2	(55.25)	0.071 (0.233)	68.39	0.076 (0.250)	78.72
3	(61.25)	0.075 (0.246)	64.88	0.080 (0.264)	74.69
4	(67.25)	0.079 (0.258)	61.86	0.084 (0.276)	71.22
5	(77.25)	0.082 (0.270)	57.62	0.090 (0.297)	66.36
6	(83.25)	0.088 (0.288)	55.45	0.094 (0.308)	63.88
*	(100.00)	0.096 (0.316)	50.47	0.103 (0.338)	58.18
7	(175.25)	0.129 (0.423)	37.79	0.137 (0.450)	43.71
8	(181.25)	0.131 (0.431)	37.14	0.139 (0.457)	42.97
9	(187.25)	0.133 (0.438)	36.51	0.142 (0.465)	42.26
10	(193.25)	0.136 (0.445)	35.92	0.144 (0.472)	41.59
11	(199.25)	0.138 (0.452)	35.36	0.146 (0.480)	40.95
12	(205.25)	0.140 (0.459)	34.82	0.148 (0.487)	40.33
13	(211.25)	0.142 (0.466)	34.30	0.151 (0.494)	39.75
14	(471.25)	0.217 (0.712)	22.52	0.226 (0.743)	26.41
15	(477.25)	0.218 (0.717)	22.37	0.228 (0.747)	26.24
16	(483.25)	0.220 (0.721)	22.23	0.229 (0.752)	26.07
17	(489.25)	0.221 (0.726)	22.08	0.231 (0.757)	25.91
18	(495.25)	0.223 (0.731)	21.94	0.232 (0.762)	25.75
19	(501.25)	0.224 (0.736)	21.80	0.234 (0.766)	25.59
20	(507.25)	0.226 (0.740)	21.66	0.235 (0.771)	25.44
21	(513.25)	0.227 (0.745)	21.53	0.236 (0.776)	25.29
22	(519.25)	0.228 (0.749)	21.40	0.238 (0.780)	25.14
23	(525.25)	0.230 (0.754)	21.27	0.239 (0.785)	24.99
24	(531.25)	0.231 (0.759)	21.14	0.241 (0.789)	24.85
25	(537.25)	0.233 (0.763)	21.01	0.242 (0.794)	24.70
26	(543.25)	0.234 (0.768)	20.89	0.243 (0.798)	24.57
27	(549.25)	0.235 (0.772)	20.77	0.245 (0.803)	24.43
28	(555.25)	0.237 (0.777)	20.65	0.246 (0.807)	24.29
29	(561.25)	0.238 (0.781)	20.53	0.247 (0.812)	24.16
30	(567.25)	0.239 (0.786)	20.42	0.249 (0.816)	24.03
31	(573.25)	0.241 (0.790)	20.30	0.250 (0.820)	23.90
32	(579.25)	0.242 (0.795)	20.19	0.251 (0.825)	23.78
33	(585.25)	0.244 (0.799)	20.08	0.253 (0.829)	23.65
34	(591.25)	0.245 (0.803)	19.97	0.254 (0.833)	23.53
35	(597.25)	0.246 (0.808)	19.86	0.255 (0.838)	23.41
36	(603.25)	0.248 (0.812)	19.76	0.257 (0.842)	23.29
37	(609.25)	0.249 (0.816)	19.65	0.258 (0.846)	23.17
38	(615.25)	0.250 (0.821)	19.55	0.259 (0.850)	23.06
39	(621.25)	0.251 (0.825)	19.45	0.260 (0.855)	22.94
40	(627.25)	0.253 (0.829)	19.35	0.262 (0.859)	22.83
41	(633.25)	0.254 (0.834)	19.25	0.263 (0.863)	22.72
42	(639.25)	0.255 (0.838)	19.16	0.264 (0.867)	22.61
43	(645.25)	0.257 (0.842)	19.06	0.266 (0.871)	22.50
44	(651.25)	0.258 (0.846)	18.97	0.267 (0.875)	22.40
45	(657.25)	0.259 (0.850)	18.87	0.268 (0.879)	22.29
46	(663.25)	0.260 (0.854)	18.78	0.269 (0.883)	22.19
47	(669.25)	0.262 (0.859)	18.69	0.270 (0.887)	22.09
48	(675.25)	0.263 (0.863)	18.60	0.272 (0.891)	21.99
49	(681.25)	0.264 (0.867)	18.52	0.273 (0.895)	21.89
50	(687.25)	0.265 (0.871)	18.43	0.274 (0.899)	21.79
51	(693.25)	0.267 (0.875)	18.34	0.275 (0.903)	21.70
52	(699.25)	0.268 (0.879)	18.26	0.277 (0.907)	21.60
53	(705.25)	0.269 (0.883)	18.18	0.278 (0.911)	21.51
54	(711.25)	0.270 (0.887)	18.09	0.279 (0.915)	21.42
55	(717.25)	0.272 (0.891)	18.01	0.280 (0.919)	21.32
56	(723.25)	0.273 (0.895)	17.93	0.281 (0.923)	21.23
57	(729.25)	0.274 (0.899)	17.85	0.283 (0.927)	21.14
58	(735.25)	0.275 (0.903)	17.78	0.284 (0.931)	21.06
59	(741.25)	0.277 (0.907)	17.70	0.285 (0.935)	20.97
60	(747.25)	0.278 (0.911)	17.62	0.286 (0.939)	20.88
61	(753.25)	0.279 (0.915)	17.55	0.287 (0.942)	20.80
62	(759.25)	0.280 (0.919)	17.47	0.288 (0.946)	20.71
63	(765.25)	0.281 (0.923)	17.40	0.290 (0.950)	20.63
64	(771.25)	0.283 (0.927)	17.33	0.291 (0.954)	20.55
65	(777.25)	0.284 (0.931)	17.25	0.292 (0.957)	20.47
66	(783.25)	0.285 (0.935)	17.18	0.293 (0.961)	20.39
67	(789.25)	0.286 (0.939)	17.11	0.294 (0.965)	20.31
68	(795.25)	0.287 (0.942)	17.04	0.295 (0.969)	20.23
69	(801.25)	0.288 (0.946)	16.98	0.296 (0.972)	20.15

*Broadcast Radio Band

Standard conditions:

For Attenuation
VSWR 1.0
Ambient Temperature 24°C (75°F)
Atmospheric Pressure, Dry Air

For Average Power
VSWR 1.0
Ambient Temperature 40°C (140°F)
Inner Conductor Temperature 102°C (216°F)
Atmospheric Pressure, Dry Air

Attenuation and average power data guaranteed within ±5%.

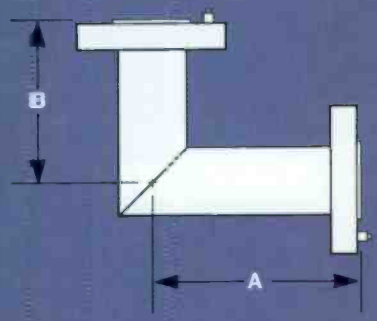
Accessories for 3-1/8" Rigid Line

All Flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

90° Miter Elbow

Swivel flanges, brass construction, reinforced outer.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**STD350-10**	50	4.19 (106)	4.19 (106)	10.7 (4.86)

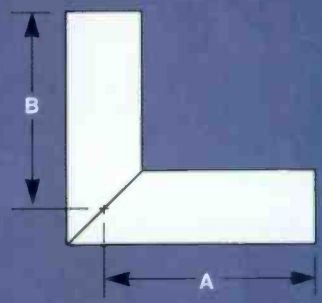


Type STD350-10

90° Miter Elbow

Unflanged. Does not include inner connector. Unpressurized.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**STD350-10-3**	50	4.00 (102)	4.00 (102)	2.63 (1.20)

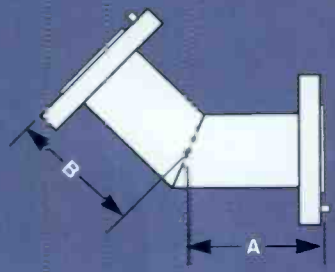


Type STD350-10-3

45° Miter Elbow

Swivel Flanges, brass construction.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**1162**	50	4.50 (114)	4.50 (114)	9.0 (4.09)

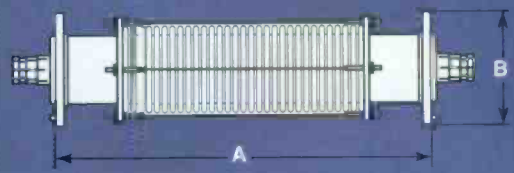


Type 1162

Flexible Section

Accommodates movement and angles up to 30° (± 15°). Maximum offset 0.5 in (13 mm). Captivated inner conductor. Includes two inner connectors.
A = 18 in (457 mm) **B** = 5.19 in (132 mm)

Swivel Flanges, unplated, has retaining cables to prevent expansion beyond 18 in under pressurization, while permitting compression and bending. Weight 13 lb (6 kg).
.....Type **19209C**

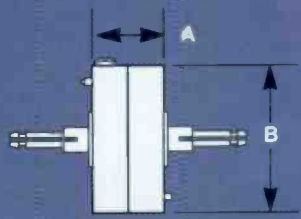


Type 19209C

Gas Barrier

Fixed male inner connectors both ends. Both sides have a pressure port.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**RLA350-16**	50	1.00 (25)	5.19 (132)	4.75 (2.2)



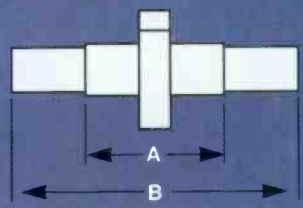
Type RLA350-16

Inner Connector

Includes electrically compensated PTFE anchor disk.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**ACX350-20**	50	1.69 (43)	4.13 (105)	0.63 (0.29)
3-1/8"	**ACX350-19***	50	1.69 (43)	4.13 (105)	0.63 (0.29)

* Captivated



Type ACX350-20

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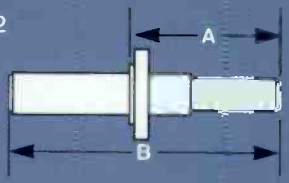
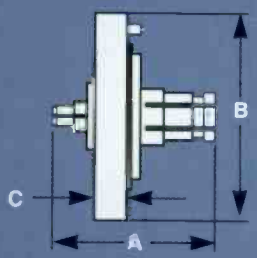
Type 4852



Type 2062



Type 1861

Type 2262

Type 23187

Accessories for 3-1/8" Rigid Line

All flanged items are EIA standard and include inner connector "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Adapter Inner Connector

50-51.5 ohm.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**4852**	2.16 (55)	3.62 (92)	0.31 (0.141)

End Terminal

For strap connection. Gas tight with pressure port.

Line Size	Type	Weight lb (kg)
3-1/8"	**2062**	6.3 (2.86)

Reducer 50-ohm

Includes two inner connectors. Not a gas barrier.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	Weight lb (kg)
3-1/8" to 1-5/8"	**1861**	4.13 (105)	5.19 (132)	0.85 (22)	5.6 (2.6)

Type N Female Adapter

Mates with UG-21. Gas tight with pressure port. Includes inner connector and hardware.

Line Size	Type	Weight lb (kg)
3-1/8"	**2262**	5.6 (2.55)

Male-to-Male Adapter

Joins two components having captivated inner connectors. 6 in (150 mm) length. No inner connectors. Includes hardware.

Line Size	Type	Weight lb (kg)
3-1/8"	**23187**	6 (2.72)

Accessories for 3-1/8" Rigid Line

All Flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Hardware Kit

Includes "O" ring, silicone lubricant, nuts, bolts and lock-washers for one flange joint.

Line Size	Type	Weight lb (kg)
3-1/8"	69226-2	0.50 (0.23)

Type 69226-2

"O" Ring Gasket

For EIA flange.

Line Size	Type
3-1/8"	10683-405

Type 10683-405

Soft Solder Swivel Field Flange

For use on interior runs. Includes soft solder, swivel flange and sleeve with fixed ring. Order inner connector and hardware kit separately.

Line Size	Type	Weight lb (kg)
3-1/8"	ACX350-37	2.9 (1.32)

Type ACX350-37

Swivel Flange

Includes fixed ring, sliding ring, silver solder and flux. Order inner connector and hardware kit separately.

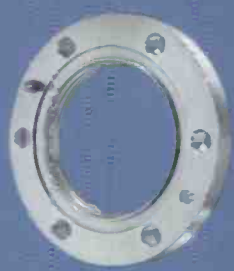
Line Size	Type	Weight lb (kg)
3-1/8"	18200	2.00 (0.91)

Type 18200

Fixed Flange

Includes silver solder and flux. Order inner connector and hardware kit separately.

Line Size	Type	Weight lb (kg)
3-1/8"	15840	2.00 (0.91)

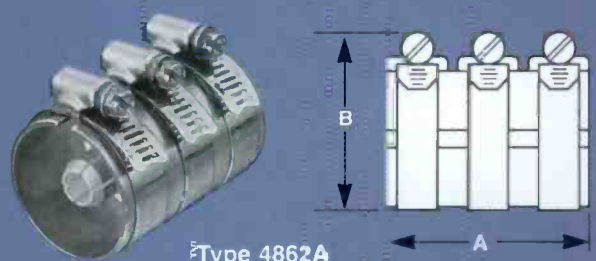


Type 15840

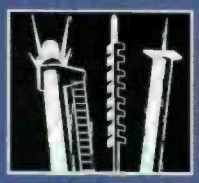
Unpressurized Coupling

Connects unflanged lines and fittings. Includes supported inner connector and sleeve outer connector with clamps.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	4862A	3.50 (89)	3.70 (94)	1.5 (0.68)



Type 4862A



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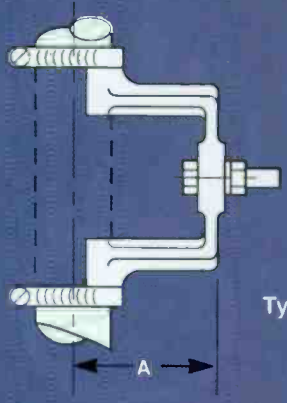
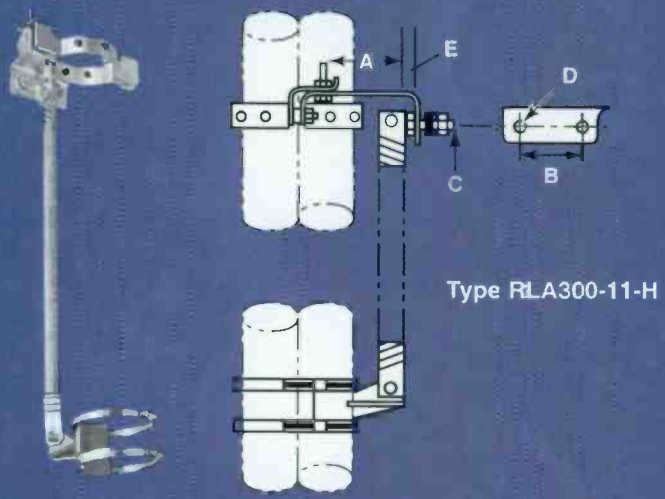
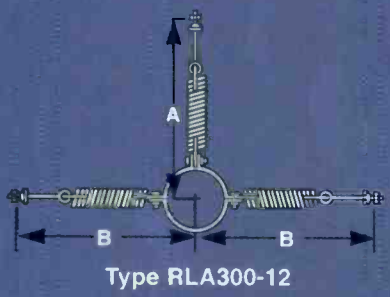
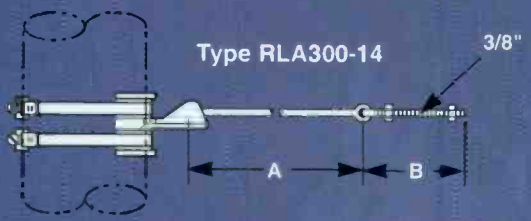
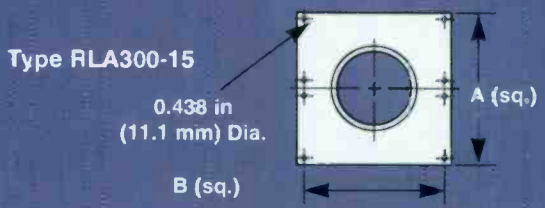










Accessories for 3-1/8" Rigid Line

3-1/8" Rigid Hanger

Hangers attach to top section. Use one for up to 300 ft (90 m) of line and one for each additional 300 ft (90 m) of line. Mounts to 9/16 in (14 mm) diameter hole with included 1/2" diameter hardware.

Line Size	Type	A in (mm)	Weight lb (kg)
3-1/8"	**13927**	3.81 (96.8)	6.3 (2.86)

NEW! Hinged Hanger™

Vertical Spring Hanger

Use at 10 ft (3 m) intervals. Supports the transmission line. Prevents lateral motion, and accommodates differential expansion and contraction. Mounting hardware for "D" holes is included. Hardware is 1/2".

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	D in (mm)	E in (mm)	Weight lb (kg)
3-1/8"	**RLA300-11-H**	4.13 (104.9)	2.25 (57.2)	1.00 (25.4)	0.53 (13.5)	0.38 (9.7)	6.0 (2.73)

3-Point Suspension Hanger

Accommodates vertical movement in the horizontal run caused by differential expansion and contraction of the vertical run. Use at 10 ft (3 m) intervals.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**RLA300-12**	26.0 (660)	17.75 (266)	9.38 (4.26)

Lateral Brace

Mounts through single 7/16 in (11mm) hole. Use one near bottom to restrict lateral motion of line while permitting vertical and horizontal movement.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**RLA300-14**	40.0 (1016)	6.50 (165.1)	2.25 (102)

Wall Feed Thru

Includes split mounting plate. Uses 3/8" mounting hardware (not included).

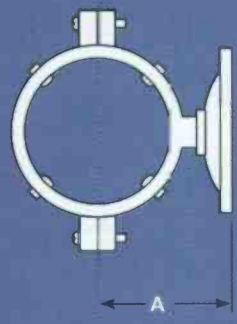
Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
3-1/8"	**RLA300-15**	8.0 (203.2)	6.87 (174.5)	8.2 (3.73)

Accessories for 3-1/8" Rigid Line

Slip Hanger

For indoor use. Flange mounted. Supports the transmission line, and accommodates lateral motion due to expansion and contraction.

Line Size	Type	A In (mm)	Weight lb (kg)
3-1/8"	**RLA300-22**	3-3/16 (81)	2.0 (0.9)



Type RLA300-16

Horizontal Hanger

Permits axial movement caused by expansion and contraction. Includes clamps and hardware. Use at 10 ft (3 m) intervals.

3-1/8" line .....Type **3912**

Type 3912

Angle Adapter

For attaching hangers to tower angle members, up to 7/8" (22 mm) thick .....Type **13555A**

Type 13555A

Round Member Adapter

For attaching hangers to round tower members, up to 3 in (75 mm) diameter. Includes 1/2" x 1-1/4" hanger attachment bolt and nut.....Type **13550**

Type 13550

1-5/8", 50-ohm Standard Rigid Line

Standard rigid coaxial transmission line is available in 1-5/8", 50-ohm size.

- ***Uses PTFE dielectric peg insulators and silver soldered flanges***
- ***Fully compatible with EIA standard RS-225 and IEC recommendations.***

All flanged sections come complete with one inner connector, a set of stainless steel flange hardware and a pressure sealing gasket.

Section	1-5/8" 50-ohm
Standard Rigid Line Components	
20 ft flanged both ends	**561**
20 ft flanged one end	**561-11**
20 ft unflanged	**561-21**
**flanged both ends	**2761-1**
**flanged one end	**2761-11**
**unflanged	**2761-21**
Characteristics	
Type No.	**561**
Impedance, ohms	50
Max. Frequency, MHz	3000
Velocity, percent	99.8
Attenuation, see table	
Average Power Rating, see table	
Peak Power Rating, kW	300
Dimensions	
Outer Conductor, outside dia. in (mm)	1.625 (41)
Inside dia., in (mm)	1.527 (38)
Inner Conductor, outside dia., in (mm)	0.664 (17)
Inside dia, in (mm)	0.588 (15)
Inner Cutback, in (mm)	0.625 (15.9)
Net Weight, lb/ft (kg/m)	1.35 (2.0)
Standard Flange Dimensions	
Flange, Overall Diameter, in (mm)	3.50 (88.9)
Bolt Circle Diameter, in (mm)	2.810 (71.37)
Number of bolts	4
Bolt size	5/16"

** Specify length,indicating inches or millimeters. Standard tolerance is ± 1/8 in (3 mm)

Standard conditions:

For Attenuation
VSWR 1.0
Ambient Temperature 24°C (75°F)
Atmospheric Pressure, Dry Air

For Average Power
VSWR 1.0
Ambient Temperature 40°C (140°F)
Inner Conductor Temperature 102°C (216°F)
Atmospheric Pressure, Dry Air

Attenuation and average power data guaranteed within ±5%.

Attenuation and Average Power Ratings for 1-5/8", 50-ohm Rigid Line

Television Channel No. (MHz)		Attenuation db/100 ft (100 m)	Average Power kW
*	(1.00)	0.017 (0.056)	300.00
2	(55.25)	0.142 (0.467)	20.01
3	(61.25)	0.150 (0.493)	19.03
4	(67.25)	0.158 (0.518)	18.19
5	(77.25)	0.170 (0.558)	17.00
6	(83.25)	0.177 (0.580)	16.40
*	(100.00)	0.195 (0.640)	15.00
7	(175.25)	0.261 (0.856)	11.11
8	(181.25)	0.266 (0.871)	10.92
9	(187.25)	0.270 (0.887)	10.75
10	(193.25)	0.275 (0.902)	10.58
11	(199.25)	0.279 (0.917)	10.42
12	(205.25)	0.284 (0.931)	10.26
13	(211.25)	0.288 (0.946)	10.11
14	(471.25)	0.442 (1.450)	6.63
15	(477.25)	0.445 (1.460)	6.58
16	(483.25)	0.448 (1.470)	6.54
17	(489.25)	0.451 (1.479)	6.50
18	(495.25)	0.454 (1.489)	6.46
19	(501.25)	0.457 (1.499)	6.41
20	(507.25)	0.460 (1.509)	6.37
21	(513.25)	0.463 (1.519)	6.33
22	(519.25)	0.466 (1.528)	6.30
23	(525.25)	0.469 (1.538)	6.26
24	(531.25)	0.472 (1.547)	6.22
25	(537.25)	0.475 (1.557)	6.18
26	(543.25)	0.477 (1.566)	6.15
27	(549.25)	0.480 (1.576)	6.11
28	(555.25)	0.483 (1.585)	6.07
29	(561.25)	0.486 (1.594)	6.04
30	(567.25)	0.489 (1.604)	6.01
31	(573.25)	0.492 (1.613)	5.97
32	(579.25)	0.494 (1.622)	5.94
33	(585.25)	0.497 (1.631)	5.91
34	(591.25)	0.500 (1.640)	5.87
35	(597.25)	0.503 (1.649)	5.84
36	(603.25)	0.506 (1.659)	5.81
37	(609.25)	0.508 (1.667)	5.78
38	(615.25)	0.511 (1.676)	5.75
39	(621.25)	0.514 (1.685)	5.72
40	(627.25)	0.516 (1.694)	5.69
41	(633.25)	0.519 (1.703)	5.66
42	(639.25)	0.522 (1.712)	5.64
43	(645.25)	0.524 (1.721)	5.61
44	(651.25)	0.527 (1.729)	5.58
45	(657.25)	0.530 (1.738)	5.55
46	(663.25)	0.532 (1.747)	5.53
47	(669.25)	0.535 (1.755)	5.50
48	(675.25)	0.538 (1.764)	5.47
49	(681.25)	0.540 (1.772)	5.45
50	(687.25)	0.543 (1.781)	5.42
51	(693.25)	0.545 (1.789)	5.40
52	(699.25)	0.548 (1.798)	5.37
53	(705.25)	0.551 (1.806)	5.35
54	(711.25)	0.553 (1.815)	5.32
55	(717.25)	0.556 (1.823)	5.30
56	(723.25)	0.558 (1.832)	5.27
57	(729.25)	0.561 (1.841)	5.25
58	(735.25)	0.564 (1.849)	5.22
59	(741.25)	0.566 (1.858)	5.2
60	(747.25)	0.569 (1.866)	5.18
61	(753.25)	0.571 (1.874)	5.15
62	(759.25)	0.574 (1.883)	5.13
63	(765.25)	0.576 (1.891)	5.11
64	(771.25)	0.579 (1.899)	5.09
65	(777.25)	0.581 (1.908)	5.06
66	(783.25)	0.584 (1.916)	5.04
67	(789.25)	0.587 (1.924)	5.02
68	(795.25)	0.589 (1.932)	5.00
69	(801.25)	0.592 (1.941)	4.98

*Broadcast Radio Band

Accessories for 1-5/8" Rigid Line and 7/8" Components

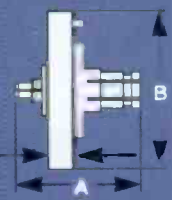
All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Reducer 50-ohm

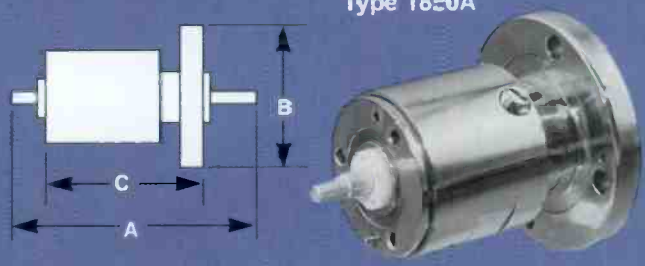
Includes two inner connectors. Not a gas barrier.

Line Size	Type	A in (mm)	B in (mm)	C in (mm)	Weight lb (kg)
1-5/8" to 7/8"	**1860A**	5.46 (139)	3.50 (89)	3.34 (85)	2.3 (1.1)
3-1/8" to 1-5/8"	**1861**	4.13 (105)	5.19 (132)	0.85 (22)	5.6 (2.6)

Type 1861



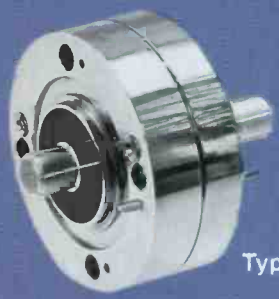
Type 1860A

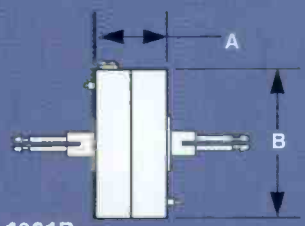


Gas Barrier

Heavy duty. Fixed male inner connectors both ends. Both sides have a pressure port.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**1260A**	50	1.13 (29)	2.25 (57)	1.2 (0.55)
1-5/8"	**1261B**	50	1.66 (42)	3.50 (89)	3.6 (1.7)



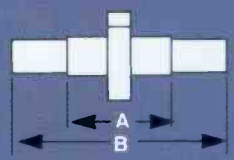


Type 1261B

Inner Connector

Includes PTFE anchor disk.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**25385**	75	0.93 (24)	1.94 (49)	0.05 (0.02)
7/8"	**34389A**	50	0.93 (24)	1.94 (49)	0.06 (0.03)
1-5/8"	**34660**	50	1.17 (30)	2.30 (58)	0.13 (0.06)

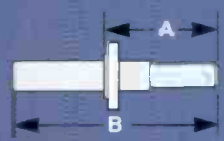


Type 34389A

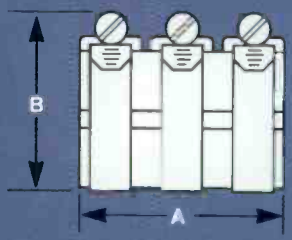
Adapter Inner Connector

50-51.5 ohm.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**4850A**	1.31 (33)	2.31 (59)	0.03 (0.014)
1-5/8"	**4851**	1.18 (30)	2.34 (59)	0.16 (0.073)



Type 4851



Type 4861A

Type 1561A

Type 18041

Type 18631

Type 69225-2

Type 10683-406

Accessories for 1-5/8" Rigid Line and 7/8" Components

All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Unpressurized Coupling

Connects unflanged lines and fittings. Includes supported inner connector and sleeve outer connector with clamps.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8"	**4861A**	2.50 (64)	2.25 (57)	0.5 (0.23)

Soft Solder Swivel Field Flange

For use on interior runs. Includes soft solder swivel flange and sleeve with fixed ring. Order inner connector and hardware kit separately.

Line Size	Type	Weight lb (kg)
7/8"	**1560A**	0.7 (0.32)
1-5/8"	**1561A**	1.3 (0.59)

Swivel Flange

Includes fixed ring, sliding ring, silver solder and flux. Order inner connector and hardware kit separately.

Line Size	Type	Weight lb (kg)
7/8"	**18096**	0.44 (0.20)
1-5/8"	**18041**	0.94 (0.43)

Fixed Flange

Includes sliver solder and flux. Order inner connector and hardware kit separately.

Line Size	Type	Weight lb (kg)
7/8"	**18630**	0.38 (0.18)
1-5/8"	**18631**	0.94 (0.43)

Hardware Kit

Includes "O" ring, silicone lubricant, nuts bolts and lock-washers for one flange joint.

Line Size	Type	Weight lb (kg)
7/8"	**66748-6**	0.03 (0.02)
1-5/8"	**69225-2**	0.25 (0.12)

"O" Ring Gasket

For EIA flange.

Line Size	Type
7/8"	**10683-197**
1-5/8"	**10683-406**

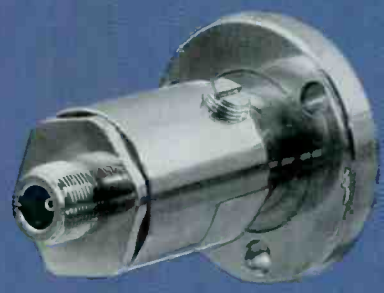
Accessories for 1-5/8" Rigid Line and 7/8" Components

All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

Type N Female Adapter

Mates with UG-21. Gas tight with pressure port. Includes inner connector and hardware.

Line Size	Type	Weight lb (kg)
7/8"	2260B	1.2 (0.55)
1-5/8"	2261A	3.4 (1.55)



Type 2260B

Type LC Female Adapter

Mates with UG-154. Gas tight with pressure port. Includes inner connector and hardware.

Line Size	Type	Weight lb (kg)
7/8"	2360A	1.2 (0.55)
1-5/8"	2361A	3.4 (1.55)

Type 2361A

Male-to-Male Adapter

Joins two components having captivated inner connectors. 6 in (150 mm) length. No inner connectors. Includes hardware.

Line Size	Type	Weight lb (kg)
1-5/8"	30452	3.0 (1.36)

Type 30452

End Terminal

For strap connection. Gas tight with pressure port.

Line Size	Type	Weight lb (kg)
1-5/8"	2061	2.3 (1.04)

Type 2061

Flexible Section

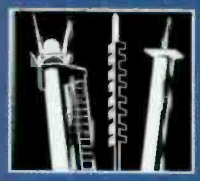
Accommodates vibration and angles up to 30°. Maximum offset 0.25 in (6mm) for 1-5/8" line and 0.5 in (13mm) for 3-1/8" line. Includes two inner connectors.

Line Size	Type	Impedance ohms	A in (mm)	B In (mm)	Weight lb (kg)
1-5/8"	20695	50	10.0 (254)	3.5 (89)	4.2 (1.91)

Type 20695

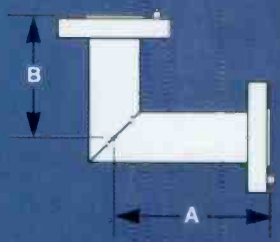
Standard Flange Dimensions

Line Size	1-5/8"	7/8"
Flange, Overall Diameter, in (mm)	3.50 (88.9)	2.25 (57.1)
Bolt Circle Diameter, in (mm)	2.810 (71.37)	1.750 (44.45)
Number of bolts	4	3
Bolt Size	5/16"	1/4"



Broadcast Antenna Systems

Type 1061A



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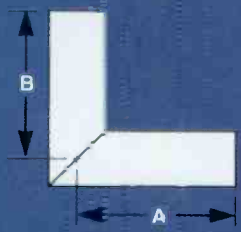
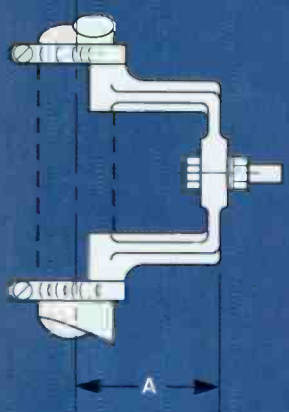




Type 13924

Type 14379

Type 15378

Type 13555A

Type 13550

Accessories for 1-5/8" Rigid Line and 7/8" Components

All flanged items are EIA standard and include inner connector, "O" ring, silicone grease and hardware, except when noted. All inner connectors are silver-plated.

90° Miter Elbow

Swivel flanges, brass construction.

Line Size	Type	Impedance ohms	A in (mm)	B in (mm)	Weight lb (kg)
7/8"	**1060A**	50	3.08 (78)	2.44 (62)	1.4 (0.64)
1-5/8"	**1061A**	50	2.89 (73)	2.89 (73)	3.5 (1.59)

90° Miter Elbow

Unflanged. Does not include inner connector.

Line Size	Type	A in (mm)	B in (mm)	Weight lb (kg)
1-5/8"	**1061A-3**	2.73 (69)	2.73 (69)	0.69 (0.32)

1-5/8" Hangers

Rigid Hanger

Hangers attach top section. Use one for up to 300 ft. (90 m) of line and one for each additional 300 ft (90 m) of line. Mounts to 9/16 in (14 mm) diameter hole with included 1/2" diameter bolt or to angle adapters.

Line Size	Type	A in (mm)	Weight lb (kg)
1-5/8"	**13924**	3.06 (77.7)	1.4 (0.64)

Spring Hanger

Accommodates line expansion and contraction. Use at 50 ft (15m) intervals. Mounts to 9/16 in (14 mm) diameter hole with included 1/2" diameter bolt or to angle adapters.

Line Size	Type	A in (mm)	B In (mm)	Weight lb (kg)
1-5/8"	**14379**	3.06 (77.7)	14.0 (355.6)	3.2 (1.45)

Sliding Hanger

Use at 10 ft (3 m) intervals. Mounts to 9/16 in (14 mm) diameter hole with 1/2" diameter bolt, or to angle adapter.

1-5/8" line .....Type **14378**

Angle Adapter

For attaching hangers to tower angle members, up to 7/8" (22 mm) thick .....Type **13555A**

Round Member Adapter

For attaching hangers to round tower members, up to 3 in (75 mm) diameter. Includes 1/2" x 1-1/4" hanger attachment bolt and nut.....Type **13550**

GUIDELine® Circular Waveguide

GUIDELine low attenuation waveguide is the premier transmission line for use in UHF television transmitting antenna systems. It offers highest possible efficiency, handles maximum power and has lower windload than rectangular waveguides. The unique design offers superior polarization stability and eliminates the need for on-site compensation tuning. Complete system layout drawings and detailed installation instructions are provided with every GUIDELine system.

Low Attenuation for High Efficiency

GUIDELine circular waveguide is the most efficient transmission line available for UHF broadcast frequencies. Attenuation is up to 50% lower than corresponding rectangular waveguides. This reduces electrical power consumption and, in some cases, may reduce the size and cost of the transmitter needed to provide maximum ERP. Attenuation tables are shown on page 358.

High Power Handling

GUIDELine waveguide will handle television transmitter power levels up to 360 kW. For higher power applications, contact Andrew.

Low Wind Load

The cylindrical shape of GUIDELine waveguide reduces tower wind loading by one-third compared with rectangular waveguide and allow pressurization without risk or distortion and performance degradation. The shape and construction also resist distortion in high winds, icing and other severe environmental conditions. The result is stable and consistent performance proven under all weather conditions.

Broadcast Antenna Systems

GUIDELine Waveguide Electrical Performance

VSWR is 1.08 or better over the channel. Optimization to 1.05 or better at visual carrier is usually possible. And, GUIDELine waveguide does not exhibit band reject spikes associated with coaxial and rectangular waveguide transmission lines because of the extremely small mismatch of the circular flange junction.

System Planning Information

Andrew offers GUIDELine waveguide on a system basis. **FAX inquiry directly to our Broadcast Systems Department at 1-800-554-2204** and specify the following information:

- *Operating channel*
- *Waveguide size - GLW1750, GLW1700, GLW1500 or GLW1350*
- *Length of vertical run in feet or meters*
- *Length of horizontal run in feet or meters*
- *Input connection required - WR1800; WR1500; WR1150; 8-3/16", 75 ohm; 6-1/8" 75 ohm or 6-1/8",50 ohm*
- *Antenna input flange 8-3/16", 75 ohm; 6-1/8", 75 ohm or 6-1/8", 50 ohm or waveguide*

To Determine Efficiency

Select the attenuation in dB/100 feet from the table in Figure 1. Multiply by the length of the waveguide run to find total attenuation. Use the formula below to determine efficiency.

$$\text{Efficiency in percent} = \frac{100}{10^{(\alpha/10)}}$$

where α is total waveguide attenuation

Example: For channel 30 and 1000 feet of GLW1750
$0.035 \times 10 = 0.35$ dB

$$\text{Efficiency} = \frac{100}{10^{(0.35/10)}} = 92.3\%$$

GUIDELine® Attenuation Ratings

Channel Number	Visual Carrier MHz	Attenuation dB/100 ft
GLW1750		
14	471.25	0.0521
15	477.25	0.0502
16	483.25	0.0484
17	489.25	0.0469
18	495.25	0.0454
19	501.25	0.0441
GLW1700		
20	507.25	0.0430
21	513.25	0.0419
22	519.25	0.0409
23	525.25	0.0399
GLW1750		
24	531.25	0.0391
25	537.25	0.0383
26	543.25	0.0375
27	549.25	0.0368
28	555.25	0.0362
29	561.25	0.0356
30	567.25	0.0350
31	573.25	0.0344
32	579.25	0.0339
33	585.25	0.0334
34	591.25	0.0330
35	597.25	0.0325
36	603.25	0.0321
37	609.25	0.0317
38	615.25	0.0314
39	621.25	0.0310
40	627.25	0.0307
41	633.25	0.0303
GLW1500		
39	621.25	0.0490
40	627.25	0.0482
41	633.25	0.0474
42	639.25	0.0466
43	645.25	0.0459
44	651.25	0.0452
45	657.25	0.0445
46	663.25	0.0439
47	669.25	0.0433
48	675.22	0.0428
49	681.25	0.0423
50	687.25	0.0418
51	693.25	0.0413
52	699.25	0.0408
53	705.25	0.0404
54	711.25	0.0399
55	717.25	0.0395
GLW1350		
56	723.25	0.0530
57	729.25	0.0523
58	735.25	0.0516
59	741.25	0.0510
60	747.25	0.0504
61	753.25	0.0498
62	659.25	0.0493
63	765.25	0.0488
64	771.25	0.0483
65	777.25	0.0478
66	783.25	0.0473
67	789.25	0.0469
68	795.25	0.0464
69	801.25	0.0460

Standard Conditions
For Attenuation: VSWR 1.0 Ambient Temperature 24°C (75°F).
For Average Power: VSWR 1.0 Ambient Temperature 24°C (75°F).
Waveguide Temperature 64°C (147°F).

GUIDELine® System Components

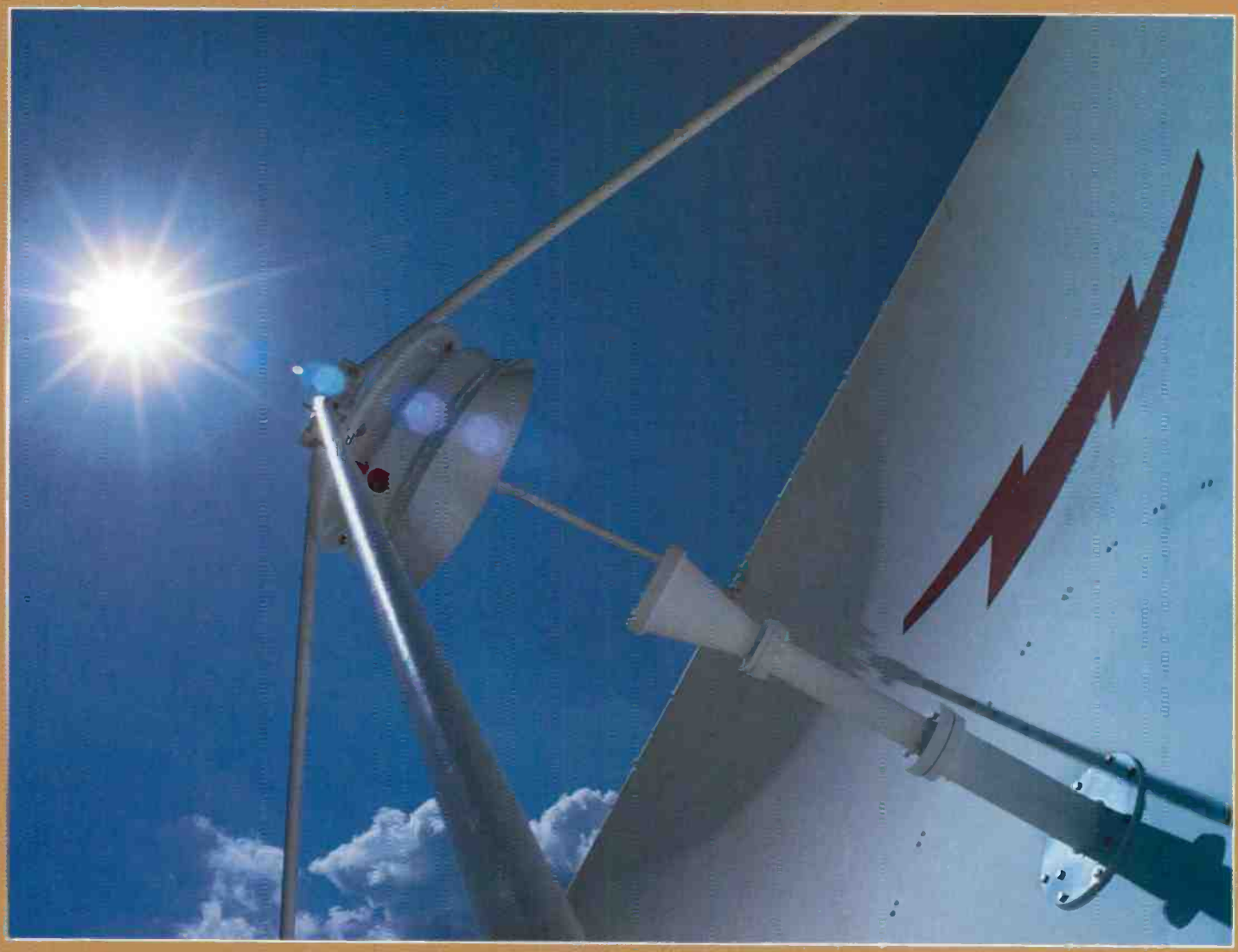
Waveguide Sections are all aluminum construction, including flanges. The unique cross-polarization cancelers provide increased rigidity. The flanges are also a unique Andrew design. A flange gasket prevents entry of moisture at the flange junction. The flange facing up contains the gasket groove and the mating flange is flat for easy installation without concern for "pinching." Flange hardware and gaskets are included for every section. Select by channel number from table.

The horizontal run is comprised of heavy-wall rectangular waveguide allowing a constant pressurization of the system up to 2 lb/in^2, while permitting the flexibility of routing the waveguide using typical WR elbow configurations.

GUIDELine Section Lengths, in (mm)

GLW1750	102.86 (2612)
GLW1700	102.86 (2612)
GLW1500	108 (2743)
GLW1350	112 (2845)

Advanced design of GUIDELine waveguide provides highest efficiency and eliminates cross polarization loads and field compensation even at power levels of 240 kW and above. Smooth, round cross section reduces tower loading.



Satellite Communications Systems

INDEX

Complete Satellite Communication Systems

Applications

Andrew has been known as a world leader in communications equipment for over half a century. The Andrew Earth Station Antenna products have become a standard by which all other ESA's are evaluated. Andrew ESA's are available in a wide range of sizes for diverse applications such as:

- *Corporate Networks*
- *Independent Broadcast*
- *Broadcast Network Distribution*
- *Satellite Carrier Services*
- *State and Local Governments*
- *International Communications*
- *Distance Learning*

Variety

Andrew offers a wide variety of standard communication systems.

- *C-, Ku-, K- and X-Band Receive and/or Transmit Systems*
- *Simultaneous C/Ku-Band Receive Systems*
- *Transportable Antenna Systems*
- *Digital and Analog Receive/Transmit Systems*
- *VSAT Antennas*
- *Satellite Networks*

Andrew continues to develop and design new products for our customer's opportunities. Contact your Andrew account representative regarding your special needs.

Enduring Design

Precision formed aluminum reflectors, extensive use of hot-dipped galvanized steel, stainless steel and high tensile friction-type hardware ensures extended system operational life, increased antenna pointing accuracy under extreme climatic conditions and continued system reliability with minimum maintenance.

Performance

Andrew earth station antenna systems are guaranteed to perform to published specifications. This performance guarantee ensures that specified standards of performance are met or exceeded.

Single Source

Andrew offers a complete line of earth station antenna products and systems from a single source. This single point of contact saves time, money and simplifies system implementation. Comprehensive system design, installation and testing from one source assures total system compatibility, ultimate operational performance and complete adaptability for future system expansion.

Expandability, Compatibility, Flexibility

A variety of electronic equipment has been tested and verified for quality and performance. This equipment, when pulled together by the Andrew ESA Systems Team, assures that the system provides the performance you expect from Andrew.

Modular options and accessories increase system flexibility and operational capability. We can configure your system to provide transmit, receive, receive/transmit, video, audio, or data capabilities, singlely or in combination - digital or analog.

and Service

Services

Round out your system package with full service program management, design, documentation, installation, and testing. The Andrew comprehensive service philosophy guarantees the final system installation meets or exceeds specified requirements.

Satisfaction

Andrew designs each system individually, engineering, installing and testing to meet or exceed customer requirements and system specifications. Andrew ESA satellite communications systems deliver the ultimate in performance and dependability in a single cost-effective package.

ISO 9000 Certified
Certificate Number FM 35455

ANDREW®

Customer Support Services

Every Andrew ESA is backed by more than a quarter century of technical experience and expertise. More importantly, Andrew offers its customers a toll-free technical support number that operates 24 hours a day, 7 days a week.

Faster, Easier Installation

Andrew antennas are specifically engineered to simplify and quicken installation, thus resulting in significant cost savings to our customers.

9.3-Meter C-Band

7.6-Meter C-, Ku-, K- or X- Band

7.3-Meter C- and/or Ku-Band

5.6-Meter Ku- or K-Band

4.6-Meter C-, Ku- or X-Band

4.5-Meter Prime Focus and Dual-Reflector C- and/or Ku- or X-Band

3.7-Meter C-, Ku-, K- or X-Band

3.6-Meter C- and/or Ku- or X-Band

1.8-/2.4-Meter Offset VSAT Antennas

2.4-Meter Prime Focus VSAT Antennas

2.4-Meter Transportable SNG Antennas

3.7-/4.5-Meter C- and/or Ku- or X-Band Transportable Antennas

Receive-Only Earth Station Antennas

ISO 9000 Certified
Certificate Number FM 35455

Earth Station Antenna Performance Quick-Reference Guide

Size	Band	Tx Gain, dBi †	Rx Gain, dBi †	G/T*	Type Approval	Meets or Exceeds the Following Standards
9.3m (31 ft)	C	54.0	51.5	32.4		INTELSAT B, F-3, F-2, F-1, D-2; G; FCC, ITU-R, Eutelsat, Russian Homologation
7.6m (25 ft)	C	52.7	49.0	29.7		INTELSAT F-2, F-1, D, G; FCC, ITU-R, Eutelsat, Russian Homologation
7.6m (25 ft)	Ku	59.4	58.0	36.1		INTELSAT E-3, E-2, E-1, G; FCC, ITU-R, Eutelsat, Russian Homologation
7.6m (25 ft)	X	54.7	54.2	33.1		
7.3m (24 ft)	C	51.8	48.6	30.3	INTELSAT F-3, F-2, F-1, D-1 and G	INTELSAT F-3, F-2, D-1, G; FCC, ITU-R, Eutelsat, Russian Homologation
7.3m (24 ft)	C/Ku	– –	55.0 (Ku) 48.0 (C)	33.0 (Ku) 28.2 (C)		Receive-Only
5.6m (18.5 ft)	Ku	57.1	55.7	34.0		INTELSAT E-3, E-2, E-1, G; FCC, ITU-R, Eutelsat, Russian Homologation
4.6m (15 ft)	C	48.4	44.3	24.7	INTELSAT F-1, D-1 and G	INTELSAT F-1, D-1, G; ITU-R, Russian Homologation
4.6m (15 ft)	Ku	55.1	53.8	32.0	INTELSAT E-2, E-1 and G	INTELSAT E-2, E-1, G; FCC, ITU-R, Eutelsat, Russian Homologation
4.6m (15 ft)	X	50.4	49.9	28.7**		
4.5m (15 ft)	C	46.7	44.0	25.0		INTELSAT F-1, G; FCC, ITU-R, Russian Homologation
4.5m (15 ft)	Ku	53.8	52.6	30.8		INTELSAT E-1, G; FCC, ITU-R, Russian Homologation
4.5m (15 ft)	C/Ku	–	52.4 (Ku) 43.8 (C)	–		Receive-Only
4.5m (15 ft)	X	49.5	48.7	27.2**		
3.7m (12 ft)	C	46.3	42.5	23.6	INTELSAT F-1, D-1 and G	INTELSAT F-1, D-1, G; ITU-R, Russian Homologation
3.7m (12 ft)	Ku	53.3	51.8	30.3	INTELSAT E-1 and G Eutelsat	INTELSAT E-1, G; FCC, ITU-R, Eutelsat, Russian Homologation
3.7m (12 ft)	X	48.4	47.9	26.6**		
3.6m (12 ft)	C	44.5	42.0	22.9		INTELSAT E-1, G; ITU-R, Russian Homologation
3.6m (12 ft)	Ku	52.0	50.7	28.9		INTELSAT E-1, G; ITU-R, Eutelsat, Russian Homologation
3.6m (12 ft)	C/Ku	–	50.4 (Ku) 41.8 (C)	–		
3.6m (12 ft)	X	47.5	46.7	25.1**		
2.4m (8 ft) Offset	C	41.7	37.6	18.5		ITU-R, Russian Homologation
2.4m (8 ft) Offset	Ku	49.5	47.6	26.3		ITU-R, Russian Homologation
2.4m (8 ft) Prime Focus	Ku	49.0	47.6	25.5	INTELSAT E-1 and G Eutelsat	INTELSAT E-1, G; FCC, Eutelsat, Russian Homologation
1.8m (6 ft)	C	39.8	35.7	16.5		ITU-R, Russian Homologation
1.8m (6 ft)	Ku	46.6	45.1	23.6		ITU-R, Russian Homologation

† Center frequency at the circular waveguide flange of the feed.

* G/T is considered using a 2-port linearly-polarized antenna configuration at 4 GHz, C-band with a 30°K LNA and at 12GHz, Ku-band with a 90°K LNA; minimum elevation angle is 10° unless noted otherwise.

** G/T is considered using a 2-port circularly-polarized antenna configuration at 7.50 GHz and at 10° elevation with a 75°K LNA.

Satellite Communications Systems

9.3-Meter C-Band

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements for B, F-3, F-2, F-1, D-2 and G.*
- *U.S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. OC/1-АФ-1).*

Guaranteed System Performance

Each Andrew System is Individually Designed, Engineered, Installed and Tested to Meet or Exceed Customer Requirements and System Specifications.

Control Options

Microprocessor or Steptrack Control Options Available for Motorized Antennas.

Wind Survival

125 mph (200 km/h) Wind Survival, in any Position of Operation.

Extra Large Equipment Enclosure

84 inch (2134 mm) Diameter by 46 inch (1170 mm) Deep Enclosure has Room for the Most Complicated Transmit Equipment with Room to Spare

Optional Accessories

Various Combining Networks, Control Systems, Maintenance Platforms and Waveguide Kits.

Exceptionally High Gain, Superior Efficiency and Closely Controlled Pattern Characteristics. As the first 9.3-meter antenna ever commissioned as a "B" station, fully compliant, meeting and exceeding INTELSAT and U.S. FCC requirements, Andrew 9.3-meter antennas are proven performers. The computer optimized Gregorian dual-reflector system, together with precision stretch-formed reflector panel segments using close-tolerance manufacturing techniques, results in exceptionally high gain, superior efficiency and closely controlled pattern characteristics.

Unsurpassed Flexibility and Electrical Performance. The Andrew 9.3-meter earth station antenna is designed to address the requirements of the television broadcast industry and other telecommunication system operators demanding unsurpassed flexibility and electrical performance in a single, cost-effective package.

Precision Manufacturing Techniques. All aluminum reflector panels and trusses are independently adjustable to ensure precise panel alignment.

Extended Product Life. The hot-dipped galvanized steel ground mount assembly ensures extended product life while the use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Worldwide Coverage. The elevation-over-azimuth mount enables horizon-to-horizon coverage from any worldwide location.

Future Versatility. A variety of optional equipment and services are offered from Andrew to further enhance the operational capabilities of the 9.3-meter earth station antenna system. Available equipment options include 2- or 4-port, linearly- or circularly-polarized combining networks, programmable control systems, feed rotation systems, maintenance platforms, professionally designed and documented cross-axis waveguide kits and pressurization systems.

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz

ES93 Series

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
at 3.625 GHz	49.8	at 5.850 GHz	53.5
at 4.000 GHz	50.7	at 6.175 GHz	54.0
at 4.200 GHz	51.1	at 6.425 GHz	54.3

ES93B Series

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
at 3.625 GHz	50.2	at 5.850 GHz	53.3
at 4.000 GHz	51.1	at 6.175 GHz	53.7
at 4.200 GHz	51.5	at 6.425 GHz	54.0

Polarization*
Linearly- or Circularly-Polarized

Polarization Discrimination, (Linearly-Polarized):
>35 dB across 1 dB beamwidth 19 - 25 log θ from 1.8° to 9.2°

Voltage Axial Ratio*, C-Band, circularly-polarized with 4-port combiner
<1.06:1 across the 1 dB beamwidth

Beamwidth, Mid-Band, Degrees

3 dB Receive (Transmit)	0.51 (0.34)
15 dB Receive (Transmit)	1.00 (0.65)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin*
10°	22
30°	12
50°	10

Antenna VSWR*, Transmit and Receive <1.25:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1663A.

Typical Slab Foundation Information

Soil Bearing Capacity	2000 PSF (9,770 kgf/m²)
Reinforcing Steel	1.47 tons (1339 kg)
Concrete Compressive Strength	3000 lb/in² (211 kgf/cm²)
Foundation Size:	
Length	19.5 ft (5.94 m)
Width	19.5 ft (5.94 m)
Depth	2.5 ft (0.76 m)
Concrete Volume	35.2 yd³ (27 m³)

Note: Other typical foundation designs are available.

G/T Performance*

LNA/LNB Noise Temperature	65K	45K	30K
ES93 G/T at 10° EL (dB/K)	30.5	30.9	31.8

* Based on a 4-port, linearly-polarized antenna configuration at 4 GHz

Uplink EIRP Capability*

HPA Output (Watts)	125	400	3000
Uplink EIRP (dBW)	74.8	79.8	88.6

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	20
Mount Type	El over AZ, Tripod
Antenna Pointing Range, Coarse/(Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	180° (180°)
Hub/Enclosure Dimensions	
Diameter	84 in (2.31 m)
Depth	46 in (1.17 m)
Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES93HS- equipped with the MK9HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	.15°/1.5°
Azimuth, Slow/Fast	0.2°/2.0°
Polarization	2.2°

For antenna series: ES93- equipped with the MK9MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

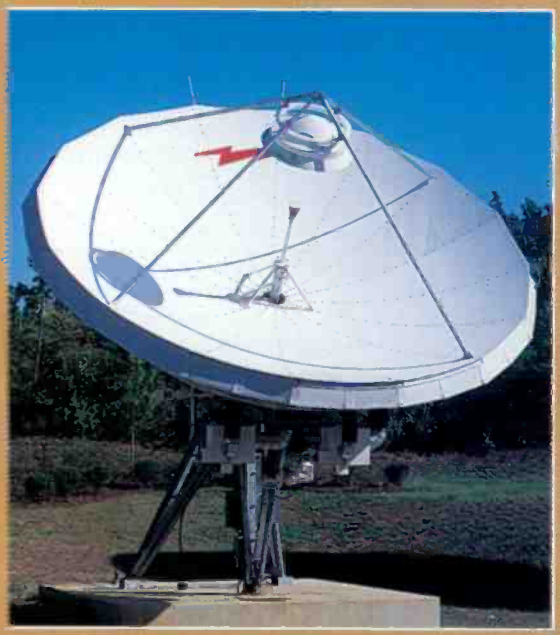
Elevation, Slow/Fast	.017°/.07°
Azimuth, Slow/Fast	.023°/.1°
Polarization	2.2°

For antenna series: ES93HS- equipped with the MK9STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	.016°/1.0°
Azimuth, Slow/Fast	.016°/2.0°
Polarization	2.2°

Satellite Communications Systems

7.6-Meter C-, Ku-, K- or X-Band



K- and X-Band options now available

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements for standard F-2, F-1, D, E-3, E-2, E-1 and G stations.*
- *EUTELSAT requirements for pattern (ITU-R) and polarization discrimination.*
- *U.S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. OC/1-AΦ-1).*

Excellent Pattern Characteristics

Gregorian Optics and Fully-Shaped Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Control Options

Microprocessor or Steptrack Control Options Available for Motorized Antennas.

Wind Survival

Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in any Position of Operation.

Large Equipment Enclosure

A 52 inch (1321 mm) Diameter by 46 inch (1170 mm) Deep Equipment Enclosure with Doors for Hub Mounting of LNA Systems.

No Alignment Required

Field alignment is not required on the 7.6-meter C-Band.

8-Meter Class Performance and Antenna Versatility. The 7.6-meter earth station antenna provides superior pattern performance and antenna versatility required by television broadcasters and telecommunication system operators.

Exceptional Electrical Performance. The precisely formed dual-reflector Gregorian system, coupled with close-tolerance reflector panel manufacturing techniques, results in extremely accurate surface contours, providing superior electrical performance characteristics verified by radiation patterns taken from 360° far-field range testing and satellite measurements.

Consistent Performance Characteristics. All aluminum reflector panels are manufactured to ensure precise panel alignment.

Large Equipment Enclosure. Integrated into the antenna back structure assembly is a large equipment enclosure (52 x 46 inch) capable of housing optional 4-port combining networks with associated support systems.

Maximum Corrosion Resistance. The mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz
X-Band Receive	7.25-7.75 GHz
X-Band Transmit	7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	48.1	5.850 GHz	52.2
4.000 GHz	49.0	6.175 GHz	52.7
4.200 GHz	49.4	6.425 GHz	53.0
7.250 GHz	54.0	7.90 GHz	54.6
7.500 GHz	54.2	8.15 GHz	54.7
7.750 GHz	54.4	8.40 GHz	54.9
10.950 GHz	57.2	14.00 GHz	59.2
11.950 GHz	58.0	14.25 GHz	59.4
12.750 GHz	58.5	14.50 GHz	59.5

Polarization*
Linearly- or Circularly-Polarized

Polarization Discrimination*, (Linearly-Polarized):
>35 dB across 1 dB beamwidth 19 - 25 log θ from 1.8° to 9.2°

Voltage Axial Ratio*, C-Band, circularly-polarized with 4-port combiner <1.06:1 across the 1 dB beamwidth
X-Band, <1.20:1 on axis, Tx and Rx

Beamwidth, Mid-band, Degrees	**C-Band**	**Ku-Band**	**X-Band**
3 dB Receive (Transmit)	0.58 (0.39)	0.22 (0.18)	0.33 (0.30)
15 dB Receive (Transmit)	1.18 (0.75)	0.39 (0.31)	0.62 (0.57)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	28	47	34
30°	19	33	25
50°	15	28	22

Antenna VSWR*, Transmit and Receive <1.25:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1678 (C-Band) and Bulletin 1680 (Ku-Band) and Bulletin 3653A (X-Band).

Typical Slab Foundation Information

Soil Bearing Capacity	2000 lb/ft² (9,764 kg/m²)
Reinforcing Steel	1686 lb (770 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	17.0 ft (5.1 m)
Width	17.0 ft (5.1 m)
Depth	2.2 ft (0.7 m)
Concrete Volume	24.5 yd³ (18.7 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES76 G/T at 10° EL (dB/K)	28.2	29.0	29.7

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES76 G/T at 10° EL (dB/K)	34.4	35.3	36.1

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (X-Band)

LNA/LNB Noise Temperature	50K	75K	100K
ES76 G/T at 10° EL (dB/K)	34.1	33.1	32.3

* Based on a 2-port, linearly-polarized antenna configuration at 7.50 GHz and at 10° elevation under clear sky conditions.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	16
Mount Type	El over AZ, Tripod
Antenna Pointing Range, Coarse/(Continuous)	
Elevation	5-90° (85°)
Azimuth	180° (120°)
Polarization	180° (180°)
Hub/Enclosure Dimensions	
Diameter	52 in (1.33 m)
Depth	46 in (1.17 m)
Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125,°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	**Speed Summary** *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES76HS- equipped with the MK9HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.15°/1.5°
Azimuth, Slow/Fast	0.2°/2.0°
Polarization	2.2°

For antenna series: ES76- equipped with the MK7MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.025°/0.1°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	2.2°

For antenna series: ES76HS- equipped with the MK9STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.024°/1.5°
Azimuth, Slow/Fast	0.016°/2.0°
Polarization	2.2°

Uplink EIRP Capability* (C-Band)

HPA Output (Watts)	125	500	3000
Uplink EIRP (dBW)	73.5	79.5	87.3

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (Ku-Band)

HPA Output (Watts)	75	300	2000
Uplink EIRP (dBW)	78.0	84.0	92.3

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

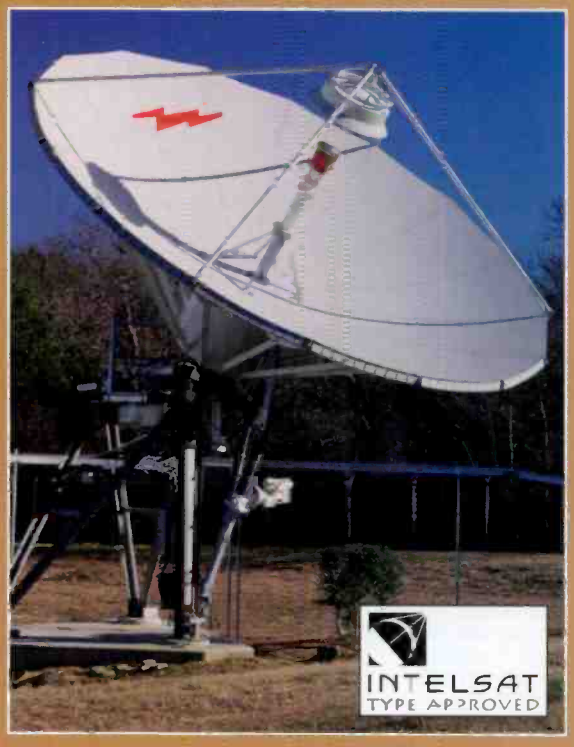
Uplink EIRP Capability* (X-Band)

HPA Output (Watts)	25	100	400
Uplink EIRP (dBW)	68.5	74.5	80.5

* Based on a 2-port antenna configuration at 8.15 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Satellite Communications Systems

7.3-Meter C- and/or Ku-Band



Electrical Performance Meets or Exceeds:

- *INTELSAT Type Approved for F-3 standards.*
  – Reference SP38-21
  Type Number: ES73-CCP2 Registration Number: IA032A00
  Type Number: ES73-CCP4 Registration Number: IA032B00
- *INTELSAT requirements for F-3, F-2, F-1, D-1 and G standards.*
- *U.S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing, verified by off-satellite measurements (C-band).*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. OC/1-AΦ-1).*

Excellent Pattern Characteristics

Gregorian Optics and Fully-Shaped Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Control Options

Microprocessor Steptrack Control Options Available for Motorized Antennas.

Wind Survival

Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in any Position of Operation.

No Field Alignment

Self-Aligning Main Reflector Requires No Field Alignment.

Large Equipment Enclosure

A 52 inch (1321 mm) Diameter by 46 inch (1170 mm) Deep Equipment Enclosure with Doors for Hub Mounting of LNA Systems.

Exceptional Electrical Performance. The precisely formed dual-reflector Gregorian system, coupled with close-tolerance reflector panel manufacturing techniques, results in extremely accurate surface contours providing superior electrical performance characteristics verified by satellite measurements. The self-aligning main reflector requires no field alignment.

Consistent Performance Characteristics. All aluminum reflector panels are manufactured to ensure precise panel alignment.

Large Equipment Enclosure. Integrated into the antenna back structure assembly is a large equipment enclosure capable of housing optional 4-port combining networks with associated support systems.

Maximum Corrosion Resistance. The mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Electrical

Operating Frequency Band*

C-Band Frequency Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.700 GHz	47.9	5.925 GHz	51.4
4.000 GHz	48.6	6.175 GHz	51.8
4.200 GHz	49.0	6.425 GHz	52.1
10.950 GHz	55.2	–	–
11.950 GHz	56.0	–	–
12.750 GHz	56.5	–	–

Polarization*

C-Band	Linearly- or Circularly-Polarized
Ku-Band	Linearly -Polarized

Polarization Discrimination*, (Linearly-Polarized):
>35 dB across 1 dB beamwidth 19 - 25 log θ from 1.8° to 9.2°

Voltage Axial Ratio*, C-Band, circularly-polarized with 4-port combiner
<1.06:1 across the 1 dB beamwidth

Beamwidth, Mid-band, Degrees	*C-Band*	*Ku-Band*
3 dB Receive (Transmit)	0.66 (0.44)	0.22 (0.18)
15 dB Receive (Transmit)	1.30 (0.83)	0.39 (0.31)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*
10°	25	48
30°	14	34
50°	12	29

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1666.

Typical Slab Foundation Information

Soil Bearing Capacity	2000 lb/ft² (9,764 kg/m²)
Reinforcing Steel	1780 lb (807 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	15.5 ft (4.7 m)
Width	15.5 ft (4.7 m)
Depth	2.0 ft (0.6 m)
Concrete Volume	17.8 yd³ (13.6 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES73 G/T at 10° EL (dB/K)	28.3	29.4	30.3

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES73 G/T at 10° EL (dB/K)	32.5	33.3	34.2

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

Uplink EIRP Capability* (C-Band)

HPA Output (Watts)	125	500	3000
Uplink EIRP (dBW)	72.6	78.7	86.4

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	16
Mount Type	El over AZ, Tripod

Antenna Pointing Range, Coarse/(Continuous)

Elevation	5-90° (85°)
Azimuth	180° (120°)
Polarization	180° (180°)

Hub/Enclosure Dimensions

Diameter	52 in (1.33 m)
Depth	46 in (1.17 m)

Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125,°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	**Speed Summary** *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES73HS- equipped with the MK9HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

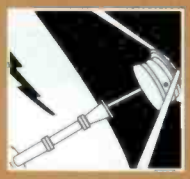
Elevation, Slow/Fast	0.15°/1.5°
Azimuth, Slow/Fast	0.2°/2.0°
Polarization	2.2°

For antenna series: ES73- equipped with the MK7MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.025°/0.1°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	2.2°

For antenna series: ES73HS- equipped with the MK9STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.024°/1.5°
Azimuth, Slow/Fast	0.016°/2.0°
Polarization	2.2°



Satellite Communications Systems

5.6-Meter Ku- or K-Band

K-Band option now available

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements for standard E-2, E-1 and G stations.*
- *EUTELSAT requirements for pattern (CCIR 580) and polarization discrimination.*
- *U.S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. ОС/1-АФ-1).*

High Gain
Gregorian Optics and Fully-Shaped Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Precision Positioning
Optional Motorized Drive Systems Enable Precision Antenna Positioning.

Wind Survival
Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in any Position of Operation.

No Field Alignment
Self-Aligning Main Reflector Requires No Field Alignment.

Large Equipment Enclosure
A 52 inch (1321 mm) Diameter by 46 inch (1170 mm) Deep Equipment Enclosure with Doors for Hub Mounting of LNA Systems.

Multiple System Application. The Andrew 5.6-meter earth station antennas are designed to accommodate high volume data and audio telecommunication system requirements as well as video distribution systems for the television broadcast industry.

High Gain and Exceptional Pattern Characteristics. The 5.6-meter high-gain earth station antenna utilizes interchangeable reflector panel design which ensures that the assembled reflector will maintain the extremely accurate surface contour and guaranteed pattern and gain performance without the need for reflector alignment.

Spacious Equipment Enclosure. A large equipment enclosure is integrated into the antenna back structure assembly capable of accommodating optional 4-port combining networks and associated support systems.

Extreme Durability. The elevation-over-azimuth mount assembly is constructed of hot-dipped galvanized steel to ensure extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Total System Services. Andrew offers complete Field Service and Program Management which includes system engineering, site planning, on-site delivery, system installation, supervision and final system testing. Comprehensive service capabilities ensure the finalized system installation meets or exceeds the specified requirements.

Electrical

Operating Frequency Band*

Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2 dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
10.950 GHz	54.9	14.00 GHz	56.9
11.950 GHz	55.7	14.25 GHz	57.1
12.750 GHz	56.2	14.50 GHz	57.2

Polarization*
Linearly-Polarized

Polarization Discrimination, (Linearly-Polarized):
>35 dB across 1 dB beamwidth 19 - 25 log θ from 1.8° to 9.2°

Beamwidth, Mid-Band, Degrees

3 dB Receive (Transmit)	0.28 (0.23)
15 dB Receive (Transmit)	0.52 (0.44)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin*
10°	41
30°	30
50°	27

Antenna VSWR*, Transmit and Receive <1.25:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1665.

Typical Slab Foundation Information

Soil Bearing Capacity	2000 lb/ft² (9,764 kg/m²)
Reinforcing Steel	1308 lb (593 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	14 ft (4.5 m)
Width	14 ft (4.5 m)
Depth	1.5 ft (0.5 m)
Concrete Volume	12.1 yd³ (9.3 m³)

Note: Other typical foundation designs are available.

G/T Performance*

LNA/LNB Noise Temperature	165K	125K	90K
ES56 G/T at 10° EL (dB/K)	32.2	33.0	34.0

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

Uplink EIRP Capability*

HPA Output (Watts)	75	300	2000
Uplink EIRP (dBW)	75.7	81.7	90.0

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	16
Mount Type	El over AZ, Tripod
Antenna Pointing Range, Coarse/(Continuous)	
Elevation	5-90° (85°)
Azimuth	180° (120°)
Polarization	180° (180°)
Hub/Enclosure Dimensions	
Diameter	52 in (1.32 m)
Depth	46 in (1.17 m)
Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125,°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES56HS- equipped with the MK9HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

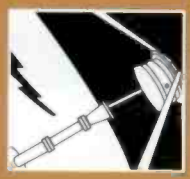
Elevation, Slow/Fast	0.15°/1.5°
Azimuth, Slow/Fast	0.2°/2.0°
Polarization	1.5°

For antenna series: ES56- equipped with the MK7MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.025°/0.1°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	1.5°

For antenna series: ES56HS- equipped with the MK9STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.024°/1.5°
Azimuth, Slow/Fast	.016°/2.0°
Polarization	1.5°



Satellite Communications Systems

4.6-Meter Dual-Reflector C-*, Ku-* or X-Band

* C- and Ku-band versions are INTELSAT Type Approved

X-Band option now available

Electrical Performance Meets or Exceeds:

- *INTELSAT F-1 Type Approved – Reference SP38-06*
  Type Number: ES46( )-CCP2 Registration Number: IA015A00
  Type Number: ES46( )-CCP2-24 Registration Number: IA015AA0
  Type Number: ES46( )-CCP4 Registration Number: IA015B00
  Type Number: ES46( )-CCP4-24 Registration Number: IA015BA0
  – Reference SP38-10
  Type Number: ES46( )-4124W Registration Number: IA021B00
  Type Number: ES46( )-4124W-24 Registration Number: IA021BA0
  Type Number: ES46( )-124W Registration Number: IA021A00
  Type Number: ES46( )-124W-24 Registration Number: IA021AA0
- *INTELSAT Requirements for standard F-1, D-1 and G (C-band) and E-1 or E-2 (Ku-band).*
- *EUTELSAT requirements for pattern and polarization discrimination.*
- *U. S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing (Ku-band).*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation. (Reference: Homologation Certificate No. OC/1-AΦ-1).*

Control Options
Microprocessor or Steptrack Control Options Available for Motorized Antennas.

Equipment Enclosure
A 48 inch (1219 mm) Diameter by 24 inch (610 mm) Deep Equipment Enclosure with Doors for Hub Mounting of LNA Systems.

Field Changeable Feed System
C-Band Feed System is Field Switchable from Circular to Linear Polarization.

No Field Alignment
Self-Aligning Main Reflector Requires No Field Alignment.

High Performance Dual-Reflector Feed System. The Andrew 4.6-meter earth station antenna incorporates a uniquely formed dual-reflector Gregorian system, coupled with close-tolerance manufacturing techniques, resulting in extremely accurate surface contours and providing superior electrical performance characteristics.

Economical Shipping Costs. The segmented aluminum reflector panels are precisely cut from a single piece, precision spun reflector to minimize shipping costs.

Horizon-To-Horizon Coverage. The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from virtually any worldwide location.

Non-Critical Pedestal Mount Installation. The easily installed pedestal mount allows from non-critical foundation orientation and is capable of 180° of azimuth travel via three 120° continuous ranges with 30° overlap. Elevation travel is continuous from 0 to 90°.

Manual Or Motorizable Mount Configurations. Multiple mount configurations provide a wide variety of options to enable custom system designs to meet initial and future optional requirements.

Motorizable Mount Enables Future Motorized Operation. The motorizable pedestal mount features self-aligning bearings for the elevation pivots, resulting in "zero" backlash and the ability to upgrade the antenna for motorized operation, including steptracking or program-tracking applications.

Minimal Field Testing. These antennas can be deployed in the field with minimal testing of G/T to become fully certified as an INTELSAT standard E-2, E-1, or F-1 station. Coordination with the local signatory is required on INTELSAT Type Accepted antennas.

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz
X-Band Receive	7.25-7.75 GHz
X-Band Transmit	7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	43.2	5.850 GHz	48.0
4.000 GHz	44.3	6.175 GHz	48.4
4.200 GHz	44.8	6.425 GHz	48.8
7.250 GHz	49.7	7.90 GHz	50.2
7.500 GHz	49.9	8.15 GHz	50.4
7.750 GHz	50.1	8.40 GHz	50.6
10.950 GHz	53.0	14.00 GHz	55.0
11.950 GHz	53.8	14.25 GHz	55.1
12.750 GHz	54.3	14.50 GHz	55.2

Polarization*
Circular, switchable to linear in the field (C-Band)
Linear (Ku-Band)

Polarization Discrimination*, (Linearly-Polarized):
>35 dB across 1 dB beamwidth - (C- or Ku-Band)

Voltage Axial Ratio*, C-Band, circularly-polarized with 4-port combiner
<1.06:1 on axis
X-Band, <1.20:1 on axis, Tx and Rx

Beamwidth, Mid-band, Degrees	**C-Band**	**Ku-Band**	**X-Band**
3 dB Receive (Transmit)	0.92 (0.63)	0.34 (0.29)	0.51 (0.47)
15 dB Receive (Transmit)	1.82 (1.21)	0.67 (0.54)	1.01 (0.93)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	32	42	37
30°	27	32	27
50°	25	29	24

Antenna VSWR*, Transmit and Receive <1.25:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1669 (C-Band),Bulletin 1670 (Ku-Band) and Bulletin 3653A (X-Band).

Typical Slab Foundation Information

Soil Bearing Capacity	3000 lb/ft² (14.646 kg/m²)
Reinforcing Steel	284 lb (129 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	10.0 ft (3.05 m)
Width	10.0 ft (3.05 m)
Depth	1.5 ft (0.5 m)
Concrete Volume	5.56 yd³ (4.25 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES46 G/T at 10° EL (dB/K)	23.3	24.1	24.7

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES46 G/T at 10° EL (dB/K)	30.2	31.1	32.0

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (X-Band)

LNA/LNB Noise Temperature	50K	75K	100K
ES46 G/T at 10° EL (dB/K)	29.7	28.7	27.9

* Based on a 2-port, linearly-polarized antenna configuration at 7.50 GHz and at 10° elevation under clear sky conditions.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	8
Mount Type	El over AZ, Pedestal
Antenna Pointing Range, Coarse/(Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	180° (180°)
Hub/Enclosure Dimensions	
Diameter	48 in (1.22 m)
Depth	24 in (0.61 m)
Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

The 4.6 m antenna motorized version can be equipped with manual struts or jackscrews which can be upgraded to motorized operation with the addition of optional motorization drive packages. The drive speed characteristics of these motor drive systems are summarized below:

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES46MPJ- equipped with the MK5HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.22°/1.03°
Azimuth, Slow/Fast	0.37°/1.6°
Polarization	1.5°

For antenna series: ES46MPJ- equipped with the MK5MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.015°/.065°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	1.5°

For antenna series: ES46MPJ- equipped with the MK5STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.014°/0.98°
Azimuth, Slow/Fast	0.023°/1.5°
Polarization	1.5°

Uplink EIRP Capability* (C-Band)

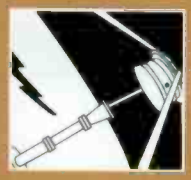
HPA Output (Watts)	50	300	1000
Uplink EIRP (dBW)	65.0	72.8	78.0

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (Ku-Band) and X-Band

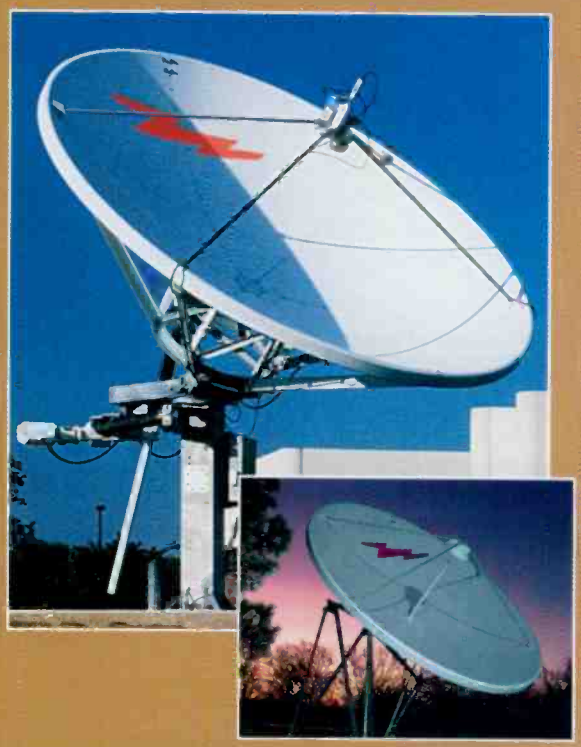
HPA Output (Watts)	(50) 25	(300) 100	(600) 400
Uplink EIRP (dBW)	(72.0) 64.2	(79.8) 70.2	(82.8) 76.2

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.



Satellite Communications Systems

4.5-Meter C- and/or Ku- or X-Band



X-Band option now available

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements for E-1 and G standards.*
- *U. S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing based on off-satellite measurements.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No OC/1-АΦ-1).*

Excellent Pattern Characteristics

Patented Prime Focus Optics or Dual-Reflector Design along with the Parabolic Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Remote Control Options

Optional Motorized Pedestal Mount Enables Remote System Control Functions.

Wind Survival

Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in any Position of Operation.

No Field Alignment

Self-Aligning Main Reflector Requires No Field Alignment.

Easy Installation

Installation Without a Crane Using Optional Hoisting Kit.

Multiple Operational Configuration Availability. These Andrew 4.5-meter high performance antennas are offered in transmit/receive as well as receive-only configurations.

Worldwide Usage. Many of these antenna types are utilized for a wide variety of high-density data, voice communication networks and broadcast industry applications in countries throughout the world.

Patented Prime Focus Feed System. The exclusively designed 2- or 4-port prime focus, beam-shaping feed and ground plane configuration, together with a precision spun aluminum reflector, produce extremely high gain, excellent efficiency and closely controlled pattern characteristics.

Computer-Shaped Gregorian Subreflector. Produces increased energy density distribution for increased antenna efficiency.

Easy/Accurate Assembly. All required installation mounting holes are pre-drilled before the reflector spinning is segmented to ensure the assembled reflector will maintain the original surface contour.

Multiple Band Operation. Exceptional performance and versatility enables the antenna to be configured for either linearly- or circularly-polarized C-Band, linearly-polarized Ku-Band, Hybrid C-/Ku-Band or X-band operation.

Both Pedestal and Tripod Mount Types Are Available. Motorizable and manual pedestal mounts feature 180° azimuth coverage in three continuous 120° overlapping ranges and 90° continuous elevation adjustment. The manual tripod mount provides 120° of coarse azimuth coverage in three overlapping ranges and 90° coarse elevation adjustment.

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz
X-Band Receive	7.25-7.75 GHz
X-Band Transmit	7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	43.0	5.850 GHz	46.2
4.000 GHz	44.0	6.175 GHz	46.7
4.200 GHz	44.4	6.425 GHz	47.0
7.250 GHz	48.4	7.90 GHz	49.2
7.500 GHz	48.7	8.15 GHz	49.5
7.750 GHz	49.0	8.40 GHz	49.8
10.950 GHz	51.8	14.00 GHz	53.6
11.950 GHz	52.6	14.25 GHz	53.8
12.750 GHz	53.1	14.50 GHz	53.9

Polarization*
Linearly- or Circularly-Polarized

Polarization Discrimination*, (Linearly-Polarized):
>35 dB on axis

Voltage Axial Ratio*, C-Band, circularly-polarized with 2-port combiner
<1.09:1 on axis,Tx
<1.20:1 on axis, Rx
X-Band, <1.20:1 on axis, Tx and Rx

Beamwidth, Mid-band, Degrees	**C-Band**	**Ku-Band**	**X-Band**
3 dB Receive (Transmit)	1.22 (0.85)	0.40 (0.85)	0.66 (0.61)
15 dB Receive (Transmit)	2.47 (1.90)	0.84 (0.67)	1.40 (1.29)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	32	45	45
30°	20	33	34
50°	16	30	29

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1672 (Pedestal), Bulletin 1673 (Tripod) and Bulletin 3653A (X-Band).

Pedestal Slab Foundation Information

Soil Bearing Capacity	3000 lb/ft² (14,646 kg/m²)
Reinforcing Steel	284 lb (129 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	10.0 ft (3.05 m)
Width	10.0 ft (3.05 m)
Depth	1.5 ft (0.5 m)
Concrete Volume	5.56 yd³ (4.25 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES45 G/T at 10° EL (dB/K)	23.4	24.3	25.0

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES45 G/T at 10° EL (dB/K)	29.1	29.9	30.8

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (X-Band)

LNA/LNB Noise Temperature	50K	75K	100K
ES45 G/T at 10° EL (dB/K)	28.1	27.2	26.5

* Based on a 2-port, linearly-polarized antenna configuration at 7.50 GHz and at 10° elevation under clear sky conditions.

Mechanical

Feed Type	Prime Focus
Reflector Material	Precision-Formed Aluminum
Reflector Segments	6
Mount Type	El over AZ, Manual Tripod or Pedestal
Antenna Pointing Range, Pedestal Mount, Coarse/(Continuous)	
Elevation	0-90° (90°)
Azimuth	180° (120°)
Antenna Pointing Range, Tripod Mount, Coarse/(Continuous)	
Elevation (Standard)	0-62° (15°)
Elevation (Extended)	33-90° (15°)
Azimuth	164° (15°)
Wind Loading, Survival	125 mph (200 km/h) in any position of operation
Wind Loading, Operational (motor drives)	45 mph (72 km/h), Pedestal Mount gusting to 65 mph (105 km/h)
Temperature, Operational	-40° to 125,°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES45MPJ- equipped with the MK5HS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.22°/1.03°
Azimuth, Slow/Fast	0.37°/1.6°
Polarization	1.5°

For antenna series: ES45MPJ- equipped with the MK5MS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.015°/.065°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	1.5°

For antenna series: ES45MPJ- equipped with the MK5STHS- series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.014°/0.98°
Azimuth, Slow/Fast	0.023°/1.5°
Polarization	1.5°

Uplink EIRP Capability* (C-Band)

HPA Output (Watts)	25	125	500
Uplink EIRP (dBW)	60.5	67.5	73.5

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (Ku-Band)

HPA Output (Watts)	25	125	500
Uplink EIRP (dBW)	60.5	67.5	73.5

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

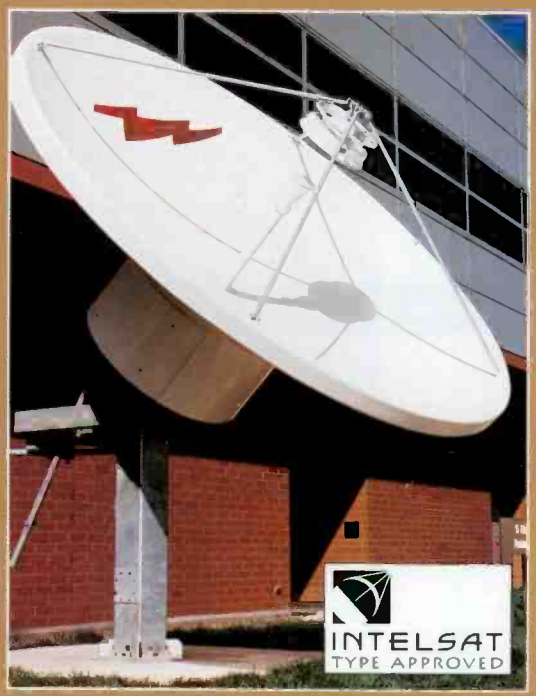
Uplink EIRP Capability* (X-Band)

HPA Output (Watts)	25	100	400
Uplink EIRP (dBW)	63.3	69.3	75.3

* Based on a 2-port antenna configuration at 8.15 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Satellite Communications Systems

3.7-Meter Dual-Reflector C-*, Ku-*, K- or X-Band



** C- and Ku-band versions are INTELSAT Type Approved*

K- or X-Band options now available

Electrical Performance Meets or Exceeds:

- *INTELSAT E-1 Type Approved - Reference SP37-01*
  Type Number: ES37( )K-124W
  Registration Number: IA012A00
  Type Number: ES37( )K-124W-24 and ES37MPJK-124W-24
  Registration Number: IA012AA0
- *INTELSAT F-1 Type Approved - Reference SP37-02*
  Type Number: ES37K-CCP2 Registration Number: IA014A00
  Type Number: ES37( )K-CCP2-24 Registration Number: IA014AA0
- *EUTELSAT Type Approved 2-port version*
  Registration Number:EA-A002
- *U.S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing at Ku-band frequency.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No OC/1-AΦ-1).*

High Gain
Gregorian Optics and Fully-Shaped Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Control Options
Microprocessor Steptrack Control Options Available for Motorized Antennas.

Easy Future Upgrades
Motorizable Mount Enables Future Motorization Upgrade.

Equipment Enclosure
A 48 inch (1219 mm) Diameter by 24 inch (610 mm) Deep Equipment Enclosure with Doors for Hub Mounting of LNA Systems.

Field Changeable Feed System
C-Band Feed System is Field Switchable from Circular to Linear Polarization.

No Field Alignment
Self-Aligning Main Reflector Requires No Field Alignment.

Superior Electrical Performance. The Andrew 3.7-meter antenna utilizes advanced dual-reflector technology together with the single-piece precision spun aluminum reflector assembly results in extremely accurate surface contour, providing exceptionally high gain, superior efficiency and closely controlled pattern characteristics.

Two-Piece Reflector. Two-piece reflectors are cut from a single-piece precision spun aluminum reflector assembly resulting in extremely accurate surface contour after assembly without special reflector alignment.

Spacious Built-In Enclosure. A large equipment enclosure capable of accommodating optional 4-port combining networks is directly attached to the rear of the reflector assembly.

Maximum Durability With Minimal Maintenance. The hot-dipped galvanized steel ground mount assembly ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Cost Effective Expansion. Available modular equipment options include 2- or 4-port combining network configurations, dual- or single-speed motor drive systems for worldwide applications, programmable control systems, feed rotation systems, anti-icing equipment and pressurization systems.

Easy Installation. The easily installed pedestal mount allows for non-critical foundation orientation.

Minimal Field Testing. These antennas can be deployed in the field with minimal testing of G/T to become fully certified as an INTELSAT standard E-1, E-2 or F-1 station. Coordination with the local signatory is required on INTELSAT Type Accepted antennas.

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz
X-Band Receive	7.25-7.75 GHz
X-Band Transmit	7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	41.0	5.850 GHz	45.8
4.000 GHz	42.5	6.175 GHz	46.3
4.200 GHz	43.0	6.425 GHz	46.5
7.250 GHz	47.7	7.90 GHz	48.2
7.500 GHz	47.9	8.15 GHz	48.4
7.750 GHz	48.1	8.40 GHz	48.6
10.950 GHz	51.0	14.00 GHz	53.1
11.950 GHz	51.8	14.25 GHz	53.3
12.750 GHz	52.3	14.50 GHz	53.4

Polarization*
Circular, switchable to linear in the field (C-Band)
Linear (Ku-Band)

Polarization Discrimination*, (Linearly-Polarized):
>35 dB across 1 dB beamwidth - (C- or Ku-Band)

Voltage Axial Ratio*, (Circularity-Polarized)
<1.09:1 on axis,Tx
<1.20:1 on axis, Rx
X-Band, <1.20:1 on axis, Tx and Rx

Beamwidth, Mid-band, Degrees	C-Band	Ku-Band	X-Band
3 dB Receive (Transmit)	1.20 (0.80)	0.42 (0.36)	0.65 (0.60)
15 dB Receive (Transmit)	2.0 (1.40)	0.85 (0.69)	1.19 (1.09)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	36	39	39
30°	23	26	27
50°	21	24	24

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. Contact Andrew for further feed/combiner option information. For Ku-Band ask for Bulletin 1671, and Bulletin 3653A (X-Band).

Manual Slab Foundation Information

Soil Bearing Capacity	3000 lb/ft² (14,646 kg/m²)
Reinforcing Steel	194 lb (88 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	9.0 ft (2.74 m)
Width	9.0 ft (2.74 m)
Depth	1.0 ft (0.3 m)
Concrete Volume	3.0 yd³ (2.3 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES37 G/T at 10° EL (dB/K)	21.9	22.8	23.6

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES37 G/T at 10° EL (dB/K)	28.4	29.3	30.3

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (X-Band)

LNA/LNB Noise Temperature	50K	75K	100K
ES37 G/T at 10° EL (dB/K)	27.6	26.6	25.9

* Based on a 2-port, linearly-polarized antenna configuration at 7.50 GHz and at 10° elevation under clear sky conditions.

Mechanical

Feed Type	Dual-Reflector, Gregorian
Reflector Material	Precision-Formed Aluminum
Reflector Segments	2
Mount Type	El over AZ, Pedestal

Antenna Pointing Range, Coarse/(Continuous)

Elevation	0-90° (90°)
Azimuth	180° (120°)
Polarization	360° (180°)

Hub/Enclosure Dimensions (when applicable)

Diameter	48 in (1.2 m)
Depth	24 in (.61 m), optional 32.5 in (.83 m)

Wind Loading, Survival (standard)
125 mph (200 km/h) in any position of operation
115 mph (185 km/h) in any position of operation with optional 32.5 in (.83 m) deep enclosure

Wind Loading, Operational (motor drives)
41 mph (66 km/h), gusting to 60 mph (97 km/h)
41 mph (66 km/h), gusting to 60 mph (97 km/h) with 32 in (.83 m) enclosure

Temperature, Operational	-40° to 125°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES37MPJK- equipped with the MK5HS-series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.22°/1.03°
Azimuth, Slow/Fast	0.37°/1.6°
Polarization	1.5°

For antenna series: ES37MPJK- equipped with the MK5MS-series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.015°/.065°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	1.5°

For antenna series: ES37MPJK- equipped with the MK5STHS-series drive systems with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.014°/0.98°
Azimuth, Slow/Fast	0.023°/1.5°
Polarization	1.5°

Uplink EIRP Capability* (C-Band)

HPA Output (Watts)	16	125	500
Uplink EIRP (dBW)	58.1	67.0	73.0

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (Ku-Band)

HPA Output (Watts)	16	125	500
Uplink EIRP (dBW)	65.2	74.1	80.1

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (X-Band)

HPA Output (Watts)	25	100	400
Uplink EIRP (dBW)	62.2	68.2	74.2

* Based on a 2-port antenna configuration at 8.15 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Satellite Communications Systems

3.6-Meter Prime Focus C- and/or Ku- or X-Band

X-Band option now available

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements for E-1 and G standards.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. OC/1-АΦ-1).*

Excellent Pattern Characteristics

Patented Prime Focus Optics and Parabolic Main Reflector Provides Excellent Pattern Characteristics and High Gain.

Multi-Band Capability

Excellent Cross-Polarization Discrimination Performance Required for EUTELSAT Applications.

Control Options

Optional System Remote Control Capability.

Wind Survival

Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in any Position of Operation.

No Field Alignment

Self-Aligning Main Reflector Requires No Field Alignment.

Easy Installation

Installation Without a Crane Using Optional Hoisting Kit.

Variety of Applications. The Andrew 3.6-meter earth station antennas are designed for high-density data and voice telecommunication networks as well as broadcast applications.

Utilized Throughout The World. These high performance antennas are currently utilized for a wide variety of telecommunication applications in countries throughout the world.

Patented Prime Focus Feed System. The exclusively designed 2- or 4-port prime focus, beam-shaping feed and ground plane configuration, together with a precision spun aluminum reflector, produce extremely high gain, excellent efficiency and closely controlled pattern characteristics.

Easy/Accurate Assembly. All required installation mounting holes are pre-drilled before the reflector spinning is segmented to ensure the assembled reflector will maintain the original surface contour.

Multiple Band Operation. Exceptional performance and versatility enables the antenna to be configured for either C-Band, Ku-Band, Hybrid C-/Ku-Band or X-Band feed/combining networks for linearly- or circularly-polarized system operation.

Galvanized Ground Mount Assembly. The hot-dipped galvanized steel ground mount assembly ensures extended product life while use of galvanized and stainless steel hardware throughout the antenna structure maximizes corrosion resistance.

Horizon-To-Horizon Coverage. The elevation-over-azimuth pedestal ground mount enables horizon-to-horizon coverage from virtually any worldwide location.

Two-Piece Reflector. Two-piece reflectors are cut from a single-piece precision spun aluminum reflector assembly resulting in extremely accurate surface contour after assembly without special reflector alignment.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

Electrical

Operating Frequency Band*

C-Band Receive	3.625-4.2 GHz
C-Band Transmit	5.850-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz
X-Band Receive	7.25-7.75 GHz
X-Band Transmit	7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	41.1	5.850 GHz	44.0
4.000 GHz	42.0	6.175 GHz	44.5
4.200 GHz	42.4	6.425 GHz	44.8
7.250 GHz	46.4	7.90 GHz	47.2
7.500 GHz	46.7	8.15 GHz	47.5
7.750 GHz	47.0	8.40 GHz	47.8
10.950 GHz	49.0	14.00 GHz	51.8
11.950 GHz	50.7	14.25 GHz	52.0
12.750 GHz	51.2	14.50 GHz	52.1

Polarization*
Linearly- or Circularly-Polarized

Polarization Discrimination*, (Linearly-Polarized):
>35 dB on axis

Voltage Axial Ratio*, C-Band, circularly-polarized with 2-port combiner
<1.09:1 on axis,Tx
<1.20:1 on axis, Rx
X-Band, <1.20:1 on axis, Tx and Rx

Beamwidth, Mid-band, Degrees	C-Band	Ku-Band	X-Band
3 dB Receive (Transmit)	1.40 (0.89)	0.46 (0.39)	0.73 (0.68)
15 dB Receive (Transmit)	3.12 (2.00)	1.03 (0.87)	1.64 (1.51)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	35	48	48
30°	22	33	35
50°	18	30	30

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1675 and Bulletin 3653A (X-Band).

Manual Slab Foundation Information

Soil Bearing Capacity	3000 lb/ft² (14,646 kg/m²)
Reinforcing Steel	194 lb (88 kg)
Concrete Compressive Strength	3000 lb/in² (211 kg/cm²)
Foundation Size:	
Length	9.0 ft (2.74 m)
Width	9.0 ft (2.74 m)
Depth	1.0 ft (0.3 m)
Concrete Volume	3.0 yd³ (2.3 m³)

Note: Other typical foundation designs are available.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES36 G/T at 10° EL (dB/K)	21.3	22.1	22.9

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10°elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES36 G/T at 10° EL (dB/K)	27.1	28.0	28.9

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (X-Band)

LNA/LNB Noise Temperature	50K	75K	100K
ES36 G/T at 10° EL (dB/K)	26.0	25.1	24.4

* Based on a 2-port, linearly-polarized antenna configuration at 7.50 GHz and at 10° elevation under clear sky conditions.

Mechanical

Feed Type - (C-Band)	Prime Focus
Feed Type - (Ku-Band)	Prime Focus
Reflector Material	Precision-Formed Aluminum
Reflector Segments	2
Mount Type	El over AZ, Pedestal

Antenna Pointing Range, Coarse/(Continuous)

Elevation	0-90° (90°)
Azimuth	180° (120°)

Wind Loading, Survival (standard)
125 mph (200 km/h) in any position of operation

Wind Loading, Survival (high-wind)
135 mph (217 km/h) in any position of operation

Wind Loading, Operational (motor drives)
45 mph (72 km/h), gusting to 65 mph (105 km/h)

Temperature, Operational	-40° to 125°F (-40° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

Motor Drive Speed Summary

Drive System *Type*	Speed Summary *High*	*Medium*	*Low*
HS	Fast	Slow	–
MS	–	Fast	Slow
STHS	Fast	–	Slow

Note: All Az/El motorization drive packages are comprised of dual-speed motors, yielding a "fast" and "slow" speed for each speed range per the above chart. All 50 Hz motor drive speeds are approximately .83 the speed of the 60 Hz motor.

For antenna series: ES36MPJK- equipped with the MK5HS-series motor drive system with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.22°/1.03°
Azimuth, Slow/Fast	0.37°/1.6°
Polarization	1.5°

For antenna series: ES36MPJK- equipped with the MK5MS-series motor drive system with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.015°/.065°
Azimuth, Slow/Fast	0.025°/0.1°
Polarization	1.5°

For antenna series: ES36MPJK- equipped with the MK5STHS-series motor drive system with 60 Hz motors.
Nominal Speed, (degrees/second)

Elevation, Slow/Fast	0.014°/0.98°
Azimuth, Slow/Fast	0.023°/1.5°
Polarization	1.5°

Uplink EIRP Capability* (C-Band)

HPA Output (Watts)	25	125	500
Uplink EIRP (dBW)	58.3	65.3	71.3

* Based on a 2-port antenna configuration at 6.175 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (Ku-Band)

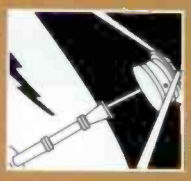
HPA Output (Watts)	16	125	500
Uplink EIRP (dBW)	63.9	72.8	78.8

* Based on a 2-port antenna configuration at 14.25 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.

Uplink EIRP Capability* (X-Band)

HPA Output (Watts)	25	100	400
Uplink EIRP (dBW)	61.3	67.3	73.3

* Based on a 2-port antenna configuration at 8.15 GHz and 0 dB allowance for waveguide (IFL) loss between the HPA and the antenna.



Satellite Communications Systems

2.4-Meter Prime Focus VSAT Antennas

Electrical Performance Meets or Exceeds:

- *INTELSAT E-1 Type Approved - Reference SP38-22 Type Number: ESA24K-1 Registration Number: IA033A00 Type Number: ES24K-1-2 Registration Number: IA033AA0*
- *INTELSAT requirements for standard E-1 and G stations.*
- *EUTELSAT Type approved- Registration Number: EA-A003*
- *U. S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing at Ku-Band.*
- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No OC/1-АΦ-1).*

Superior System Flexibility

System Flexibility Enables the Use of a Single VSAT Antenna Product Line to Satisfy all System Application Requirements.

Easy Future Upgrades

Total System Compatibility Ensures that the Current System Configuration can be Easily Upgraded at a Later Date to Address Future Requirements Using Additional Accessory Components.

Complete Line of Options and Accessories. Cross axis kits, shield kits and deicing kits are available with the 2.4 meter VSAT product line.

INTELSAT and Eutelsat Type Approval. The prime focus 2.4-Meter VSAT antennas have been Type Approved by both INTELSAT and Eutelsat. This Type Approval ultimately saves the customer both time and money by negating extensive system testing.

Prime Focus Feed System. The prime focus designed 2.4-meter VSAT provides excellent pattern characteristics and high gain.

Electrical Specifications - 2.4 Meter VSAT

Operating Frequency Band

Ku-Band Receive	*Ku-Band Transmit*
10.95-12.75 GHz	12.75-14.50 GHz

Gain, at rectangular waveguide flange of feed. (dBi, ±0.2 dB)

Rx Frequency	*Rx Gain*	*Rx Frequency*	*Rx Gain*
10.950 GHz	47.0	12.200 GHz	47.6
11.325 GHz	47.1	12.500 GHz	47.8
11.700 GHz	47.4	12.750 GHz	48.1
11.950 GHz	47.6		

Tx Frequency	*Tx Gain*	*Tx Frequency*	*Tx Gain*
12.750 GHz	48.1	14.000 GHz	49.0
13.000 GHz	48.4	14.250 GHz	49.0
13.250 GHz	48.7	14.500 GHz	49.2

Polarization	Linear
Polarization Discrimination	>35 dB across 1 dB beamwidth
Antenna VSWR, Receive (Transmit)	1.5:1 (1.35:1)
with W/G Option	1.5:1 (1.4:1)
Isolation, Tx to Rx	>35 dB

Beamwidth, degrees

3 dB Receive (Transmit)	0.75 (0.65)
15 dB Receive (Transmit)	1.60 (1.40)

Antenna Noise Temperature

Elevation	*Kelvin*
10°	63°
20°	48°
30°	45°

Antenna G/T @10° El, @10.95 GHz with 90° K LNA	25.5 dB/K

Mechanical Specifications

Feed Type*	Prime Focus, Aluminum Components Chromate Converted per MIL-C-5541C Finished with highly diffusive white paint
Flange Type	WR75 Cover Gaskets
Reflector Type	Precision-Formed Aluminum, single-piece Chromate Converted per MIL-C-5541C Finished with highly diffusive white paint
Mount Type	Az over El, manual pipe mount Galvanized per ASTM-AL 23 Customer furnished 5-inch nominal schedule 80 pipe interface

Antenna Pointing Range

Elevation	0-90°
Azimuth	360°

Polarization Adjustment	180°
Wind Loading, Survival in any position of operation	125 mph (200 km/h)
Wind Loading, Operational	50 mph (80 km/h)

Pointing Accuracy, worst case

Winds Gusting to 50 mph (80 km/h)	0.084°
Gain Degrades @11 GHZ	<0.25 dB

* Feed replacement does not require electrical realignment.

Environment Specifications

Temperature, Operational	-50° to 125°F (-45° to 52°C)
Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%

Available Options

Polarized Cross-Axis Kit*	0.5 dB attenuation
Deicing Kit	Walton Snow Shield
Shield Kit	Needed for FCC 2° Compliance

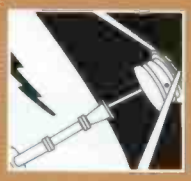
* Allows transmit RF module mounting behind reflector.

Shipping Information

Weight, Net	
Reflector	125 lbs. (57 kg)
Mount	130 lbs. (59 kg)
Feed System	10 lbs. (4.5 kg)
Dimensions/Weight, Gross	
Unit Pack	107"Lx44"Wx100"H, 800 lbs. (363 kg)
Bulk Pack, 10 each	
Reflector Pack	107"Lx85"Wx108"H, 2350 lbs. (1066 kg)
Mount/Feed Pack	40"Lx60"Wx40"H, 1000 lbs. (454 kg)

Available Options

Type ESA24K-1, 2.4-Meter Ku-Band ESA
Type ESA24K-1-2, 2.4-Meter Ku-Band ESA with 90 LNA
Type 173615 Polarization Cross-Axis Kit
Type 173622 Partial Shield Kit
Type 173623 Reflector Deicing Kit (Walton Snow Shield)
Type 173623-1 Reflector Deicing Kit (110 version)
Type 173623-2 Reflector Deicing Kit (220 version)
Type 173623-3 Reflector Deicing Kit (no heater)



Satellite Communications Systems

1.8-Meter and 2.4-Meter Offset VSAT Antennas

Electrical Performance Meets or Exceeds:

- *ITU-R, S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No. ОС/1-АФ-1).*

Superior System Flexibility

System Flexibility Enables the Use of a Single VSAT Antenna Product Line to Satisfy all System Application Requirements.

Easy Future Upgrades

Total System Compatibility Ensures that the Current System Configuration can be Easily Upgraded at a Later Date to Address Future Requirements Using Additional Accessory Components.

Exceptional Durability

Both Heavy Duty (35 lb Capacity) Self-Aligning and Standard (15 lb Capacity) Self-Aligning Feed Support Types are Available.

Complete Line of Options and Accessories. Field installable enclosed radiant heater (ERH) anti-icing systems for 1.8-meter VSATs provide thermostatically controlled protection of the reflector assembly from the accumulation of ice and snow.

Variety of Operational Power Requirements. The 1.8-meter ERH anti-icing system is capable of operating at either 100-125 Vac or 200-250 Vac at 50/60 Hz.

Prime Focus Offset Feed System. The offset feed system produces excellent pattern characteristics and eliminates transmit waveguide degradation.

Electrical - 2.4 Meter

Operating Frequency Band*

C-Band Receive	3.7-4.2 GHz
C-Band Transmit	5.925-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.950 GHz	37.6	6.175 GHz	41.7
11.950 GHz	47.6	14.25 GHz	49.4

Polarization*
Linear

Polarization Discrimination*
>35 dB on axis

Beamwidth, Mid-band, Degrees	**C-Band**	**Ku-Band**
3 dB Receive (Transmit)	2.02 (1.32)	0.72 (0.61)
15 dB Receive (Transmit)	4.07 (2.84)	1.42 (1.33)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*
10°	34	35
20°	26	26

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. Contact Andrew for further feed/combiner option information.

Electrical - 1.8 Meter

Operating Frequency Band*

C-Band Receive	3.7-4.2 GHz
C-Band Transmit	5.925-6.425 GHz
Ku-Band Receive	10.95-12.75 GHz
Ku-Band Transmit	14.0-14.5 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.950 GHz	35.7	6.175 GHz	39.8
11.950 GHz	45.1	14.25 GHz	46.6

Polarization*
Linear

Polarization Discrimination*
>35 dB on axis

Beamwidth, Mid-band, Degrees	**C-Band**	**Ku-Band**
3 dB Receive (Transmit)	2.82 (1.88)	0.87 (0.74)
15 dB Receive (Transmit)	5.49 (3.62)	1.76 (1.48)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*
10°	36	41
20°	28	31

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. Contact Andrew for further feed/combiner option information.

Mechanical - 2.4 Meter

Feed Type	Prime Focus, Offset
Reflector Material	Precision-Formed Aluminum
Reflector Segments	1
Mount Type	El over AZ

Antenna Pointing Range, Continuous

Elevation	0-90°
Azimuth	82.5°
Polarization	360°

Wind Loading, Survival
125 mph (200 km/h) in any position of operation

Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

G/T Performance* (C-Band)

LNA/LNB Noise Temperature	65K	45K	30K
ES24 G/T at 10° EL (dB/K)	16.9	17.7	18.5

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES24 G/T at 10° EL (dB/K)	24.3	25.2	26.3

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.

Mechanical - 1.8 Meter

Feed Type	Prime Focus, Offset
Reflector Material	Precision-Formed Aluminum
Reflector Segments	1
Mount Type	El over AZ

Antenna Pointing Range, Continuous

Elevation	0-90°
Azimuth	82.5°
Polarization	360°

Wind Loading, Survival
125 mph (200 km/h) in any position of operation

Rain	4 in (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.

G/T Performance* (C-Band)

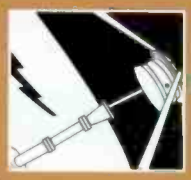
LNA/LNB Noise Temperature	65K	45K	30K
ES18 G/T at 10° EL (dB/K)	15.0	15.8	16.5

* Based on a 2-port, linearly-polarized antenna configuration at 4 GHz and at 10° elevation under clear sky conditions.

G/T Performance* (Ku-Band)

LNA/LNB Noise Temperature	165K	125K	90K
ES18 G/T at 10° EL (dB/K)	21.7	22.6	23.6

* Based on a 2-port, linearly-polarized antenna configuration at 12 GHz and at 10° elevation under clear sky conditions.



Satellite Communications Systems

3.7/4.5-Meter C-, Ku- or X-Band Transportable Antennas

X-Band option now available

Electrical Performance Meets or Exceeds:

- *INTELSAT requirements.*
- *EUTELSAT requirements.*
- *U. S. FCC regulation 25-209, for mandatory pattern requirements for 2° satellite spacing based on off-satellite measurements. Applies to 3.7-meter (Ku-Band) and 4.5-meter (C- and Ku-Band) only.*
- *ITU-R S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No OC/1-АФ-1).*

Available in Three Modular Types:

- *Antenna Only*
- *Antenna with Manual/Motorizable Elevation-Over-Azimuth Positioner*
- *Antenna with Manual/Motorizable Positioner and Heavy Duty Tandem Axle Trailer*

Wind Survival

Rugged Aluminum and Steel Construction Provides 125 mph (200 km/h) Wind Survival, in the "Stow" Position and 65 mph (105 km/h) Gusting to 80 mph (125 km/h) in Any Position of Operation With Proper Anchoring.

Control Options

Variable Speed Motor Drive With Microprocessor Control Options Are Available.

High Gain, Exceptional Pattern Characteristics and Extensive Versatility. The various 2- and 4-port feed system designs produce superior performance and allow for exceptional versatility at the time of initial purchase, as well as in the future, as requirements evolve.

Precision Trifold Reflector. The aluminum Trifold® reflector panels are cut form a single-piece precision spinning. Panel design and manufacture provides excellent thermal expansion characteristics and ensures that the deployed reflector assembly will maintain the extremely accurate surface contour.

Rapid Deployment. The unique Trifold design enables antenna deployment by one person in less than 30 minutes.

Extended Range Positioner. The versatile elevation-over-azimuth positioner features continuous 330° azimuth coverage and 85° continuous elevation adjustment. This large range of adjustment provides non-critical positioner/trailer orientation, and the ability to view geostationary satellites, horizon-to-horizon, from any location worldwide.

Increased Durability and Pointing Accuracy. The aluminum back structure and hot-dipped galvanized steel positioner maintains pointing accuracy and ensures durability and reliability.

Wide Variety of Available Options. Andrew provides a complete line of available options, including motor drive systems (with power interfaces addressing both domestic and international standards), remote microprocessor antenna control for motorized positioner drive systems, pressurization equipment, a utility storage box and interconnecting cable and waveguide assemblies.

Electrical - 3.7 m

Operating Frequency Band*

C-Band - Receive/Transmit	3.625-4.2 GHz/5.850-6.425 GHz
Ku-Band - Receive/Transmit	10.95-12.75 GHz/14.0-14.5 GHz
X-Band - Receive/Transmit	7.25-7.75 GHz/7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	41.0	5.850 GHz	45.6
4.000 GHz	42.5	6.175 GHz	46.1
4.200 GHz	43.0	6.425 GHz	46.3
7.250 GHz	47.7	7.90 GHz	48.2
7.500 GHz	47.9	8.15 GHz	48.4
7.750 GHz	48.1	8.40 GHz	48.6
10.950 GHz	50.9	14.00 GHz	52.9
11.950 GHz	51.6	14.25 GHz	53.1
12.750 GHz	52.1	14.50 GHz	53.2

Polarization Discrimination*, (Linearly-Polarized):
C- /Ku-Band >35 dB on axis

Voltage Axial Ratio*, circularly-polarized with 2-port combiner
C-Band, <1.09:1 on axis, Tx <1.20:1 on axis, Rx
X-Band, <1.20:1 on axis, Tx <1.20:1 on axis, Rx

Beamwidth, Mid-band, Degrees	*C-Band*	*Ku-Band*	*X-Band*
3 dB Receive (Transmit)	1.20 (0.80)	0.42 (0.36)	0.65 (0.60)
15 dB Receive (Transmit)	2.00 (1.40)	0.85 (0.69)	1.19 (1.09)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	36	39	39
30°	23	26	27
50°	21	24	24

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1667 and Bulletin 3653A (X-Band).

Mechanical

Feed Type	Dual-Reflector
Reflector Material	Precision-Formed Aluminum
Reflector Segments	3-Pieces, Hinged Transportable
Mount Type, when applicable	El over AZ, Tripod
Antenna Pointing Range, Coarse/(Continuous), when applicable	
Elevation	5-90° (85°)
Azimuth	330° (330°)
Polarization	360° (180°)
Wind Loading, Survival	80 mph (129 km/h) in any position of operation, 125 mph (200km/h) in "Stow" position, with anchoring
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Trailer Size:	
Length	289 in (7.34 m)
Width	96 in (2.44 m)
Height, with Trifold® Antenna	112.1 in (2.85 m), with subreflector/supports 102 in (2.59 m), without subreflector/supports
Weight, with Trifold® Antenna	7200 ib (3266 kg)
Trailer Wheels	4, with 1 spare
Tandem Axle Assembly	12,000 lb (5455 kg) tandem with axle with 4 in (102mm) drop
Wheel Size	14.5 in (368 mm)
Tires	G78 x 15 Nylon Bias, 8 ply, 8 x 14.5LT
Trailer Hitch Interface	2.312 in ball hitch (standard) Pintel hook is available as special order
Trailer Tongue Weight	650 lb (295 kg) nominal
Outrigger Jacks	4, each with 7000 lb (3282 kg) capacity
Front Leveling Jack	5000 lb (2273 kg) capacity
12 Vdc Electrical Connector	6-way, includes both male and female

Electrical - 4.5 m

Operating Frequency Band*

C-Band - Receive/Transmit	3.625-4.2 GHz/5.850-6.425 GHz
Ku-Band - Receive/Transmit	10.95-12.75 GHz/14.0-14.5 GHz
X-Band - Receive/Transmit	7.25-7.75 GHz/7.90-8.40 GHz

Gain*, at circular waveguide flange of feed. (dBi, ±0.2dB)

Rx Frequency	*Rx Gain*	*Tx Frequency*	*Tx Gain*
3.625 GHz	43.0	5.925 GHz	46.2
4.000 GHz	44.0	6.175 GHz	46.7
4.200 GHz	44.4	6.425 GHz	47.0
7.250 GHz	48.4	7.90 GHz	49.2
7.500 GHz	48.7	8.15 GHz	49.5
7.750 GHz	49.0	8.40 GHz	49.8
10.950 GHz	51.6	14.00 GHz	53.4
11.950 GHz	52.4	14.25 GHz	53.6
12.750 GHz	52.9	14.50 GHz	53.7

Polarization Discrimination*, (Linearly-Polarized):
C- /Ku-Band >30 dB on axis

Voltage Axial Ratio*, circularly-polarized with 2-port combiner
C-Band, <1.09:1 on axis, Tx <1.20:1 on axis, Rx
X-Band, <1.20:1 on axis, Tx <1.20:1 on axis, Rx

Beamwidth, Mid-band, Degrees	*C-Band*	*Ku-Band*	*X-Band*
3 dB Receive (Transmit)	1.22 (0.85)	0.41 (0.33)	0.66 (0.61)
15 dB Receive (Transmit)	2.47 (1.90)	0.86 (0.69)	1.40 (1.29)

Antenna Noise Temperature* - under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.

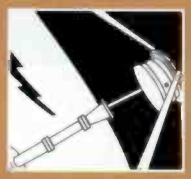
Elevation	*Kelvin (C-Band)*	*Kelvin (Ku-Band)*	*Kelvin (X-Band)*
10°	32	45	45
30°	20	33	34
50°	16	30	29

Antenna VSWR*, Transmit and Receive <1.3:1

* Actual antenna specifications are amended by the choice of feed/combiner options. For further feed/combiner option information, ask for Andrew Bulletin 1664A and Bulletin 3653A (X-Band).

Mechanical

Feed Type	Prime Focus
Reflector Material	Precision-Formed Aluminum
Reflector Segments	3-Pieces, Hinged Transportable
Mount Type, when applicable	El over AZ, Tripod
Antenna Pointing Range, Coarse/(Continuous)	
Elevation	5-90° (85°)
Azimuth	330° (330°)
Polarization	360° (90°)
Wind Loading, Survival	80 mph (129 km/h) in any position of operation, 125 mph (200km/h) in "Stow" position, with anchoring
Wind Loading, Operational (motor drives)	45 mph (72 km/h), gusting to 65 mph (105 km/h)
Trailer Size:	
Length	289 in (7.34 m)
Width	96 in (2.44 m)
Height, with Trifold® Antenna	118 in (3.0 m) with feed system supports 108 in (2.75 m) without feed system supports
Weight, with Trifold® Antenna	7600 lb (3447 kg)
Trailer Wheels	4, with 1 spare
Tandem Axle Assembly	12,000 lb (5455 kg) tandem with axle with 4 in (102mm) drop
Wheel Size	14.5 in (368 mm)
Tires	G78 x 15 Nylon Bias, 8 ply, 8 x 14.5LT
Trailer Hitch Interface	2.312 in ball hitch (standard) Pintel hook is available as special order
Trailer Tongue Weight	650 lb (295 kg) nominal
Outrigger Jacks	4, each with 7000 lb (3282 kg) capacity
Front Leveling Jack	5000 lb (2273 kg) capacity
12 Vdc Electrical Connector	6-way, includes both male and female



Satellite Communications Systems

2.4-Meter Transportable SNG Antennas

Electrical Performance Meets or Exceeds:

- *INTELSAT E-1 and G requirements.*
- *U. S. FCC regulation 25.209, for mandatory pattern requirements for 2° satellite spacing at Ku-band frequency.*
- *ITU-R S.580-4 and S.465-5 recommendations for pattern performance for 2° satellite spacing.*
- *Approved for use in the territory of Russia by the Ministry of Communications of the Russian Federation (Reference: Homologation Certificate No OC/1-AΦ-1).*

Prime Focus Offset Feed System

Zero Aperture Blockage Enables Superior Pattern Characteristics.

Motorized Control

Motorized Cable Drive System Allows for Reliable, Smooth Running System.

Control Options

Antenna Controller Combines Encoders and Remote/ Local Controls into an Easy to Operate Package.

Compact/Lightweight Design. This design reduces windloading, is easier to install and is less costly to ship. The stow height is at 24" for more overall clearance for the truck.

Antenna. The vehicle mountable 2.4-meter prime focus offset fed antennas from Andrew incorporate performance and optional characteristics particularly suited for television broadcast industry satellite news gathering applications. These high performance antennas are specifically designed for mobile transmit/receive systems requiring versatile frequency reuse capability and are currently being utilized as the integral component of major television broadcasting network systems worldwide.

Feed System. The exclusively designed prime focus, beam-shaping feed configuration, together with the precision spun aluminum reflector assembly, produces extremely high gain, superior efficiency and closely controlled pattern characteristics.

Full Integration and Factory Pre-Testing. Each SNG antenna is fully integrated and pretested before leaving the factory to reduce vehicle installation time and costs.

Control System. A motorized cable drive system replaces jackscrews for a reliable, precise and smooth running system. The SNG controller combines encoders and remote/local controls into a small, easy to operate package.

Electrical Specifications

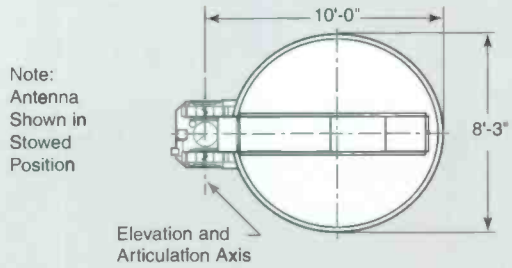
Operating Frequency Band*			
Ku-Band Receive	10.95-12.75 GHz		
Ku-Band Transmit	14.0-14.5 GHz		
Gain*, at circular waveguide flange of feed.			
Rx Frequency	***Rx Gain***	***Tx Frequency***	***Tx Gain***
11.950 GHz	47.6	14.25 GHz	49.4
Polarization	Linear		
Polarization Discrimination*			
(Linear Polarization)	>35 dB on axis		
Beamwidth, at Midband	**Ku-Band**		
3 dB Receive (Transmit)	0.72° (0.61°)		
15 dB Receive (Transmit)	1.42° (1.33°)		
Antenna Noise Temperature* under clear sky conditions, at 68°F (20°C), at the circular waveguide flange of the feed.			
Elevation	***Kelvin (Ku-Band)***		
10°	35°K		
30°	26°K		
Antenna VSWR*, Transmit and Receive	**<1.3:1**		

* Actual antenna specifications are amended by the choice of feed/combiner options. Contact Andrew for further feed/combiner option information.

Mechanical Specifications

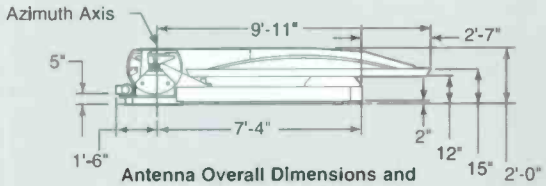
Feed Type	Prime Focus, Offset
Reflector Material	Precision-Formed Aluminum
Reflector Segments	1
Mount Type	El over AZ, Pedestal
Antenna Pointing Range, Continuous	
Elevation	66°
Azimuth	±180°
Polarization	±90°
Wind Loading, Survival	
65 mph (105 km/h) in any position of operation	
Wind Loading, Operational (motor drives)**	
45 mph (72 km/h), gusting to 65 mph (105 km/h)	
Temperature, Operational	-40° to 125°F (-40° to 52°C)
Rain	4 In (102 mm) per hour
Solar Radiation	360 BTU/hr/ft² (1135 Watts/m²)
Relative Humidity	100%
Shock and Vibration	As encountered by commercial air, rail and truck shipment
Atmospheric Conditions	Moderate coastal/industrial areas. Severe conditions require additional protection.
Positioner Travel Rates**	
Elevation	0.05° to 1°/second
Azimuth	0.05° to 1°/second
Polarization	1.8°/second

** Final specifications subject to change with verification testing. All designs, specifications and availabilities of products and services presented are subject to change without notice.

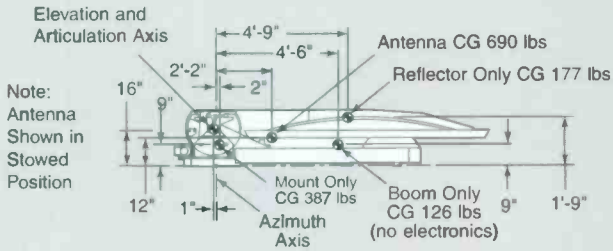


Antenna Overall Dimensions - Top View

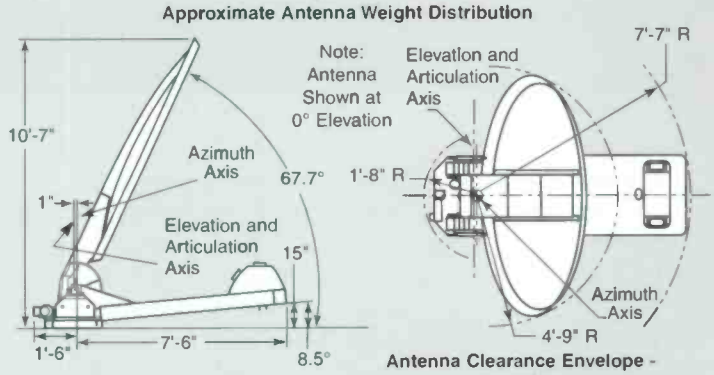
Mounting Pattern on Truck



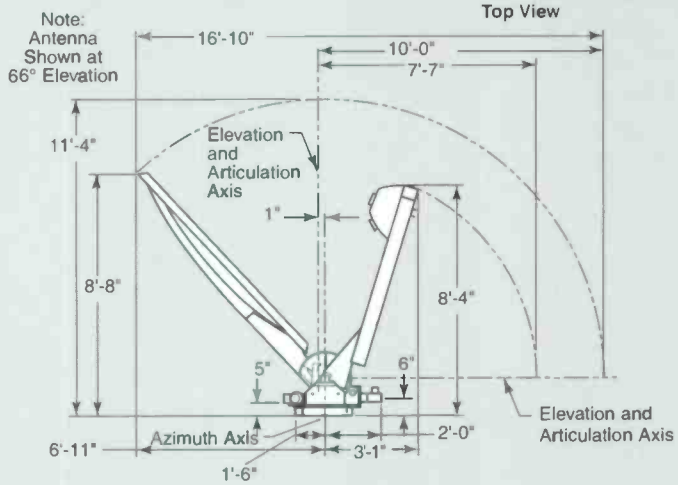
Antenna Overall Dimensions and Mounting Pattern - Side View



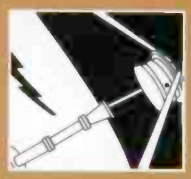
Approximate Antenna Weight Distribution



Antenna Clearance Envelope - Top View



Antenna Clearance Envelope and Center of Gravity - Side View



Satellite Communications Systems

Receive-Only Earth Station Antennas

- *10.95 to 11.7 GHz*
- *Dual-Polarized*
- *125 MPH (200 km/h) Wind Survival*
- *Fast, Simple Installation*

Andrew is offering a full range of small diameter receive-only earth station antennas for operation in the 10.95 to 11.7 GHz band. These ESA's range in size from 1.8- to 4.5-meters, featuring a high performance dual-polarized ground plane feed system which provides excellent gain and radiation pattern control. Polarization is adjustable through 360 degrees by rotation of the feed horn.

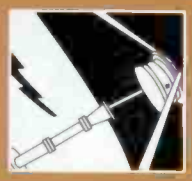
All these earth station antennas utilize high accuracy, spun aluminum reflectors which are chromate conversion coated and painted on the inner surface with matt white polyurethane paint. Hot dip galvanizing of the steel mount ensures their reliable performance and long life in adverse environments. The antennas have been designed to facilitate fast assembly and pointing without the use of a crane. Reflector heating options are available for the 3.0- and 3.7-meter ESA's.

Electrical

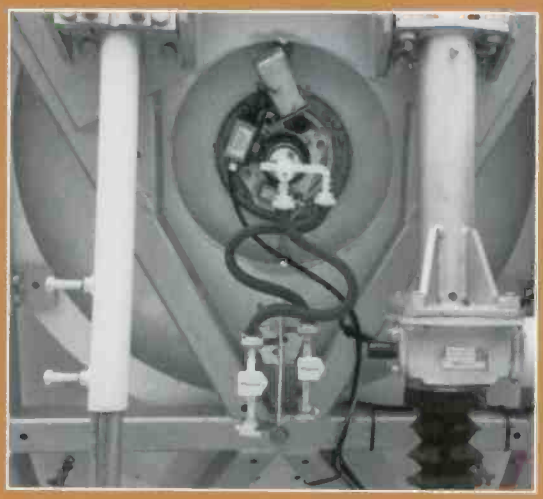
Antenna Type	ESA18-G11	ESA24-G11	ESA30-G11	ESA37-G11	ESA45-G11
Diameter, Meters	1.8	2.4	3.0	3.7	4.5
Operating Frequency, GHz	10.95 to 11.7	10.95 to 11.7	10.95 to 11.7	10.95 to 11.7	10.95 to 11.7
Polarization	Linear	Linear	Linear	Linear	Linear
Gain, dBi					
Bottom	44.8	47.4	48.5	50.3	52.2
Mid	45.0	47.8	48.6	50.5	52.6
Top	45.1	47.9	49.0	51.0	52.9
VSWR, Maximum	1.3	1.3	1.3	1.3	1.3
Cross Polar Discrimination, dB	28	28	28	28	28
Isolation, dB	35	35	35	35	35
Half Power Beamwidth, Degrees	1.07	0.80	0.71	0.55	0.45
Noise Temperature, K					
at 15° EL	46	39	31	37	35
at 20° EL	43	36	27	33	31
at 30° EL	40	33	24	30	28
Output Flanges	WR75	WR75	WR75	WR75	WR75

Mechanical

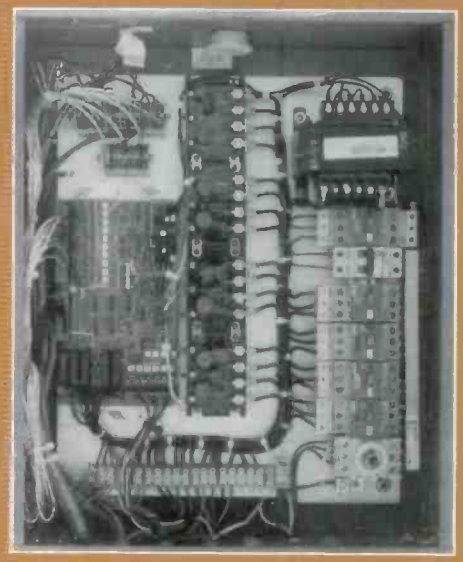
Antenna Type	ESA18-G11	ESA24-G11	ESA30-G11	ESA37-G11	ESA45-G11
Survival Wind Rating, mph (km/h)					
Without Ice	125 (200)	125 (200)	125 (200)	125 (200)	125 (200)
With 2" (50 mm) Radial Ice	87 (140)	87 (140)	87 (140)	87 (140)	87 (140)
Mount Adjustment Range					
Elevation					
Coarse	0-45°	0-70°	0-70°	0-80°	0-45°
Fine	±5°	±5°	±5°	±5°	±5°
Azimuth					
Coarse	0-360°	0-360°	0-360°	0-360°	±45°
Fine	±5°	±10°	±10°	±10°	±5°
Net Weight, lbs. (kg)	136 (62)	616 (280)	682 (310)	1067 (485)	1793 (815)
Standard Reflector Configuration	One Piece	One Piece	One Piece	Two Piece	Two Piece



Satellite Communications Systems



4 Port Combiner Network with Optional Polarization Drive



Solid State Local Motor Controller Assembly

APC300 Steptrack Antenna Controller

ESA Options

Additional Options to Compliment Your Andrew Earth Station Antenna

- ***Motorization*** - *Low/Medium, High-Speed or Steptracking Available*
- ***Local Motor Control Options***
- ***Remote Control Options*** - *Standard and Steptracking Available*
- ***Anti-Icing and De-Icing Options***
- ***LNA/LNB Subsystems***
- ***Testing and Installation Services***

Contact your Andrew Account Manager for additional information on the options available for your Earth Station Antenna.

Introduction

In order to service your requirements in a timely manner, the following check list has been provided for you. We ask that you complete this form as it will assist our Customer Service representatives by understanding your requirement in its entirety.

Earth Station Antenna

Customer Definition Check List

Project: _____

Contact Name(s): _____

Company Name: _____

Street Address: _____

City:_____ State/Province:_____ Zip Code:_____ Country:_____

Telephone Number:_____ FAX Number:_____

Quote Number (if previously quoted and revision and/or update is required): _____

Application

❑ Broadcast Analog or Digital Video
❑ Private Network/End User
❑ Common Carrier/Teleport
❑ Compressed Digital Video
❑ INTELSAT

1. What is the applicable Standard or Regulation required for this application?

❑ None ❑ US FCC ❑ CCIR 580 ❑ CCIR 465-1

Eutelsat Standard ___ INTELSAT Standard* ___

* Is there a need for an INTELSAT Type Approved antenna? _____

2. Is this a Transmit & Receive or a Receive-Only ESA?

❑ Tx/Rx ❑ Rx Only

3. What frequency band is desired?

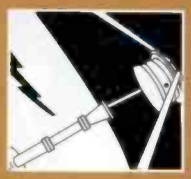
❑ Ku-Band ❑ R/O Dual-Band (C-/Ku-) ❑ C-Band ❑ X-Band ❑ K-Band

Ku-Band Rx/Tx Frequencies	C-Band Rx/Tx Frequencies	X-Band Rx/Tx Frequencies	K-Band Rx/Tx Frequencies
❑ 10.7-12.75/13.75-14.8 GHz	❑ 3.7-4.2/5.925-6.425 GHz	❑ 7.25-7.75/7.9-8.4 GHz	❑ 10.7-12.75/17.3-18.1 GHz
❑ 10.7-11.70/12.75-14.8 GHz	❑ 3.625-4.2/5.850-6.425 GHz		
	❑ 3.400-4.200/5.850-6.675 GHz		

Other (specify) _____

4. Is the antenna going to operate Linearly- or Circularly-Polarized?

Linear	Circular
❑ >35 dB XPD	❑ 1.3:1 VAR Tx & Rx
❑ >30 dB XPD	❑ 1.09 VAR Tx, 1.20 VAR Rx
❑ Other_____	❑ 1.06:1 VAR Tx & Rx
	❑ Other _____



Satellite Communications Systems

5. What is the customer's desired Gain or G/T*?

C-Band, (4.0 GHz Nominal)

	❑	❑	❑	❑	❑	❑	❑	❑	❑
Size	**1.8m**	**2.4m**	**3.6m**	**3.7m**	**4.5m**	**4.6m**	**7.3m**	**7.6m**	**9.3m**
Rx Gain	35.7	37.6	42.0	42.5	44.0	44.3	48.6	49.0	51.5
Tx Gain	39.8	41.7	44.5	46.3	46.7	48.4	51.8	52.7	54.0
G/T*	16.5	18.5	22.9	23.6	25.0	24.7	30.3	29.7	32.4

Note (*) NOMINAL G/T is based on 10° elevation and a 30° Kelvin LNA or LNB with 2-port combiner.

Ku-Band, (12.0 GHz Nominal)

	❑	❑	❑	❑	❑	❑	❑	❑
Size	**1.8m**	**2.4m**	**3.6m**	**3.7m**	**4.5m**	**4.6m**	**5.6m**	**7.6m**
Rx Gain	45.1	47.6	50.7	51.8	52.6	53.8	55.7	58.0
Tx Gain	46.6	49.5	52.0	53.3	53.8	55.1	57.1	59.4
G/T**	23.6	26.3	28.9	30.3	30.8	32.0	34.0	36.1

Note (**) NOMINAL G/T is based on 10° elevation and a 75° Kelvin LNA or LNB with 2-port combiner.

C-/Ku-Band, (4.0 GHz and 12 GHz Nominal)

	❑	❑	❑
Size	**3.6m**	**4.5m**	**7.3m**
Rx Gain	41.8/50.4	43.8/52.4	48.0/55.5

6. What kind of feed combining network is required?

C-Band	**Ku-Band**	**X-Band**	**K-Band**	**Other**
❑ 2-port	❑ 2-port	❑ 2-port	❑ 4-port	❑ Specify_____
❑ 4-port	❑ 4-port			

❑ 4-port C-/Ku-Band R/O

7. What is the anticipated Tx power handling capacity that is required of the antenna/feed?

❑ < 500 Watts ❑ < 1000 Watts ❑ ≤ 2500 Watts ❑ > 2500 Watts

❑ Other (specify): _____

8. Is the antenna to be motorized/motorizable? ❑ Yes ❑ No ❑ Motorized later

If yes, ❑ 2-Axis ❑ 3-Axis

9. What is the primary power available for the power options?

❑ 208 VAC, 60 Hz/3Ø with 4-wire

❑ 380 VAC, 50 Hz/3Ø with 4-wire

Please respond to Item 9 above for any power options for the antenna requirement.

10. What is the method of controlling the motor drive?

❑ Local Control ONLY! (at the base of the antenna)
❑ Local plus Remote Programmable Control
❑ Step Track/Smartrack®
❑ Other _____

11. What is the required length of the remote control cable [between the Local Motor Control (LMC) and remote control]? (CCK-) _____ feet

12. Does the antenna require anti-icing?

Half Main Reflector	❑ Yes	❑ No
Full Main Reflector	❑ Yes	❑ No
Feed Anti-Ice	❑ Yes	❑ No

Is electrical anti-icing acceptable or is hot air anti-icing required?

❑ Electrical (Anti-ice) (3.6m - 5.6m)	❑ Hot Air (De-ice) (3.6m - 9.3m)	❑ Natural Gas ❑ Electrical

13. Accessories .... Identify those options that are required for this requirement.

- ❑ Rain Deviator (feed blower)
- ❑ Lightning Rod Kit
- ❑ Feed Heater (dual-reflector)
- ❑ Polarization Cross-Axis Waveguide Kit (Tx only) - 1 run or 2 runs - 1XP( ) or 2XP( )
- ❑ Az/El Cross-Axis Waveguide Kit (Tx only) - 1 run or 2 runs - 1XA( ) or 2XA( )
- ❑ Maintenance Platform (5.6m/7.3m/7.6m/9.3m Only)
- ❑ Other: _____

14. Does your project require an electronic system? If so, please answer the following:

Electronic Equipment/Uplink/Downlink

Type of Traffic: ❑ Audio ❑ Video ❑ Low Speed Data (less than 2 mb/s)

What Satellite(s) will be used? _____

Do You Require Redundancy? ❑ Yes ❑ No If Yes, do you require: ❑ 1:1 ❑ 1:N

What Video Format is Required? ❑ PAL ❑ MAC ❑ NTSC ❑ SECAM

Type of Audio Subcarrier Modulators _____ Quantities _____

Quantity of Receivers (if any)_____

Monitor and Control System ❑ Graphical Based ❑ Text Based ❑ Not Req'd

Remote Terminals? (Up to 4 remote terminals). Qty. _____

Equipment to be controlled/monitored _____

Services

Installation and Testing Services: ❑ Antenna ❑ Electronics ❑ Full Crew ❑ Supervisor Only* ❑ Commissioning ❑ None

* Requires customer to provide two mechanically-inclined persons for duration of installation.

Project Specifics

Space Restrictions that Could Limit Antenna Size (Identify):_____

_____

Is There a Location near the Antenna for the RF Equipment?_____

_____

Where is Antenna to be Mounted? (i.e. ground, rooftop)_____

_____

Questions or Information You Require: _____

_____

Satellite Communications Systems

15. Do you require additional literature on the antennas specified? (i.e., Sales Bulletin or Foundation Specifications) _____

_____

_____

16. Please indicate antenna material final destination.

Country: _____

Please return this form to your designated Account Manager or the Customer Service Center.

(FAX 1-800-349-5444 or 708-349-5444)

Satellite Communication Applications

- *Corporate Networks*
- *Independent Broadcast*
- *Broadcast Network Distribution*
- *Satellite Carrier Services*
- *State and Local Governments*
- *International Communications*
- *Distance Learning*

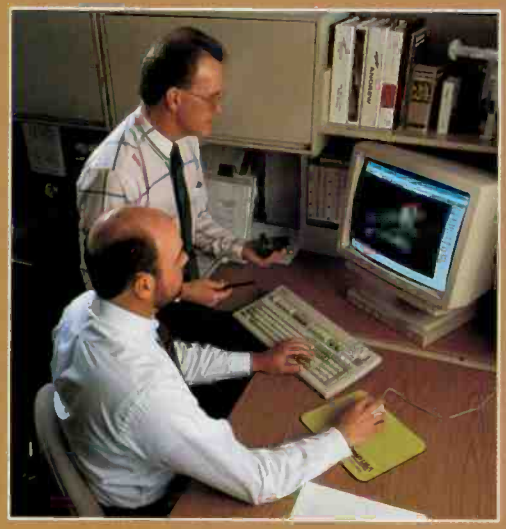
The Andrew Advantage

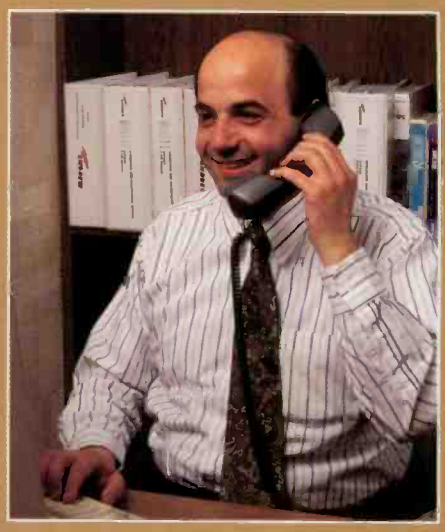
Maximum Customer Satisfaction. Guaranteed system performance specifications ensure increased signal clarity and availability which maximizes your dB/dollar ratio. Every Andrew system installation is individually designed, engineered, installed and tested to meet or exceed customer requirements and system specification.

Cost-Effective Investment. Andrew satellite communication systems deliver the ultimate in performance and dependability in a single cost-effective package. Superior antenna gain and pattern performance provide improved signal quality and increased signal availability and resulting in reduced transponder power requirements and lower system and operating costs.

Reduced maintenance costs are achieved through initially optimized system design for increased future expandability. Upgrade capability provides extended system life.

Satellite Communications Systems





Andrew Systems Approach

System Program Management. Each customer order is assigned a program manager to take full control of the project execution. The program manager is the single point of contact, providing unified project implementation. The program manager ensures that the correct equipment is ordered, tested and integrated as required so the system when shipped works the first time, every time.

System Design Engineering. Engineering services available for each system project extend from feasibility studies and preliminary conceptual design to final acceptance and performance verification testing.

System design is a direct result of customer requirements, signal quality parameters, regulations, operating frequency band and space segment performance.

System Documentation. Each system is documented so that installation, implementation and maintenance are a simple process. Documentation may include assembly, installation drawings, as-built drawings and equipment operation and maintenance manuals.

System Installation. Andrew provides qualified installers who are competent and knowledgeable about all types of installation requirements. Whether it is ground-mount, rooftop or any nonstandard installation, an Andrew crew performs the installation efficiently, in a minimum amount of time. This saves money and allows you to be on-the-air in record time. Andrew can also provide an installation supervisor to assist your crew in the antenna erection.

System Testing. The time tested Andrew method of ESA and electronics testing assures that any regulatory requirement, INTELSAT, EUTELSAT, PANAMSAT, U.S. FCC, etc. are met with minimum inconvenience.

Satellite Communications Systems

Andrew Earth Station Antenna Systems

Uplinks

- *Modulators*
- *Upconverters*
- *High Power Amplifiers*
- *Custom Designed Switching and Combining Networks*

Downlinks

- *LNAs/LNBs*
- *Downconverters*
- *Demodulators/Receivers*
- *Signal Distribution*

Systems

- *VALULink™*
- *VALUTrak™*
- *SAFRON™*

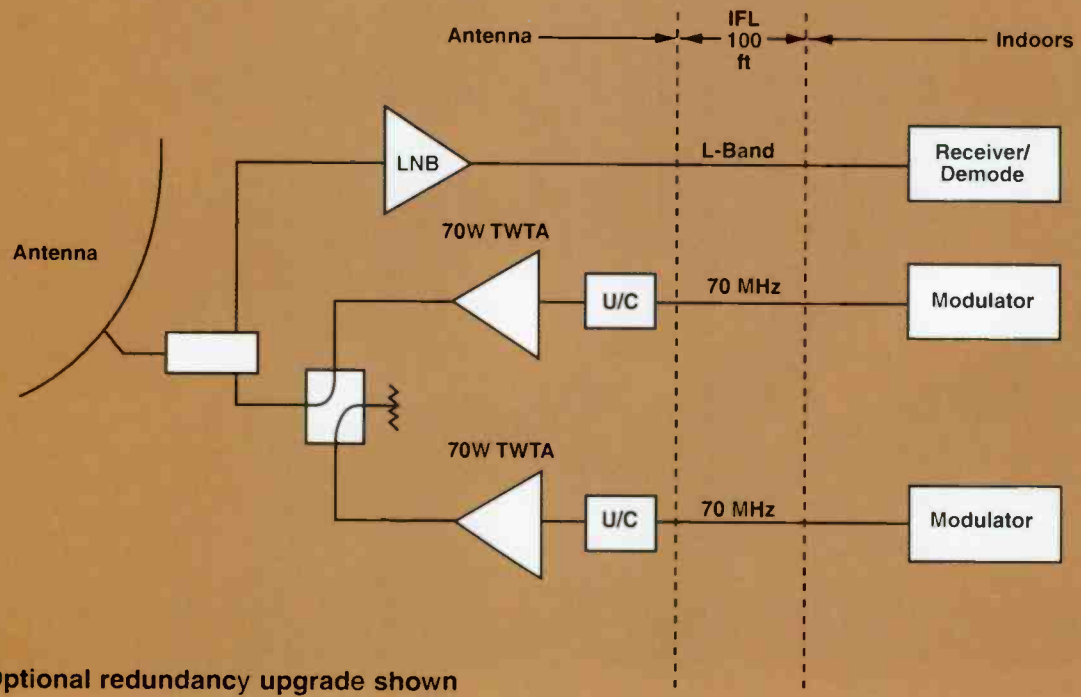
Site

- *Standard and Customized Redundance Schemes*
- *Individually Designed Monitor and Control Systems*
- *Turnkey Shelter Installations*
- *Power distribution*
- *UPS Systems*

Services

- *Complete System Design*
- *Factory Integration and Test*
- *Program Management*
- *Site Installation*
- *Field Test and Commissioning*
- *Frame Relay and TCP/IP WAN Application Engineering*
- *Traffic Analysis and Network Design*
- *Assistance with Link Analysis*
- *Assistance with Space Segment and Licensing*

Satellite Communications Systems



Optional redundancy upgrade shown

VALULink™ II

Performance of a large uplink at a small price. The Andrew VALULink™II is an economical digital-capable Ku-Band uplinking system. VALULink™II is designed to satisfy the uplink requirements for most broadcast and commercial users. It is especially designed for users who need to occasionally uplink high quality programming. VALULink™II is easy to use and maintain.

The base VALULink™II system includes: antenna and 2-Port R/T Feed, 100 ft of IFL Cabling, Hub Mounted 75 Watt TWTA and Upconverter, LNB, Video Modulator, Video Receiver and a PC based Monitor and Control (M&C) system.

The VALULink™II antenna can be 3.7M, 4.6M, 5.6M or 7.6M. The system is fully compliant with FCC rules and includes the required Automatic Transmitter Identification System (ATIS). Redundancy and TWTA options are available to configure your VALULink™II to your exact requirements.

Antenna Size	EIRP (dBW)*
3.7m	71.2
4.6m	73.0
5.6m	75.1
7.6m	76.6

* Approximate EIRP. Assumed with 75W TWTA, no switching, 50° IFL.

VALUTrak™

The VALUTrak™ single-axis tracking system offers a low cost alternative to motorizing an existing C-band R/O fixed antenna or to purchasing a new motorized antenna to track inclined orbit satellites (IOM).

The VALUTrak unit is positioned at time of installation to account for the variance in site longitudes. While the satellite's "North-South" motion increases over time, the unit will simply scan farther "North" and "South" to track this expanded motion.

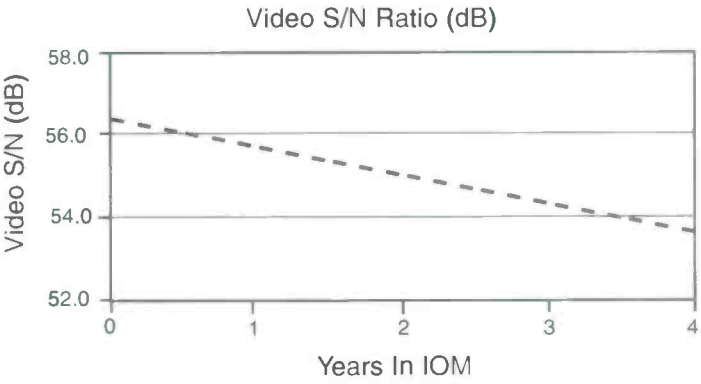
The following chart details anticipated maximum scan video signal-to-noise (S/N) ratio for a period of 4 years. This is for a typical video system and is based on the following assumptions:

1) Satellite inclination increases 0.8°/yr

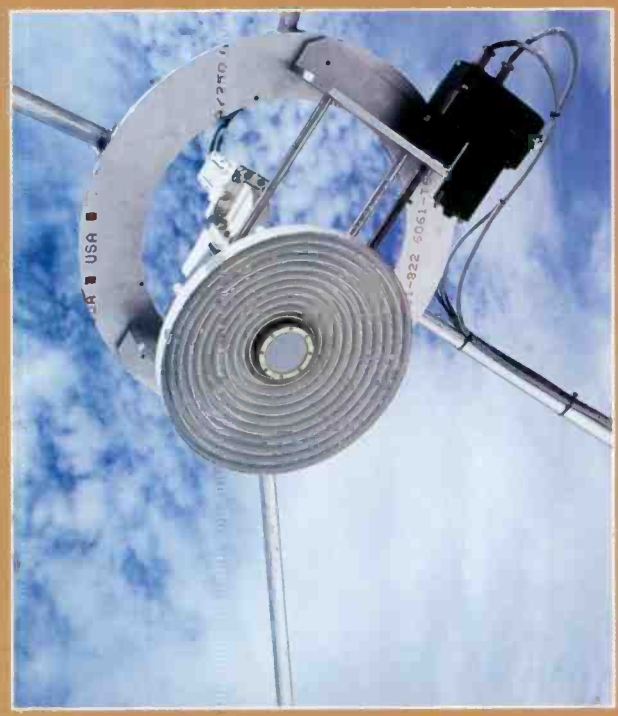
2) Satellite EIRP is 34 dBw

3) Antenna is Andrew ES45T-R-1 or ES45P with 35° LNB

4) Full transponder C-Band operation

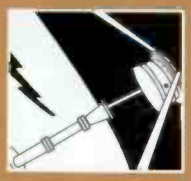


Signal-to-Noise Ratio vs. Time

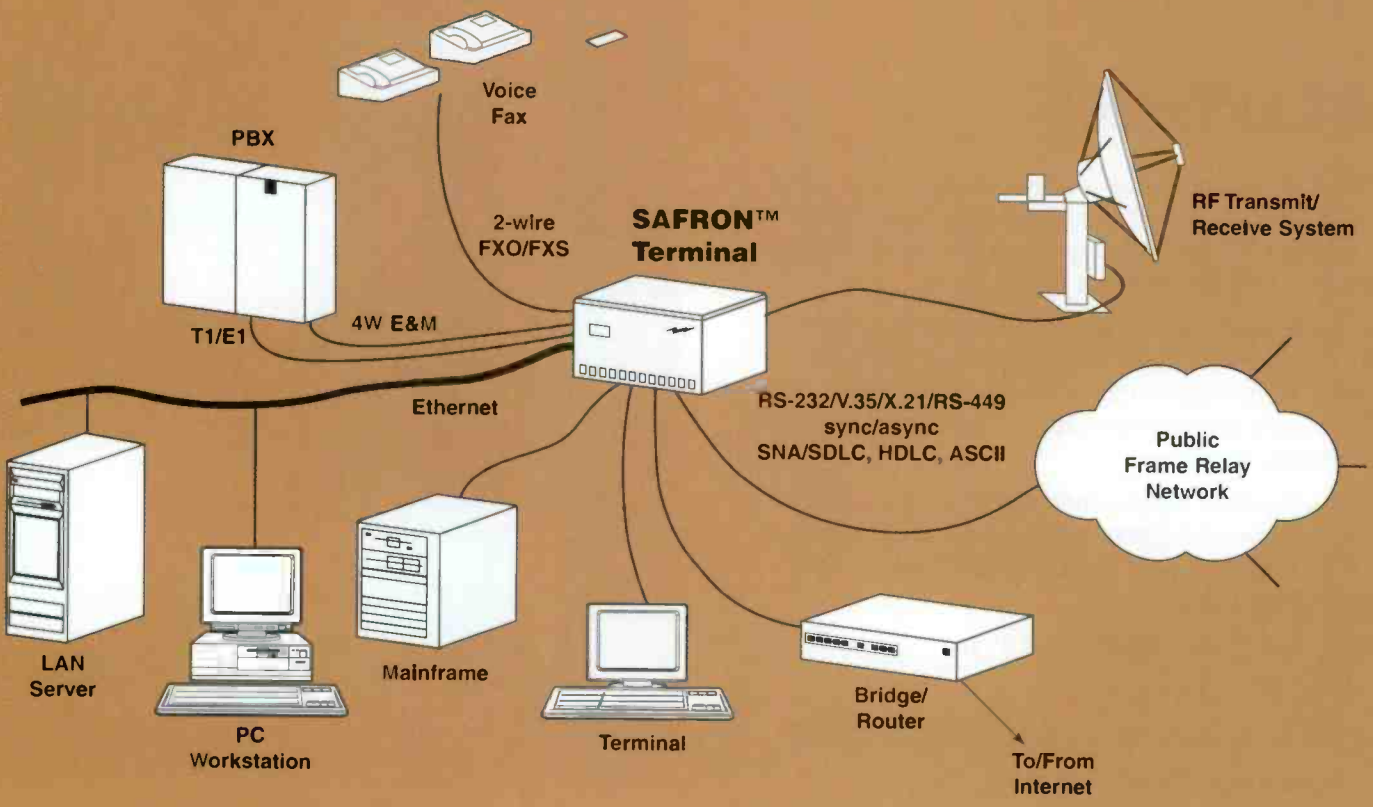


Although one cannot predict future satellite performance, experience has shown these calculations to be representative of a well managed satellite. The final performance of the system is influenced by various losses introduced with the tracking system and LNB noise temperature.

The VALUTrak sysytem can be used with antennas of many sizes from various vendors. Contact your Andrew representative.



Satellite Communications Systems



Satellite Networks

The Andrew Satellite Frame Relay On-line Network (SAFRON™) system is a highly efficient solution for satellite-based packet data networks, such as Internet services. The same experience and expertise which have made the quality of Andrew earth station antennas a world-wide standard are directly applied to the Andrew SAFRON system as well as its other products and services. Andrew provides complete network engineering support services such as:

- *Frame Relay and TCP/IP WAN application engineering*
- *Traffic analysis and network design*
- *Assistance with link analysis*
- *Assistance with space segment and licensing*
- *Integration and Test*
- *Installation and commissioning*

Ensure your network's adaptability for the future with Andrew and SAFRON™ networks.

SAFRON™... Fast Packet Networks for the Nineties

SAFRON networks provide on-line connectivity from anywhere to anywhere in the network, seamlessly. The SAFRON multi-point network builds on the highly flexible architecture of Frame Relay.

The SAFRON™ System

SAFRON offers a comprehensive set of voice, fax and data interfaces in addition to international standard Frame Relay. This standarization provides public and private organizations the global multi-drop connectivity necessary to communicate between modern Ethernet and Token Ring LAN data networks, as well as telephone and fax facilities, with the efficiency of voice compression and digital circuit multiplication. All major LAN and WAN protocols are supported.

SAFRON networks are an excellent alternative to standard MCPC point-to-point links and provide superior data functionality to SCPC/DAMA if the network is expanded to a mesh. In a star configuration, SAFRON networks provide superior voice quality compared to conventional VSATs, and much better data throughput allowing Internet, Intranets, and corporate WAN's to be efficiently served by satellite for the first time.

A SAFRON network is an ideal solution for:

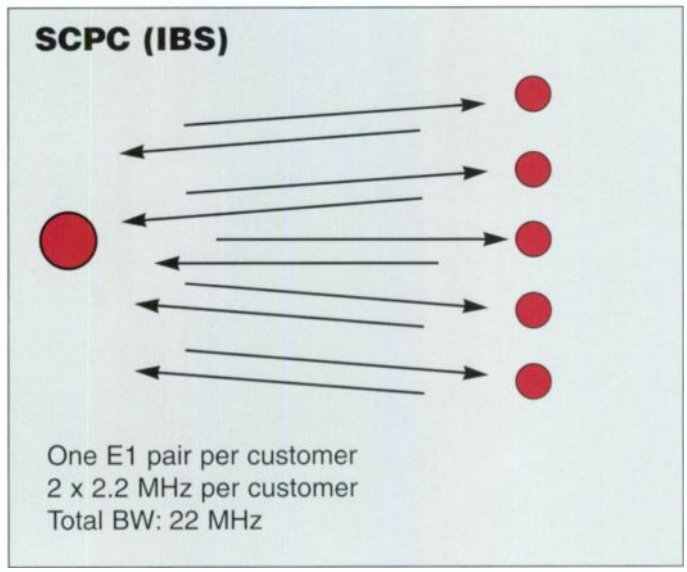
- *Internet access*
- *Intranets*
- *Frame Relay network extension*
- *Mixed WAN data and Voice*
- *Partial and Full Mesh*
- *High speed access to central databases*

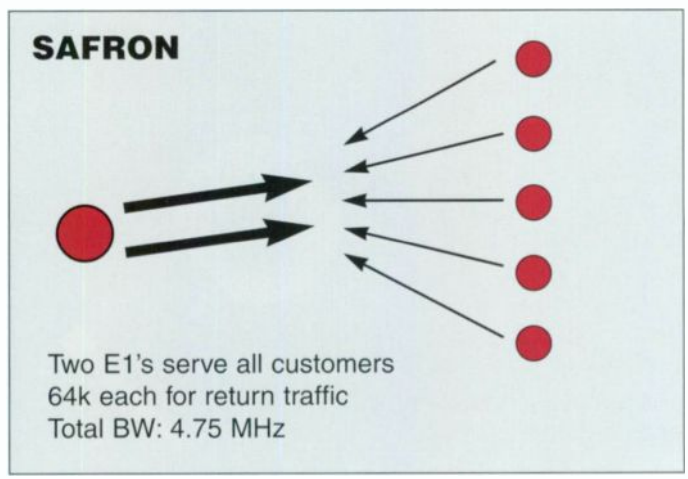
SAFRON's powerful architecture supports key flexibility and low-cost usage parameters such as:

- *Dynamic bandwidth on demand - capacity is automatically shared among receiving stations*
- *Dynamic allocation of bandwidth within carrier*
- *Continuous transmit carrier from each station carries traffic for all destinations*
- *Asymmetric carrier bit rates*
- *Asymmetric data rates among terminals*

Internet Example

Objective: Service from the Internet access point to five Internet Service Providers





Result: The SAFRON network gives 78% saving in space segment cost... and World Wide Web (WWW) performance is doubled.

HELIAX®
Coaxial Cables

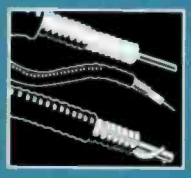
INDEX

General Information

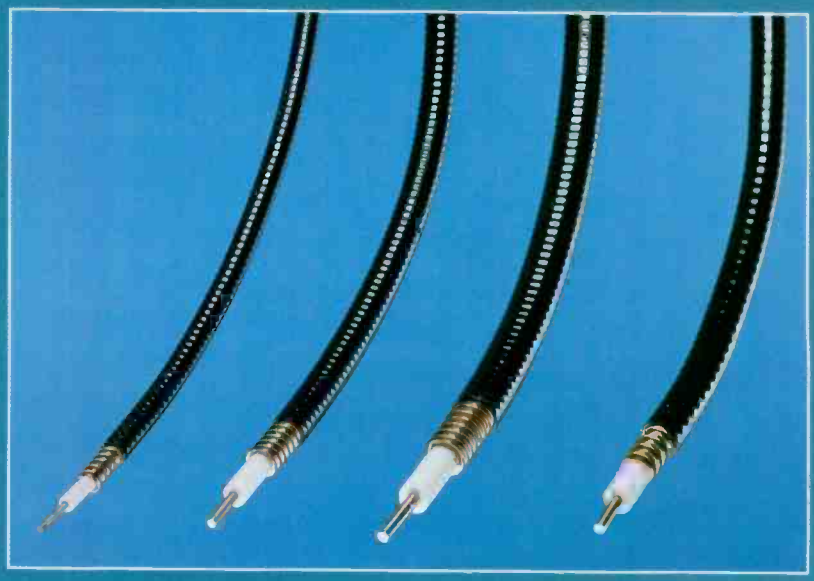
Ordering Information and Specifications

Applications and Technical Information

Refer to Other Sections for:



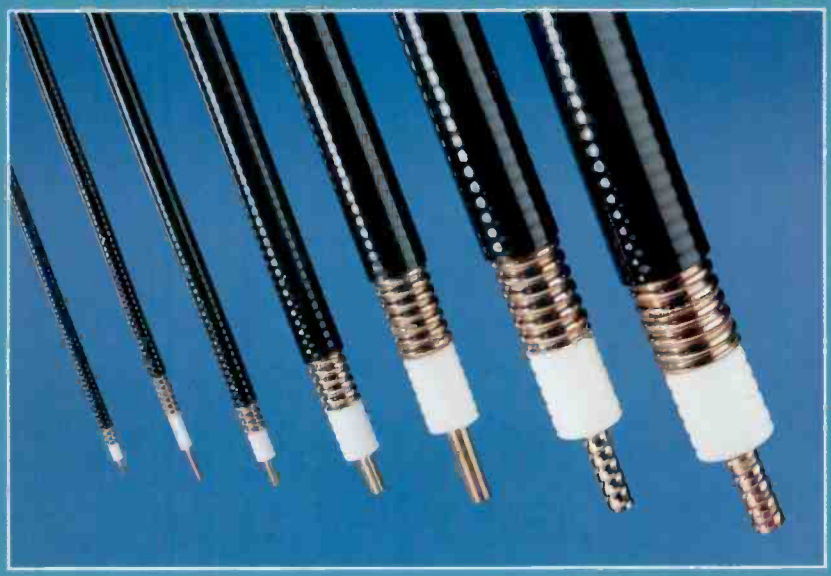
HELIAX® Coaxial Cables



HELIAX® Coaxial Cable Selection Guide - 50-ohm, Foam Dielectric

Nominal Size	Superflexible, FSJ Series			Extraflexible, EFX Series
	1/4"	3/8"	1/2"	3/8"
Catalog Pages	439	445	450	454
Standard Cables				
Standard Black Jacket	FSJ1-50A	FSJ2-50	FSJ4-50B	EFX2-50
Fire Retardant Cables				
CATVX, VW-1, IEC 332-1	FSJ1RN-50A	FSJ2RN-50	FSJ4RN-50B	
CATV, UL1581, IEC 332-3, IEEE 383	FSJ1RN-50A	FSJ2RN-50	FSJ4RN-50B	
CATVR, UL1666 (Riser)	FSJ1RN-50A	FSJ2RN-50	FSJ4RN-50B	
CATVP, UL910 PLENUM, jacketed				
CATVP, UL910 PLENUM, unjacketed				
Low VSWR Cables, Specially Tested				
Standard Black Jacket	FSJ1P-50A-(**)	FSJ2P-50-(**)	FSJ4P-50B-(**)	
Fire Retardant (CATVR), 824-894 MHz, 1.20 VSWR max.				
Special Application Cables				
Phase Stabilized; Phase Measured	p. 585	p. 585	p. 585	
MIL-C-28830 Qualified				
Characteristics				
Maximum Operating Frequency, MHz	20400	13400	10200	13500
Peak Power Rating, kW	6.4	13.2	15.6	15.6
Relative Propagation Velocity, %	84	83	81	85
Minimum Bend Radius, in (mm)	1 (25)	1 (25)	1.25 (32)	1.75 (45)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).				
30 MHz	0.98 (3.22)	0.65 (2.14)	0.56 (1.85)	0.589 (1.93)
100 MHz	1.81 (5.94)	1.21 (3.97)	1.05 (3.44)	1.09 (3.58)
450 MHz	3.93 (12.9)	2.66 (8.73)	2.32 (7.61)	2.40 (7.87)
1000 MHz	6.00 (19.7)	4.09 (13.4)	3.63 (11.9)	3.70 (12.1)
2000 MHz	8.73 (28.6)	6.01 (19.7)	5.41 (17.7)	5.45 (17.9)
6000 MHz	16.2 (53.2)	11.4 (37.4)	10.6 (34.8)	10.4 (34.1)
10000 MHz	21.8 (71.5)	15.6 (51.1)	14.7 (48.2)	14.2 (46.6)
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40 °C (104° F); inner conductor temperature 100°C (212°F); no solar loading.				
30 MHz	2.28	3.97	5.76	3.99
100 MHz	1.23	2.14	3.09	2.15
450 MHz	0.567	0.975	1.38	0.978
1000 MHz	0.372	0.634	0.889	0.635
2000 MHz	0.256	0.431	0.598	0.431
6000 MHz	0.138	0.228	0.307	0.227
10000 MHz	0.102	0.166	0.220	0.165

** Insert suffix number from specific cable Catalog page. † See specific Catalog page.



HELIAX® Coaxial Cables

HELIAX® Coaxial Cable Selection Guide - 50-ohm, Foam Dielectric

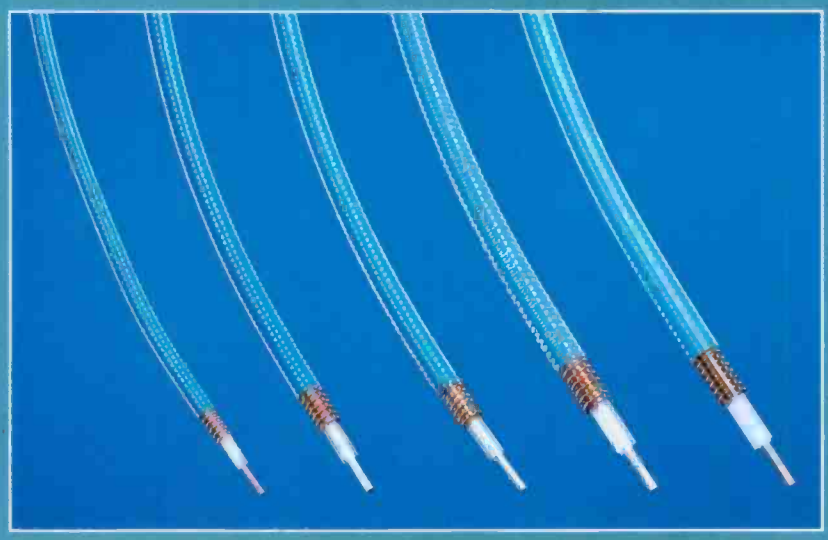
Foam Dielectric, LDF Series						
1/4" 456	3/8" 458	1/2" 461	7/8" 465	1-1/4" 469	1-5/8" 474	2-1/4" 479
Standard Cables						
LDF1-50	LDF2-50	LDF4-50A	LDF5-50A	LDF6-50	LDF7-50A	LDF12-50
Fire Retardant Cables						
LDF1RN-50	LDF2RN-50	LDF4RN-50A	LDF5RN-50A	LDF6RN-50	LDF7RN-50A	LDF12RN-50
LDF1RN-50	LDF2RN-50	LDF4RN-50A	LDF5RN-50A	LDF6RN-50	LDF7RN-50A	LDF12RN-50
LDF1RN-50	LDF2RN-50	LDF4RN-50A	LDF5RN-50A	LDF6RN-50	LDF7RN-50A	LDF12RN-50
Low VSWR Cables, Specially Tested						
	LDF2P-50-(**) 41690-74	LDF4P-50A-(**) 41690-75	LDF5P-50A-(**) 41690-76	LDF6P-50-(**) 41690-73	LDF7P-50A-(**)	LDF12P-50-(**)
Special Application Cables						
	p. 585	p. 585 202071-1	p. 585 202071-2		202071-3	
Characteristics						
15800	13500	8800	5000	3300	2500	2200
12.1	15.6	40	91	205	315	425
86	88	88	89	89	88	88
3 (76)	3.75 (95)	5 (125)	10(250)	15 (380)	20 (510)	24 (610)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24°C (75°F).						
0.661 (2.20)	0.57 (1.87)	0.37 (1.21)	0.19 (0.64)	0.15 (0.48)	0.12 (0.39)	0.095 (0.312)
1.206 (4.08)	1.05 (3.44)	0.68 (2.24)	0.37 (1.21)	0.27 (0.90)	0.22 (0.74)	0.181 (0.594)
2.56 (8.94)	2.30 (7.56)	1.51 (4.96)	0.83 (2.74)	0.62 (2.02)	0.51 (1.69)	0.422 (1.38)
3.82 (13.73)	3.55 (11.6)	2.34 (7.68)	1.31 (4.30)	0.96 (3.17)	0.82 (2.69)	0.682 (2.24)
5.40 (20.13)	5.21 (17.1)	3.45 (11.3)	1.97 (6.46)	1.45 (4.77)	1.25 (4.10)	1.06 (3.47)
9.34 (37.94)	9.85 (32.3)	6.64 (21.8)	–	–	–	–
12.06 (51.72)	13.5 (44.3)	–	–	–	–	–
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40°C (104°F); inner conductor temperature 100°C (212°F); no solar loading.						
3.38	4.14	6.31	14.0	21.1	28.9	39.5
1.85	2.23	3.39	7.49	11.21	15.3	20.8
0.871	1.02	1.53	3.32	5.01	6.71	8.91
0.585	0.663	0.994	2.11	3.20	4.22	5.52
0.413	0.451	0.673	1.40	2.13	2.76	3.55
0.239	0.239	0.351	–	–	–	–
0.185	0.175	–	–	–	–	–

HELIAX®
Coaxial Cables

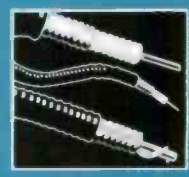
HELIAX® Coaxial Cable Selection Guide - 50-ohm, Foam and Air Dielectric

Nominal Size Catalog Pages	High Power, High Temp., Superflexible, ETS Series 1/4" 442	 3/8" 448	High Power, High Temp., Superflexible, HST Series 1/4" 484
Standard Cables			
Fire Retardant Cables			
CATVP, UL910 PLENUM, jacketed	ETS1-50T	ETS2-50T	HST1-50
CATVP, UL910 PLENUM, unjacketed	ETS1-50	ETS2-50	
Special Application Cables			
Phase Stabilized; Phase Measured	p. 586	p. 586	
Characteristics			
Maximum Operating Frequency, MHz	20000	13400	18000
Peak Power Rating, kW	6.4	13.2	6.4
Relative Propagation Velocity, %	82	83	82
Minimum Bend Radius, in (mm)	1 (25)	1 (25)	1 (25)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).			
30 MHz	0.98 (3.21)	0.66 (2.16)	0.918 (3.01)
100 MHz	1.80 (5.91)	1.23 (4.02)	1.69 (5.55)
450 MHz	3.89 (12.8)	2.73 (8.95)	3.68 (12.1)
1000 MHx	5.90 (19.4)	4.24 (13.9)	5.61 (18.4)
2000 MHz	8.52 (28.0)	6.32 (20.7)	8.15 (26.7)
6000 MHz	15.5 (50.9)	12.3 (40.4)	15.1 (49.5)
10000 MHz	20.7 (68.0)	17.1 (56.1)	20.3 (66.6)
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40 °C (104° F); inner conductor temperature (as noted); no solar loading.			
Inner Conductor Temperature, C° (F°)	200 (392)	200 (392)	250 (482)
30 MHz	5.48	9.89	3.60
100 MHz	2.98	5.31	1.95
450 MHz	1.38	2.38	0.897
1000 MHz	0.909	1.53	0.588
2000 MHz	0.629	1.03	0.405
6000 MHz	0.345	0.529	0.219
10000 MHz	0.259	0.381	0.163

** Insert suffix number from specific cable Catalog page. † See specific Catalog page.



HELIAX® Coaxial Cables



HELIAX® Coaxial Cable Selection Guide - 50-ohm, Air Dielectric

High Power, High Temp., Superflexible, HST Series			Plenum, Superflexible, HS-RP Series	
3/8"	1/2"	1/4"	3/8"	1/2"
488	493	482	486	502
Standard Cables				
Fire Retardant Cables				
HST2-50	HST4-50	HS1RP-50A	HS2RP-50	HS4RP-50
Special Application Cables				
Characteristics				
13400	10200	10000	13.4	10200
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24°C (75°F).				
0.672 (2.21)	0.591 (1.94)	0.949 (3.11)	0.655 (2.15)	0.516 (1.69)
1.24 (4.08)	1.10 (3.60)	1.75 (5.73)	1.21 (3.97)	0.954 (3.13)
2.72 (8.92)	2.43 (7.98)	3.78 (12.4)	2.63 (8.62)	2.08 (6.83)
4.16 (13.7)	3.77 (12.4)	5.74 (18.8)	4.01 (13.1)	3.19 (10.5)
5.56 (18.3)	5.59 (18.3)	8.30 (27.2)	5.82 (19.1)	4.65 (15.3)
11.4 (37.4)	10.8 (35.4)	15.18 (49.8)	10.8 (35.3)	8.69 (28.5)
15.5 (50.8)	14.9 (48.8)	20.3 (66.6)	14.5 (47.5)	11.8 (38.6)
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40°C (104°F); inner conductor temperature (as noted); no solar loading.				
250 (482)	250 (482)	100 (212)	100 (212)	100 (212)
9.98	15.6	1.56	2.69	3.31
5.40	9.29	0.850	1.46	1.79
2.47	4.19	0.393	0.670	0.821
1.61	2.71	0.259	0.439	0.537
1.10	1.83	0.179	0.302	0.368
0.588	0.947	0.098	0.164	0.197
0.433	0.685	0.073	0.121	0.145

** Insert suffix number from specific cable Catalog page. † See specific Catalog page.

HELIAX® Coaxial Cables

HELIAX® Coaxial Cable Selection Guide - 50-ohm, Air Dielectric

Nominal Size	Air Dielectric, HJ Series 1/2"	5/8"	7/8"	1-5/8"	2-1/4"
Catalog Pages	490	508	511	517	520
Standard Cables					
Standard Black Jacket	HJ4-50	HJ4.5-50	HJ5-50	HJ7-50A	HJ12-50
Fire Retardant Cables					
CATVX, VW-1, IEC 332-1	HJ4RN-50	HJ4.5RN-50	HJ5RN-50	HJ7RN-50A	HJ12RN-50
CATV, UL1581, IEC 332-3, IEEE 383	HJ4RN-50	HJ4.5RN-50	HJ5RN-50	HJ7RN-50A	HJ12RN-50
CATVR, UL1666 (RISER)	HJ4RN-50	HJ4.5RN-50	HJ5RN-50	HJ7RN-50A	HJ12RN-50
CATVP, UL910 PLENUM, jacketed	41690-85	HJ4.5RP-50	HJ5RP-50	HJ7RP-50A	
Low VSWR Cables, Specially Tested					
Standard Black Jacket	HJ4P-50-(**)	HJ4.5P-50-(**)	HJ5P-50-(**)	HJ7P-50A-(**)	HJ12P-50-(**) HJ7SP-50A-(**)
Fire Retardant (CATVR), 824-894 MHz, 1.20 VSWR max.			41690-78	41690-79	
Special Application Cables					
High Power/High Temperature Phase Stabilized; Phase Measured	p. 586		p. 586	27591-101	
Characteristics					
Maximum Operating Frequency, MHz	10900	6600	5200	2700	2300
Peak Power Rating, kW	21	40	90	305	425
Relative Propagation Velocity, %	91.4	92	91.6	92.1	93.1
Minimum Bend Radius, in (mm)	5 (125)	7 (180)	10 (250)	20 (510)	22 (560)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).					
30 MHz	0.45 (1.48)	0.26 (0.86)	0.20 (0.66)	0.11 (0.36)	0.09 (0.29)
100 MHz	0.83 (2.72)	0.49 (1.60)	0.37 (1.21)	0.21 (0.68)	0.17 (0.55)
450 MHz	1.77 (5.82)	1.07 (3.51)	0.82 (2.70)	0.45 (1.48)	0.38 (1.24)
1000 MHx	2.65 (8.69)	1.64 (5.37)	1.27 (4.17)	0.70 (2.30)	0.59 (1.93)
2000 MHz	3.85 (12.6)	2.40 (7.86)	1.85 (6.07)	1.05 (3.44)	0.88 (2.89)
6000 MHz	7.84 (25.7)	4.50 (14.8)	–	–	–
10000 MHz	11.7 (38.2)	–	–	–	–
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40° C (104° F); inner conductor temperature (as noted); no solar loading.					
Inner Conductor Temperature, C° (F°)	100 (212)	100 (212)	100 (212)	100 (212)	100 (212)
30 MHz	4.37	8.94	13.8	31.0	43.0
100 MHz	2.41	4.84	7.36	16.5	23.1
450 MHz	1.12	2.20	3.27	7.55	10.3
1000 MHz	0.736	1.43	2.12	4.94	6.61
2000 MHz	0.506	0.986	1.49	3.33	4.42
6000 MHz	0.243	0.525	–	–	–
10000 MHz	0.173	–	–	–	–

HELIAX® Coaxial Cables

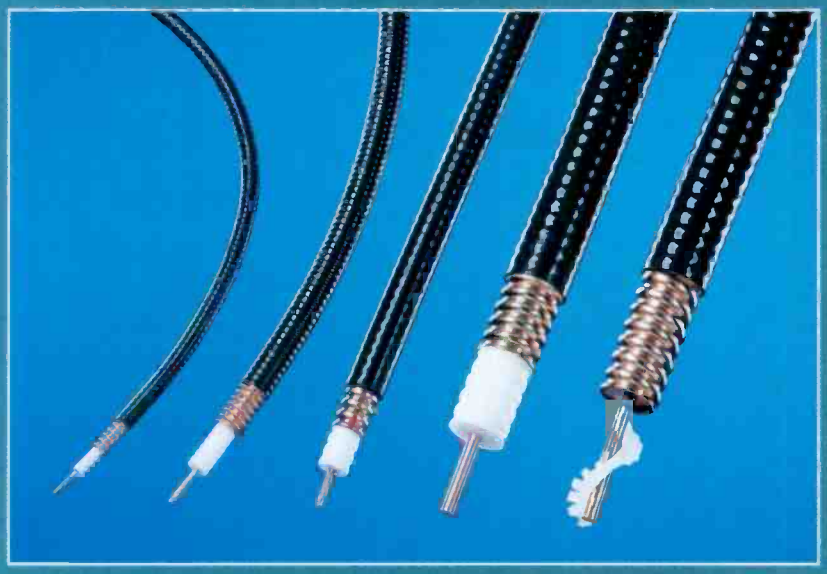
HELIAX® Coaxial Cable Selection Guide - 50-ohm, Air Dielectric

Air Dielectric, HJ Series			5" High Power
3"	4"	5"	5"
523	525	527	529
Standard Cables			
HJ8-50B	HJ11-50	HJ9-50	HJ9HP-50
Fire Retardant Cables			
Low VSWR Cables, Specially Tested			
42141† 209227†	42144†	42142†	
Special Application Cables			
Characteristics			
1640	1220	960	960
640	1100	1890	1690
93.3	92	93.1	96.4
30 (760)	40 (1015)	50 (1270)	50 (1270)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24°C (75°F).			
0.07 (0.25)	0.06 (0.19)	0.04 (0.13)	0.04 (0.12)
0.14 (0.46)	0.11 (0.37)	0.08 (0.26)	0.07 (0.25)
0.34 (1.12)	0.27 (0.88)	0.18 (0.59)	0.19 (0.61)
0.56 (1.84)	0.43 (1.41)	–	–
–	–	–	–
–	–	–	–
–	–	–	–
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40° C (104° F); inner conductor temperature (as noted); no solar loading.			
121 (250)	121 (250)	100 (212)	150 (302)
80.5	123	162	335
42.5	64.4	83.9	172
17.9	27.6	37.6	70.8
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

HELIAX® Coaxial Cables

HELIAX® Coaxial Cable Selection Guide - 50-ohm, Air Dielectric

	Air Dielectric, High Power, HT Series		Air Dielectric, High Power High Temp.,HLT Series	Air Dielectric, Plenum HL Series
	1/2"	7/8"	1/2"	1/2"
	493	514	499	496
Standard Cables				
Standard Black Jacket				
Fire Retardant Cables				
CATVX, VW-1, IEC 332-1 CATV, UL1581, IEC 332-3, IEEE 383 CATVR, UL1666 (RISER) CATVP, UL910 PLENUM, jacketed CATVP, UL910 PLENUM, unjacketed	HT4-50	HT5-50	HLT4-50T	HL4RP-50
Special Application Cables				
High Power/High Temperature	HT4-50	HT5-50	HLT4-50T	HL4RP-50
Characteristics				
Maximum Operating Frequency, MHz	10900	5200	4000	8800
Peak Power Rating, kW	21	90	21.4	40.0
Relative Propagation Velocity, %	92	92.5	93	88
Minimum Bend Radius, in (mm)	5 (125)	10 (250)	5 (125)	5(125)
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).				
30 MHz	0.47 (1.54)	0.21 (0.70)	0.380 (1.25)	0.39 (1.28)
100 MHz	0.89 (2.91)	0.42 (1.38)	0.723 (2.37)	0.73 (2.39)
450 MHz	2.06 (6.76)	1.05 (3.44)	1.68 (5.52)	1.62 (5.30)
1000 MHx	3.31 (10.9)	1.78 (5.85)	2.71 (8.90)	2.51 (8.23)
2000 MHz	5.11 (16.8)	2.91 (9.56)	4.21 (13.8)	3.73 (12.2)
6000 MHz	10.7 35.2)	–	–	7.22 (23.6)
10000 MHz	15.5 (50.7)	–	–	–
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40° C (104° F); inner conductor temperature 100° C (212° F); no solar loading.				
Inner Conductor Temperature, C° (F°)	200 (392)	200 (392)	200 (392)	100 (212)
30 MHz	11.7	32.7	12.7	6.77
100 MHz	6.21	16.6	6.70	3.64
450 MHz	2.68	6.65	2.88	1.64
1000 MHz	1.66	3.92	1.78	1.06
2000 MHz	1.08	1.51	1.15	0.712
6000 MHz	0.514	–	–	0.368
10000 MHz	0.356	–	–	–



HELIAX® Coaxial Cables

HELIAX® Coaxial Cable Selection Guide - 75-ohm, Foam and Air Dielectric

Superflexible, FSJ Series		Foam Dielectric, LDF Series		Air Dielectric, HJ Series
1/4"	1/2"	1/2"	7/8"	7/8"
531	533	536	539	542
Standard Cables				
FSJ1-75	FSJ4-75A	LDF4-75A	LDF5-75	HJ5-75
Fire Retardant Cables				
FSJ1RN-75	FSJ4RN-75A	LDF4RN-75A		HJ5RN-75
FSJ1RN-75	FSJ4RN-75A	LDF4RN-75A		HJ5RN-75
FSJ1RN-75	FSJ4RN-75A	LDF4RN-75A		HJ5RN-75
Special Application Cables				
Characteristics				
22000	11500	10000	5300	5600
6.7	10.0	26	70	60
78	81	88	89	90
1 (25)	1.25 (32)	5 (125)	10 (250)	10 (250
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).				
1.00 (3.28)	0.52 (1.70)	0.33 (1.10)	0.195 (0.640)	0.21 (0.68)
1.87 (6.14)	0.96 (3.17)	0.62 (2.04)	0.369 (1.21)	0.39 (1.27)
4.17 (13.7)	2.16 (7.07)	1.38 (4.53)	0.852 (2.79)	0.85 (2.79)
6.50 (21.3)	3.36 (11.0)	2.14 (7.02)	1.37 (4.48)	1.29 (4.23)
9.70 (31.8)	5.02 (16.5)	3.17 (10.4)	2.10 (6.89)	1.92 (6.30)
19.2 (62.9)	9.85 (32.3)	6.14 (20.1)	–	–
26.9 (88.3)	13.7 (44.9)	8.46 (27.8)	–	–
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 40° C (104° F); inner conductor temperature 100° C (212° F); no solar loading.				
100 (212)	100 (212)	100 (212)	100 (212)	100 (212)
1.06	3.31	3.09	5.68	9.31
0.564	1.77	1.67	3.00	5.01
0.256	0.795	0.751	1.30	2.25
0.163	0.509	0.484	0.812	1.49
0.109	0.342	0.327	0.527	0.977
0.055	0.177	0.169	–	–
0.040	0.125	0.122	–	–

HELIAX®
Coaxial Cables

HELIAX® Coaxial Cable

Accept No Substitute

HELIAX® is the Andrew brand name that stands for the most complete cost-effective, high performance coaxial cable systems in the world.

For more than 40 years, Andrew Corporation has led the industry in meeting the need for semiflexible RF transmission line. In land mobile, broadcast, cellular, military, terrestrial microwave, HF, earth station, personal communication, and many other applications, HELIAX coaxial cable products, including air and foam-dielectric cable, are the industry standard of excellence. The unique feature that makes HELIAX coaxial cable the best in the world is a solid copper, corrugated outer conductor which gives it strength, durability, flexibility, and complete shielding. These outstanding coaxial cables are complemented by our compatible connectors, hangers, grounding systems and other installation accessories to form a complete RF transmission line system. This broad range of coaxial cable and cable products means that Andrew can provide the right fit for any application you may have, from a single component to a complete, integrated cable system. It also means that all of your transmission line needs can be met by just one vendor — Andrew.

When you purchase HELIAX coaxial cable from Andrew, you're buying more than just cable. You're buying quality and performance that will save you money over the life of your system investment. You receive:

- *Outstanding Electrical Performance*
- *Long Service Life*
- *Simplified System Planning*
- *Lower Installation Cost*
- *ISO 9001 certified*

Here's a closer look at the benefits:

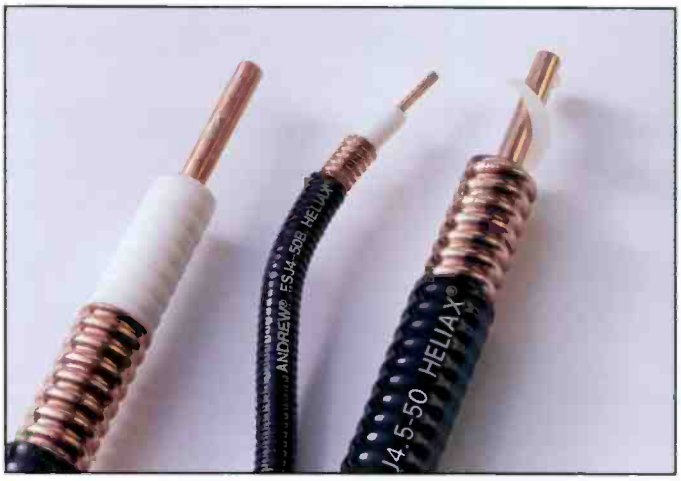
Outstanding Electrical Performance

HELIAX coaxial cable, connectors and accessories are designed to provide optimum electrical performance for a wide range of RF applications. You can be certain that HELIAX coaxial cable systems will perform as you expect with no surprises. All HELIAX coaxial cable system components are inspected to stringent requirements including Military Standard MIL-I-45208.

HELIAX connectors are designed exclusively for use with HELIAX coaxial cables to provide excellent electrical performance for the complete transmission line system.

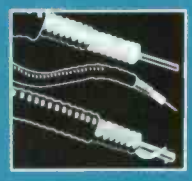
Service Guarantee

At Andrew, we're committed to meeting our customers' highest expectations by offering the best products backed by the most responsive service in the industry. So whatever our customer needs, whenever and wherever they need it, we will deliver.



Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

HELIAX®
Coaxial Cables



HELIAX® is the registered trademark under which semi-flexible coaxial cables are sold by Andrew. HELIAX cables, connectors and accessories are proprietary products of Andrew manufactured under patents issued and pending.

Low Attenuation
The low attenuation of HELIAX coaxial cable results in highly efficient signal transfer which maximizes overall system performance.

Complete Shielding
Since HELIAX cable has a solid copper outer conductor, you get continuous RFI/EMI shielding to minimize interference and maximize system security.

Low VSWR
Also available are low VSWR versions of HELIAX cable which minimize system noise.

Excellent Intermodulation Performance
The solid inner and outer conductors of HELIAX cable virtually eliminate intermodulation generation. Connectors minimize intermodulation by ensuring high contact pressure at the connector to cable interface.

High Power Rating
The low attenuation and excellent heat transfer properties of HELIAX cables combined with temperature stabilized dielectric materials result in safe long term operation at the high average power levels often required for broadcast, military and other transmit applications.

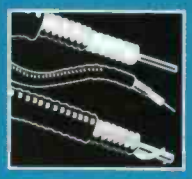
Long Service Life
When it comes to reliability, HELIAX coaxial cables have built-in quality features to protect your investment and provide long term cost-effective performance. Service and maintenance costs are avoided because HELIAX cable systems are designed to last.

All HELIAX coaxial cables are jacketed for direct burial or for corrosive environmental conditions. Standard jacketing material is weather-resistant polyethylene suitable for use in extreme climates. Operational fire retardant CATVX, CATVR and CATVP rated jacketed cables are available to meet safety regulations for indoor installations. These indoor cables require protection during outdoor storage. See page 588 for information on cable and connector temperature ratings.

Strong and Flexible
HELIAX cable's solid copper, corrugated outer conductor gives it great strength, durability and flexibility. This assures long life as well as ease of installation.

Weatherproof and Durable
HELIAX cable's standard black polyethylene jacketing is weatherproof and ultraviolet stabilized making it suitable for outdoor applications. HELIAX cable is directly buriable and highly resistant to crushing. It is exceptionally corrosion resistant, helping to provide a long term, trouble-free cable system. Many users have been in operation for more than 20 years with the same HELIAX cable.

Reliable
The availability of HELIAX cable in long, continuous lengths eliminates the need for joints which can affect reliability.



HELIAX® Coaxial Cables

Simplified System Planning

Selecting a HELIAX cable system will make system planning easy and cost-effective. With Andrew, you have the advantage of our outstanding engineering resources and comprehensive product line. Look at the system planning benefits you receive when you purchase HELIAX coaxial cable:

One-Stop Shopping

With Andrew "one-stop" shopping, all of your transmission line needs – quality cable, connectors, accessories and service – are available from one vendor. You avoid the problems of delivery delays, out-of-sequence deliveries, and non-compliant materials which are frequently the result of dealing with multiple vendors. At Andrew, all of our cable components are engineered to work together as a HELIAX cable system.

Fast Delivery

Product availability is critical when you have a weather emergency or "last minute" design change that could result in downtime and lost revenue. In such situations, we respond quickly to get you on-the-air. Rapid product availability allows Andrew to be a real problem solver for you at installation time. With schedules to meet, you need to avoid delivery delays, contain costs, and get your system operating on time. With HELIAX coaxial cable from Andrew, you can do it.

Large Variety of Sizes and Types

The wide variety of HELIAX cable sizes and types lets you select the best cable for your specific application allowing more cost-effective planning. Optional fire-retardant, non-halogenated jacketing is available to meet safety regulations for indoor installations.
See Cable Selection Guide on pages 406 - 413.

Factory Connector Attachment

For your convenience, HELIAX cables can be ordered cut to length and factory fitted with connectors per your specifications. This service helps you avoid field assembly and testing.

Free Software and Product Information

To help plan your system, Andrew provides a number of helpful software packages. In addition, you can obtain Installation Instruction Bulletins, Special Publications and Product Specifications via "Answers from Andrew" fax back service and the Andrew Internet site

Lower Installation Cost

The HELIAX cable product line helps lower your field installation costs.

Long Continuous Lengths

This simplifies installation and eliminates the cost of splicing. Cable lengths can be conveniently stocked on site and cut to required lengths.

Flexibility

HELIAX cable's corrugated copper outer conductor gives it flexibility which makes shipping, handling and installation easier and more cost-effective than rigid line.

Ease of Connector Attachment

Connectors for HELIAX coaxial cable can be easily attached in the field with standard hand tools. HELIAX connectors provide high resistance to connector pull-off and twist-off as well as excellent electrical contact.

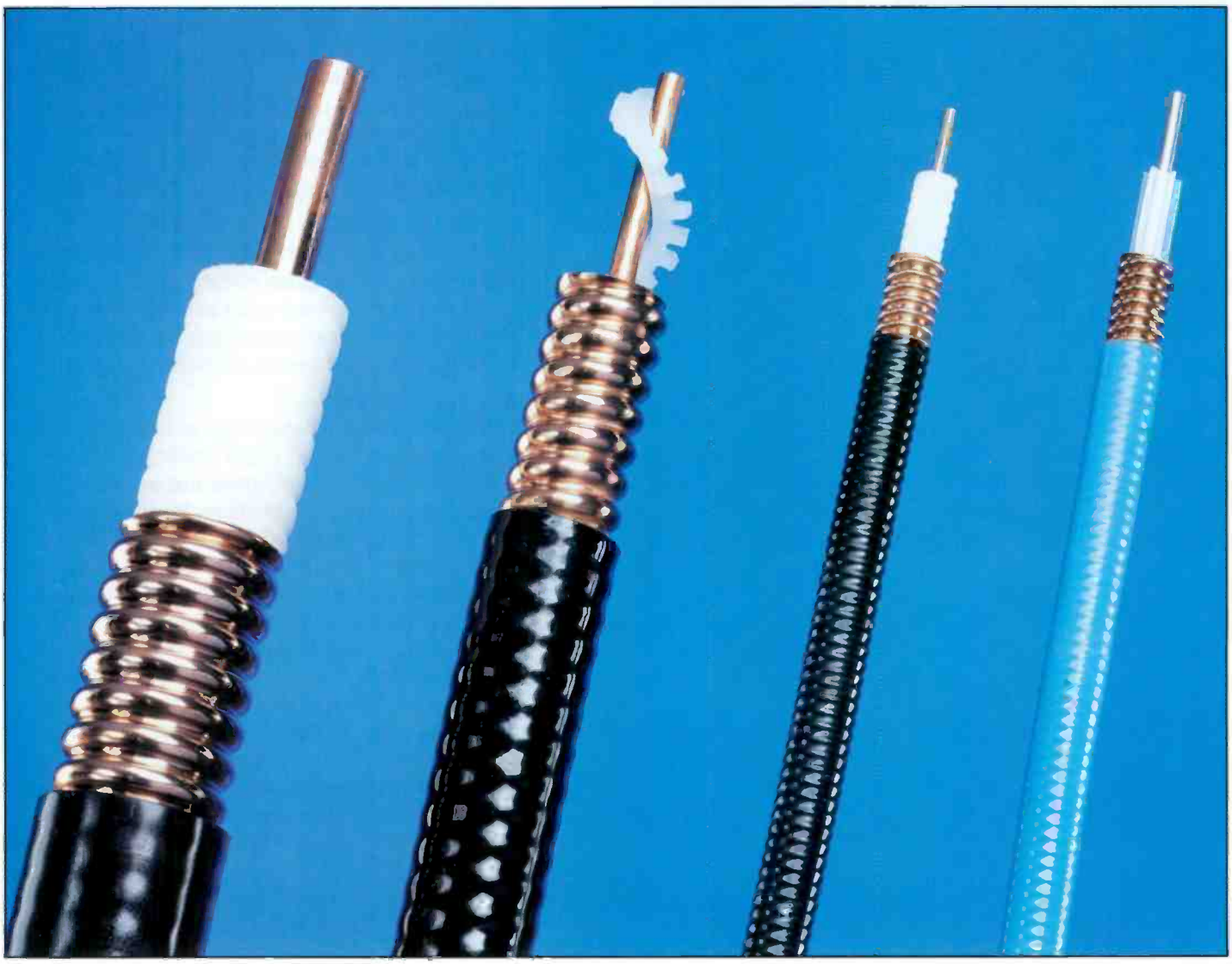
Whatever your transmission line needs may be, HELIAX coaxial cables, connectors and accessories made exclusively by Andrew consistently provide you with outstanding electrical performance, long service life, simplified system planning, and lower installation costs.

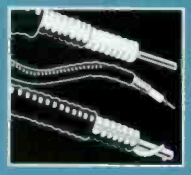
ISO 9001 Certified

ISO 9001 is the internationally recognized standard for quality systems. It was designed to provide a thorough, yet flexible model for quality systems design and implementation. Andrew facilities have successfully completed the requirements of ISO 9001, the most stringent portion of the standard. This certification resulted from a consistent quality system that involves everyone in the organization in improving both internal and external quality.

HELIAX® Coaxial Cable Types

- *Foam dielectric (LDF Series)*
- *Superflexible foam dielectric (FSJ and ETS Series)*
- *Extraflexible foam dielectric (EFX Series)*
- *Superflexible star dielectric (HS and HST Series)*
- *Air dielectric (HL, HT and HJ Series)*





HELIAX®
Coaxial Cables

Superflexible and Extraflexible Cables

HELIAX superflexible and extraflexible cables are designed for ease of installation in tight wiring spaces in shelters, radio rooms, and plenums. These cables are perfect for antenna and equipment room jumpers. Like all HELIAX cables, superflexible cables feature a solid outer conductor for unsurpassed electrical and mechanical performance. A polyethelene foam dielectric offers excellent electrical performance and prevents water migration.

Flexibility
Andrew HELIAX superflexible cables are manufactured with deep, helical corrugations in the outer conductor. Extraflexible cables are manufactured with deep, annular corrugations. These exclusive corrugating processes permit Andrew cables and assemblies to be bent on very tight radii, without any degradation in performance. In addition, numerous reverse bends can be made, again without loss in performance.

Superior Electrical Performance
HELIAX cables and assemblies offer specifiers and users superior electrical performance in smaller sized cables. HELIAX cables and assemblies provide excellent attenuation and superior power handling and shielding versus comparably sized braided cables.

Excellent Intermodulation Performance
The solid inner and outer conductors found in all HELIAX cables minimize intermodulation generation. The braided outer conductors and stranded inner conductors that are common in other cables form numerous contacts in the electrical path, which are sources of intermodulation.

Complete Product Range
Andrew now offers a complete range of cables to meet every application and budget requirement. HELIAX superflexible and extraflexible cables are available in a wide range of sizes and constructions for general use, plenum, and flame retardant applications. The HS series cables feature a "star-shaped" dielectric and superflexible construction. They are for use in plenum applications. In addition, Andrew has recently introduced a line of superflexible cables for high power applications. Designated the "HST" series, these new cables feature a star-shaped dielectric which offers higher power handling at higher temperatures than any other flexible cable. A wide selection of connectors and factory manufactured assemblies in both standard and custom jumper configurations is available, to complement Andrew cable and make system planning easy and simple.

Foam Dielectric Cables

Superior Electrical Performance
Like the FSJ and EFX cables, LDF cables have a closed-cell, foam-polyethylene dielectric that prevents water migration and maintains its characteristics over time.

LDF cables are designed for low loss. Their lower density foam allows higher velocities and provides lower attenuation than FSJ cables. Attenuation characteristics approach those of air dielectric cables.

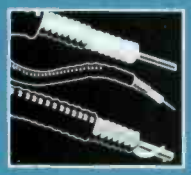
Flexibility
HELIAX Foam Dielectric Cables feature an annularly corrugated outer conductor that provides excellent shielding while offering flexibility.

Complete Product Range
LDF cables are available in sizes from 1/4" to 2-1/4" to meet application requirements for Cellular and Personal Communications, Land Mobile Radio, Earth Station Antenna jumpers, equipment room and antenna jumpers, CATV, HF communications, VLF, military data links, AM and FM broadcast, terrestrial microwave, and CCTV. Phase stabilized versions are available.

Weatherproof
Annular (ring type) corrugations prevent water migration. Closed cell dielectric prevents water penetration. Connector O-rings seal out moisture.

Excellent Intermodulation Performance
Solid inner and outer conductors eliminate IM generated by numerous moving contacts in the current path that are found with stranded inner conductors and braided outer conductors.

Quick and Easy Connector Attachment
A range of self flaring connectors are available for easy field attachment requiring no special tools.



HELIAX® Coaxial Cables

Air Dielectric Cables

HELIAX® air dielectric cables from Andrew, available in 1/4" to 5" sizes, are designed to give you the lowest attenuation and highest average power rating. When these cables are equipped with the proper pressurization systems, they may be used in any indoor/outdoor environment. Air cables if used indoors in a controlled environment do not require pressurization.

The HJ air cables have a polyethylene or polypropylene spacer, and different jacketing materials dependent on fire retardancy requirements. High power HJ series cables use a special fluoropolymer spacer for maximum power handling with excellent attenuation. The cables are ideal for antenna feeder applications such as AM and FM radio, UHF and VHF TV, terrestrial microwave and earth station antenna systems, land mobile and cellular radio, ITFS, MMDS and MDS antenna systems, HF communications, military communications and radar.

The HL air cables utilize a polyethylene spiral to space the inner conductor from the outer conductor, and a fluoropolymer jacket to provide fire retardancy. These cables are intended for indoor plenum type applications.

The HT air cables use a fluoropolymer spiral to space the inner from the outer, and are unjacketed. These cables are for high temperature and/or high power applications.

The outstanding features of HELIAX® air-dielectric cables are:

Low Attenuation
Low loss dielectric materials combined with high conductivity copper conductors result in low attenuation for efficient signal transfer and maximum system performance.

Solid Copper Corrugated Outer Conductor
Results in low loss, continuous RFI/EMI shielding to minimize interference and maximize system security. Corrugated outer conductor allows for ease of installation.

High Power Handling
Results from low attenuation and excellent heat transfer characteristics.

Weatherproof/Pressure Tight
HJ type cables have silicone gasketed connectors with 1/8" NPT pressure inlets. Connectors are designed to be pressure tight for maximum protection against water entry.

System Integrity
If a pressurized air-dielectric cable should be damaged, the pressurization system will alarm so that the leak can be corrected before water enters the cable and degrades performance.

Rugged Construction
HELIAX HJ cables are made with the strongest dielectric spacer in the industry, to withstand the stress of installation.

HELIAX® Coaxial Cable... Today's Alternative to Braided Cable

Excellent Intermodulation Performance
HELIAX coaxial cables and connectors minimize intermodulation generation by using solid conductors. Stranded inner conductors and braided outer conductors, used in many other cables, form numerous contacts within the current path which are a source of intermodulation.

Complete RF Shielding

Unlike braided cables, HELIAX coaxial cables have a solid corrugated copper outer conductor to protect against electromagnetic and radio frequency interference (EMI & RFI).

Phase Stability
HELIAX coaxial cables offer excellent phase stability over temperature variations and with bending. This makes them an excellent choice for phase-critical applications such as delay lines and matched feeders in phased-array antennas.

Low Attenuation
The continuous outer conductor and low loss polyethylene foam dielectric of HELIAX cables result in much lower losses than comparably sized braided cables.

High Power Capability
The excellent thermal conductivity and the low attenuation of HELIAX cables provide for higher average power handling capability when compared to comparably sized braided cables.

Flexibility
HELIAX coaxial cables have excellent flexibility for ease of installation. These cables can be bent on small radii and will withstand repeated bends without degrading performance.

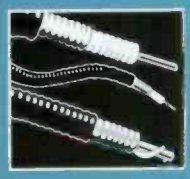
Weatherproof and Durable for Outdoor Applications
HELIAX coaxial cables are protected with a rugged black polyethylene jacket which provides abrasion resistance and complete environmental protection. Unlike braided cables, they can be used outdoors without the fear of water migration.

Fire Retardancy
HELIAX coaxial cables are available with special jacketing to meet relevant fire retardance standards.
See page 579.

HELIAX®
Coaxial Cables

HELIAX® Coaxial Cable vs

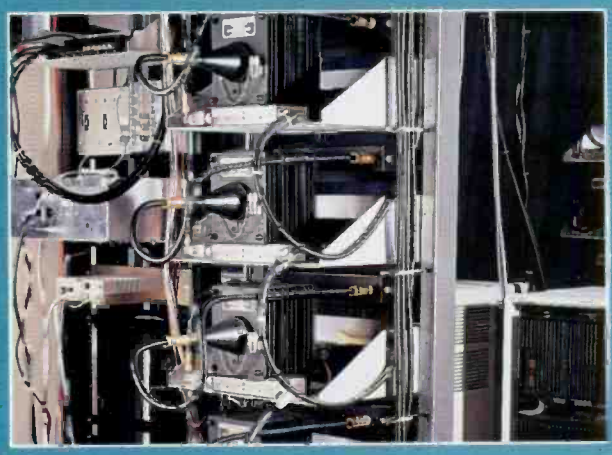
	Standard Superflexible			Extraflexible	LDF Series			High Power Cables			Standard Superflexible		LDF Series
	FSJ1-50A	FSJ2-50	FSJ4-50B	EFX2-50	LDF1-50	LDF2-50	LDF4-50A	HST1-50	HST2-50	HST4-50	FSJ1-75	FSJ4-75A	LDF4-75A
Nominal Size	1/4"	3/8"	1/2"	3/8"	1/4"	3/8"	1/2"	1/4"	3/8"	1/2"	1/4"	1/2"	1/2"
Impedance, ohms	50	50	50	50	50	50	50	50	50	50	75	75	75
Electrical Characteristics													
Relative Propagation Velocity, %	84	83	81	85	86	88	88	82	83	81	78	81	88
Maximum Operating Frequency, MHz	20400	13400	10200	13500	15800	13500	8800	18000	13400	10200	22000	11500	10000
Attenuation, dB/100 ft (dB/100 m) Standard conditions: VSWR 1.0; ambient temperature 24° C (75° F).													
150 MHz	2.23	1.49	1.29	1.35	1.47	1.30	0.845	2.08	1.53	1.36	2.31	1.19	0.770
	(7.32)	(4.90)	(4.23)	(4.43)	(5.03)	(4.27)	(2.77)	(6.84)	(5.03)	(4.45)	(7.58)	(3.90)	(2.53)
450 MHz	3.93	2.66	2.32	2.40	2.56	2.30	1.51	3.68	2.72	2.43	4.17	2.16	1.38
	(12.9)	(8.73)	(7.61)	(7.87)	(8.94)	(7.56)	(4.96)	(12.1)	(8.92)	(7.98)	(13.7)	(7.07)	(4.53)
824 MHz	5.42	3.68	3.25	3.33	3.46	3.19	2.10	5.06	3.75	3.39	5.82	3.01	1.92
	(17.8)	(12.1)	(10.7)	(10.9)	(12.36)	(10.5)	(6.90)	(16.6)	(12.3)	(11.1)	(19.1)	(9.89)	(6.31)
960 MHz	5.87	4.00	3.55	3.62	3.74	3.47	2.29	5.59	4.07	3.69	6.35	3.28	2.09
	(19.3)	(13.1)	(11.6)	(11.9)	(13.43)	(11.4)	(7.51)	(18.0)	(13.4)	(12.1)	(20.8)	(10.8)	(6.86)
1500 MHz	7.47	5.12	4.57	4.63	4.67	4.43	2.93	6.97	5.19	4.74	8.23	4.24	2.69
	(24.5)	(16.8)	(15.0)	(15.2)	(17.15)	(14.5)	(9.61)	(22.9)	(17.0)	(15.5)	(27.0)	(13.9)	(8.82)
2000 MHz	8.73	6.01	5.41	5.45	5.40	5.21	3.45	8.15	6.09	5.59	9.70	5.02	3.17
	(28.6)	(19.7)	(17.7)	(17.9)	(20.13)	(17.1)	(11.3)	(26.7)	(20.0)	(18.3)	(31.8)	(16.5)	(10.4)
4000 MHz	12.8	8.96	8.20	5.90	7.63	7.74	5.18	12.0	9.01	8.41	14.9	7.62	4.77
	(42.0)	(29.4)	(26.9)	(19.4)	(29.89)	(25.4)	(17.0)	(39.3)	(29.5)	(27.6)	(48.7)	(25.0)	(15.7)
6000 MHz	16.2	11.4	10.6	10.4	9.34	9.85	6.64	15.1	11.4	10.8	19.2	9.85	6.14
	(53.2)	(37.4)	(34.8)	(34.1)	(37.94)	(32.3)	(21.8)	(49.5)	(37.4)	(35.4)	(62.9)	(32.3)	(20.1)
10000 MHz	21.8	15.6	14.7	14.2	12.06	13.5	–	20.3	15.5	14.9			
	(71.5)	(51.1)	(48.2)	(46.6)	(51.72)	(44.3)		(66.6)	(50.8)	(48.9)			
Average Power Rating, kW Standard conditions: VSWR 1.0; ambient temperature 25° C (77° F); inner conductor temperature 100° C (212° F), except HST Series 200° C (482° F).													
150 MHz	1.32	2.29	3.29	1.74	1.51	2.39	3.63	3.16	4.38	7.52	0.610	1.90	1.78
450 MHz	0.748	1.29	1.82	0.978	0.871	1.35	2.02	1.78	2.47	4.19	0.338	1.05	0.991
824 MHz	0.544	0.929	1.31	0.706	0.644	0.972	1.45	1.30	1.79	3.01	0.242	0.750	0.710
960 MHz	0.502	0.855	1.20	0.649	0.597	0.895	1.33	1.20	1.65	2.77	0.220	0.688	0.653
1500 MHz	0.395	0.669	0.931	0.507	0.477	0.700	1.05	0.944	1.29	2.15	0.172	0.537	0.508
2000 MHz	0.338	0.569	0.788	0.431	0.413	0.595	0.888	0.807	1.10	1.83	0.144	0.452	0.432
4000 MHz	0.230	0.383	0.520	0.289	0.292	0.400	0.591	0.550	0.745	1.21	0.094	0.296	0.286
6000 MHz	0.182	0.300	0.404	0.227	0.239	0.315	0.463	0.437	0.437	0.588	0.073	0.234	0.223
10000 MHz	0.135	0.219	0.290	0.165	0.185	0.231	–	0.324	0.433	0.685	0.052	0.165	0.161
Mechanical Characteristics													
Diameter over jacket													
in	0.29	0.415	0.52	0.45	0.345	0.44	0.63	0.29	0.415	0.52	0.29	0.52	0.63
(mm)	(7.4)	(10.5)	(13.2)	(11.3)	(8.8)	(11.2)	(15.9)	(7.4)	(10.45)	(13.2)	(7.4)	(13.2)	(16)
Weight, lb/ft	0.045	0.078	0.14	0.09	0.06	0.08	0.15	0.057	0.094	0.165	0.046	0.14	0.14
(kg/m)	(0.067)	(0.12)	(0.21)	(0.13)	(0.09)	(0.12)	(0.22)	(0.085)	(0.140)	(0.245)	(0.068)	(0.21)	(0.21)
Min. Bending Radius													
in	1	1	1.25	1.75	3	3.75	5	1	1	1.25	1	1.25	5
(mm)	(25)	(25)	(32)	(45)	(76)	(95)	(125)	(25)	(25)	(32)	(25)	(32)	(125)

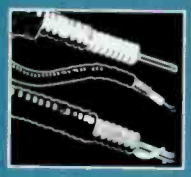


*Conventional Braided Cables**

M17/74 RG-213/U	M17/75 RG-214/U	Commercial Version of RG-213/U	M17/60 RG-142B/U	M17/127 RG-393/U	M17/2 RG-6/U	M17/6 RG-11/U
65.9	65.9	84	69.5	69.5	65.9	65.9
1000	11000	–	12400	11000	300	1000
2.6	2.9	1.5	4.6	2.7	3.6	2.7
(8.5)	(9.5)	(4.9)	(15.1)	(8.8)	(11.8)	(8.8)
5.0	5.5	2.8	8.4	4.9	6.7	5.1
(16.4)	(18.0)	(9.2)	(27.6)	(16.1)	(22.0)	(16.7)
7.4	7.8	4.0	11.8	7.0	9.6	7.5
(24.3)	(25.6)	(13.1)	(38.7)	(23.0)	(31.5)	(24.6)
8.5	8.6	4.4	13.0	7.6	10.6	8.6
(27.9)	(28.2)	(14.4)	(42.7)	(24.9)	(34.8)	(28.2)
–	11.3	5.8	16.9	10.0	14.0	–
–	(37.1)	(19.0)	(55.4)	(32.8)	(45.9)	–
–	13.6	7.0	20.2	11.9	16.9	–
–	(44.6)	(23.0)	(66.3)	(39.0)	(55.4)	–
–	21.6	11.1	31.4	18.5	–	–
–	(70.9)	(36.4)	(103)	(60.7)	–	–
–	28.6	14.7	41.1	24.2	–	–
–	(93.8)	(48.2)	(135)	(79.4)	–	–
–	41.4	–	58.5	34.5	–	–
–	(136)	–	(192)	(113)	–	–
0.91	0.91	1.2	2.1	5.4	0.42	0.57
0.44	0.44	0.58	1.1	2.9	0.19	0.26
0.29	0.29	0.39	0.79	2.0	0.13	0.17
0.26	0.26	0.35	0.73	1.8	0.11	0.15
–	0.19	0.26	0.56	1.4	0.083	–
–	0.16	0.21	0.47	1.2	0.068	–
–	0.096	0.12	0.29	0.76	–	–
–	0.070	0.088	0.22	0.58	–	–
–	0.046	–	0.14	0.40	–	–
0.405	0.425	0.405	0.195	0.390	0.332	0.405
(10.29)	(10.79)	(10.29)	(4.95)	(9.91)	(8.43)	(10.29)
0.11	0.13	0.089	0.043	0.175	0.082	0.098
(0.164)	(0.193)	(0.132)	(0.064)	(0.260)	(0.122)	(0.146)
5	6	6	2	4	3	4.5
(125)	(150)	(150)	(50)	(102)	(75)	(115)

* Braided cables not supplied by Andrew. Listing is for comparative purposes only.





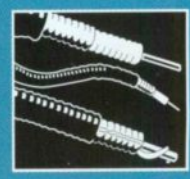
HELIAX®
Coaxial Cables

HELIAX® Cable and Connectors Now with Three Year Warranty

An extended three-year warranty is now included, at no extra charge, on all new purchases of HELIAX coaxial cable, connectors and cable assemblies. Here are the details of this exclusive warranty:

- *Complete coverage against defects in material and workmanship for HELIAX cables, connectors and assemblies.*
- *When connectors are attached by Andrew or an Andrew certified distributor, the attachment is also covered.*
- *Any HELIAX coaxial cable that has been fitted with non-Andrew connectors is expressly excluded from this extended warranty and is subject to the terms of the Andrew standard one-year warranty.*

ANDREW.



HELIAX® Connector Selector Guide for Foam Dielectric Cables

	FSJ1/ETS1	FSJ2/ETS2	FSJ4	EFX2	LDF1	LDF2	LDF4	LDF5	LDF6	LDF7	LDF12
N male		■	■			■	■	■			
N male, plated		■	■			■	■	■	■	■	
N male, hex head		■	■			■	■				
N male, hex head, plated	■	■	■	■	■	■	■	■	■	■	
N male, captivated		■	■				■				
N male, plated, captivated		■	■				■				
N male, hex head, captivated		■	■				■				
N male, hex head, captivated, plated		■	■				■				
N male, high frequency	■										
N male, right angle, plated			■				■				
N male, right angle, hex head plated	■		■				■				
N male, right angle, hex head, captivated, plated			■		■						
N female		■	■			■	■	■			
N female, plated		■	■	■	■	■	■	■	■	■	■
N female, captivated		■	■				■				
N female, plated captivated		■	■				■				
N female, bulkhead										■	
N female, bulkhead plated	■	■	■		■	■	■				
N female, panel mount plated							■				
SMA male	■			■		■					
SMA male, right angle	■										
SMA female, bulkhead	■										
BNC male, plated	■										
TNC male	■					■					
TNC male, plated				■		■					
TNC male, high frequency	■										
TNC female, plated						■					
TNC female	■			■		■	■				
UHF male	■		■	■		■	■	■			
UHF female	■		■	■		■	■	■			
Mini-UHF male	■										
HN male			■				■	■			
4.1-9.5 DIN male, captivated			■			■					
4.1-9.5 DIN male, solder						■					
4.1-9.5 DIN male, right angle, captivated			■			■					
7-16 DIN male, captivated		■	■	■		■	■	■	■	■	■
7-16 DIN male, solder	■	■	■				■				
7-16 DIN male, right angle, solder			■				■				
7-16 DIN male, right angle, captivated		■	■				■	■			
7-16 DIN female, captivated		■	■	■		■	■	■	■	■	■
7-16 DIN female, solder	■	■	■				■				
7-16 DIN female, panel mount	■	■	■				■				
7-16 DIN female, bulkhead			■								
7-16 DIN female, bulkhead, captivated			■					■	■		
7-16 DIN female, panel mount, captivated			■			■		■		■	
LC male							■	■	■	■	
LC female								■	■	■	
SC male			■				■				
SC male, right angle							■				
SC female							■				
7/8" EIA flange			■				■	■	■	■	
7/8" EIA flange, right angle							■	■			
1-5/8" EIA flange										■	
3-1/8" EIA flange, gas pass											■
3-1/8" EIA flange, gas barrier											■
F flange male							■	■	■	■	
F flange female							■	■			
End terminal							■	■			
Splice							■	■	■	■	

HELIAX® Connectors

Premium Performance Connectors Complement HELIAX Coaxial Cables

Andrew offers an extensive line of connectors for HELIAX coaxial cables. Used together, HELIAX cables and connectors produce the highest quality transmission line assembly available. HELIAX connectors are designed and manufactured by Andrew exclusively for HELIAX cable to optimize the electrical and mechanical performance of the transmission line system. They are the only connectors completely compatible with HELIAX cable.

HELIAX Connectors Offer Many Advantages:

Easy Attachment

Unlike many other high-performance connectors, HELIAX connectors can be attached using common hand tools. Attachment is even easier using EASIAX® cable prep tools featured on page 568. Assemblies can be fabricated on-site to fit a particular application. Or, if you prefer, Andrew will supply factory fitted cable assemblies tested to your specifications including VSWR, insertion loss and phase performance.

Weatherproof and Durable

HELIAX connectors incorporate O-rings and gaskets to keep moisture out of the interface and maintain their excellent electrical performance. They are constructed of metals that are compatible with the cables for long-term corrosion protection outdoors.

Low Intermodulation Generation

For high channel capacity, multi-channel cellular and trunking systems, intermodulation is of greater concern today than for the radio systems of just a few years ago.

Intermodulation (IM) is the harmonic mixing of two or more signals into an additional unwanted signal that can seriously degrade the performance of wireless systems. As channel bandwidths are reduced to increase capacity for pager, two-way, trunking, PCS, and cellular systems, unwanted IM signals can appear.

In passive components, such as connectors and coaxial cables, IM is usually caused by ferromagnetic materials or thin surface oxide layers at junctions between conductors. To reduce IM generation, these products must be eliminated. Solid connectors (such as the Andrew connectors with no ferromagnetic materials used within the RF current path) and cables with single inner and outer conductors and no junctions (such as HELIAX coaxial cables) reduce IM to inconsequential and almost immeasurable levels.

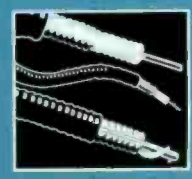
Andrew is one of the few companies worldwide that understands IM, tests for IM, and designs products to virtually eliminate IM. We test each design for optimum IM performance before any connector is released.

Excellent RF Shielding

Outer conductor attachments clamp or solder 360° around the cable resulting in virtually complete shielding.

HELIAX connectors for air dielectric cables are not interchangeable with those for foam dielectric cables. HS and HST series cables use corresponding FSJ connectors. These cables are intended for indoor use only, as the connectors cannot be pressurized. Differences include:

- *Air dielectric connectors are equipped with gas ports to allow pressurization of the cable.*
- *Most air dielectric connectors are available in both gas barrier and gas pass versions. The gas barrier prevents air flow to the mating connector.*
- *Air dielectric cables have a helical corrugated outer conductor. LDF foam cables have annular corrugations and thus use a different clamping nut to secure the connector to the cable.*
- *Most air dielectric connectors are attached using a snip flare. LDF foam connectors are self flaring.*



New Connectors

New RingFlare Connectors Guarantee Fast Installation
RingFlare connectors feature a unique, expandable clamping ring that automatically flares the cable as the connector is tightened. Captivated inner contacts dramatically decrease installation time.

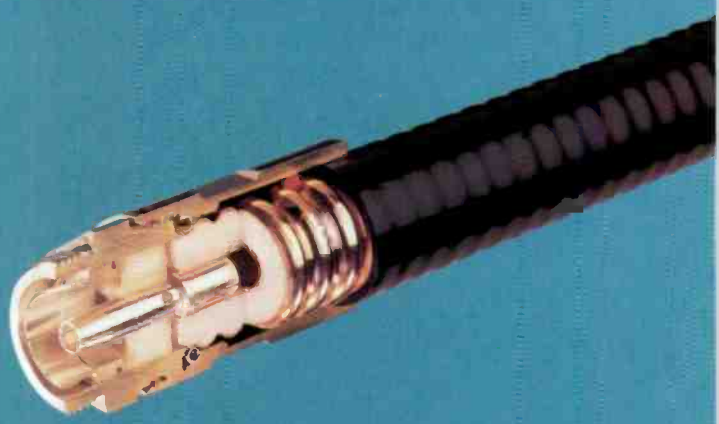
For ordering information see page 466.

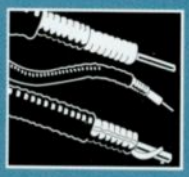
New Connectors for New Cable Types
Self-Flaring connectors are now available for new cable types LDF1-50, 1/4" foam dielectric HELIAX cable, EFX2-50 3/8" extraflexible foam dielectric cable, and LDF12-50 2-1/4" foam dielectric cable. Connectors include Type N and DIN. These connectors join the extensive family of HELIAX self-flaring connectors.

For ordering information see pages 455, 457 and 480.

New Connector Product Improvement
Redesigned Inner Contacts Simplify Installation.
Inner contacts of connectors for all 7/8", LDF5-50A foam dielectric cable have been redesigned for faster and easier installations. The new design reduces the number of rotations required to attach the pin to the inner conductor by 75 percent, cutting the effort and time needed to install the connector.

For ordering information, see page 466.





Connector Numbering System

This Catalog features a functional, connector type numbering system that installation, purchasing and receiving personnel should find easy to understand. With a few exceptions, it is limited to our Type N and DIN connectors. Here are three examples:

Type Number: **L2NM**
L2 denotes it is used with ***L****DF****2****-50 cable*
NM denotes it is an ***N Male***

Type Number: **L4PNF**
L4 denotes it is used with ***L****DF****4****-50 cable*
PNF denotes it is a ***P****lated* ***N F****emale*

Type Number: **F4PDM-C**
F4 denotes it is used with ***F****SJ****4****-50B cable*
PDM denotes it is a ***P****lated 7-16* ***D****IN* ***M****ale*
C denotes it features a captivated pin

Cable Keys

E2	EFX2-50	3/8"
F1	FSJ1-50A	1/4"
F2	FSJ2-50	3/8"
F4	FSJ4-50B	1/2"
H4	HJ4-50	1/2"
H4.5	HJ4.5-50	5/8"
H5	HJ5-50	7/8"
H7	HJ7-50A	1-5/8"
H8	HJ8-50B	3"
H11	HJ11-50	4"
H9	HJ9-50	5"
H9HP	HJ9HP-50	5" (High Power)
H12	HJ12-50	2-1/4"
L1	LDF1-50	1/4"
L2	LDF2-50	3/8"
L4	LDF4-50A	1/2"
L5	LDF5-50A	7/8"
L6	LDF6-50	1-1/4"
L7	LDF7-50A	1-5/8"
L12	LDF12-50	2-1/4"

Connector Keys

NM	N Male
NF	N Female
NR	N Male Right Angle
PNM	Plated N Male
PNR	Plated N Male Right Angle
PNF	Plated N Female
PBM	Plated BNC Male
PSM	Plated SMA Male
PSF	Plated SMA Female
PSR	Plated SMA Male Right Angle
PDM	Plated 7-16 DIN Male
PDF	Plated 7-16 DIN Female
PDR	Plated 7-16 DIN Male Right Angle
PKM	Plated 4.1-9.5 DIN Male
PKR	Plated 4.1-9.5 DIN Male Right Angle
PTM	Plated TNC Male

Connector Keys (Continued)

PTF	Plated TNC Female
SM	SMA Male
SF	SMA Female
UM	UHF Male
UF	UHF Female
MU	Mini UHF Male
FM	CATV F Male
M	EIA Flange Male
F	EIA Flange Female

Suffix Keys

HF	High Frequency
BH	Bulkhead
7550	75-Ohm Cable, 50-Ohm Mating Pin
7570	75-Ohm Cable, 70-Ohm Mating Pin
C	Captivated Pin Inner Attachment (solderless)
PM	Panel Mount
I	Indoor Use
IC	Indoor Use, Captivated Pin
PMC	Panel Mount, Captivated Pin
H	Hex Coupling Nut
BHC	Bulkhead, Captivated Pin
PMC	Panel Mount, Captivated Pin
T	Tunable
HC	Hex Coupling Nut, Captivated Pin Inner Contact Attachment
PR	Pressure Port
IP	Installer Pax
RP	Reel Pax
RC	Ring Flare, Captivated Pin Inner contact Attachment
B	Gas Barrier
P	Gas Pass

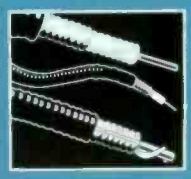
Coupling Torque for All Type N and 7-16 Din Connectors

Type N lbf-in (N•m)	**7-16 DIN lbf-in (N•m)**
15-20 (1.7-2.3)	220-265 (25-30)

Pin Depth for Type N and 7-16 DIN Connectors

Connector	**Pin Depth, in (mm)***
N Male	0.208-0.230 (5.28-5.84)
N Female	0.187-0.207 (4.75-5.26)
7-16 DIN Male	0.058-0.070 (1.47-1.78)
7-16 DIN Female	0.070-0.082 (1.78-2.08)

* High frequency performance may be enhanced by adjusting pin depth to minimize the gap between male and female connectors.



HELIAX® Connectors

The pictures below and on pages 430-433 show the various connector interfaces and body styles available for HELIAX® cables. In many cases, a single picture is used to represent several similar connectors. See the connector ordering information charts for details.

N Males

For FSJ1, FSJ2, FSJ4 Cables

For LDF1, EFX2 Cables

For LDF2, LDF4, HLT4, FSJ4 Cables

For LDF5, LDF6, LDF7 Cables

For HJ4, HT4, HJ5, Cables

Right Angle N Males

For FSJ1 Cable

For LDF4 Cable

For FSJ4 Cable

Bulkhead N Females

For FSJ1 Cable

For LDF1, LDF2, LDF4 Cables

For FSJ2, FSJ4 Cables

N Females

For FSJ2,FSJ4 Cables

For HJ4, HT4, HJ5, HT5, HJ7, HJ12 Cables

For LDF1, LDF2, LDF4, EFX2, HLT4 Cables

Mini UHF Male

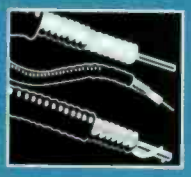
For FSJ1 Cable

UHF Males

For FSJ1 Cable

For LDF2, EFX2, LDF4, HLT4, FSJ4 Cables

For LDF5, Cable



HELIAX® Coaxial Cables

HELIAX® Connectors

UHF Females

For FSJ1 Cable

For LDF2, EFX2, LDF4, HLT4, FSJ4 Cables

For LDF5 Cable

For HJ4, HT4, HJ5 Cables

SMA Males

For FSJ1 Cable

For FSJ1 Cable

For LDF2, EFX2 Cable

SMA Females

For FSJ1 Cable

4.1-9.5 DIN Males

For LDF2, FSJ4 Cables

7-16 DIN Males

For FSJ1, FSJ4, FSJ2, LDF2 Cables

For LDF4, HLT4 Cables

For LDF5 Cables

For LDF6 Cable

For LDF7, LDF12 Cables

Right Angle 7-16 DIN Males

For FSJ2, FSJ4 Cables

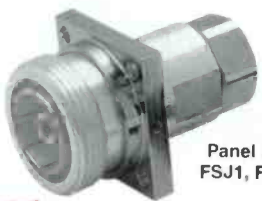
For LDF4,LDF5 Cables

7-16 DIN Females

For FSJ1, FSJ2, FSJ4, LDF2 , EFX2 Cables

Bulkhead for FSJ4 Cable

For LDF5 Cable



Panel Mount for FSJ1, FSJ4 Cable

For LDF4, HLT4 Cables

For LDF6, LDF7, LDF12 Cables

HELIAX® Connectors

SC Male

For LDF4,
FSJ4 Cables

LC Males

For LDF4,
HLT4, LDF5,
Cables

For LDF6,
LDF7 Cables

For HJ5
Cable

BNC Male

For FSJ1
Cable

TNC Male

For FSJ1
Cable

For LDF2,
EFX2
Cable

LC Females

For LDF5,
LDF7 Cables

For HJ7,
LDF6 Cables

TNC Female

For FSJ1
Cable

For LDF2, EFX2,
LDF4 Cable

HN Males

For FSJ1
Cable

For FSJ4
Cable

For LDF4,
HLT4, LDF5,
Cables

CATV Type "F" Males

For FSJ1
Cable

For FSJ4
Cable

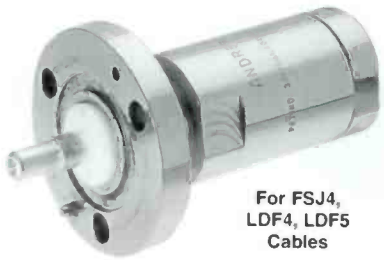
CATV Equipment Housing

For LDF4
Cables

HELIAX® Coaxial Cables

HELIAX® Connectors

7/8" EIA Flanges



For FSJ4, LDF4, LDF5 Cables

For LDF6, LDF7 Cables

For HJ4, HJ5 Cables

For HJ7, HJ12 Cables

1-5/8" EIA Flanges

For LDF6, LDF7 Cables

For HJ7, HJ12 Cables

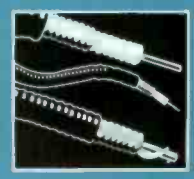
3-1/8" EIA Flanges

Female

For HJ12, HJ8, HJ11, LDF12 Cables

Male

For HJ8, HJ11 Cable



HELIAX® Connectors

4-1/2" IEC Flange

For HJ11, H9 Cable

For HJ11, HJ9 Cable

6-1/8" EIA Flange

For HJ11 Cable

For HJ9, HJ9HP Cable

Splices

For LDF4, LDF5 Cables

For HJ4, HJ5 HJ7 Cables

For LDF6, LDF7, LDF12 Cables

For HJ12, HJ8, HJ11, HJ9 Cables

"F" Flanges, Male

For LDF4, LDF5 Cables

For LDF6, LDF7 Cables

End Terminals

For LDF5 Cable

For HJ4, HT4, HJ5, HT5 Cables

For LDF4 Cable

For HJ7 Cable

HELIAX®
Coaxial Cables

Cable Assembly Department

Assembly Operation

Assemblies in Stock

Andrew Factory Made Cable Assemblies

Andrew has cable assembly facilities all over the world to provide you with the best jumper quality and service. Our local assembly locations can provide you with fast delivery, often in 24 hours.

Making assemblies in the field can be difficult and expensive. Proper training, tools and environmental conditions can all impact the cost and quality of a cable assembly. As you know, a poorly made cable assembly can affect system performance.

When you specify or purchase a jumper from Andrew, you can rest assured that the product has been manufactured by highly trained individuals utilizing factory automated processes. We are so confident in our quality that we guarantee it!

Check out all the advantages of the Andrew factory made cable assembly program:

- *Fast delivery... When and where you want it.*
- *Popular jumpers are in stock for immediate delivery...No waiting*
- *100% testing...Ensures performance*
- *3 year warranty...Cable, connectors, and attachment are guaranteed.*
- *Attachment performed by highly trained personnel...We do the job right*
- *Special lengths and markings per your specifications*
- *Select from the wide variety of Andrew cables and connectors... One-stop-shopping simplifies sourcing.*
- *Jumpers are available for flame retardant, high power/high temperature, and plenum applications.*

The HELIAX® Cable Assurance

HELIAX cable systems are the finest in the industry. When you make a HELIAX cable purchase, you're buying more than just cable. You're buying:

- *Superior Electrical Performance*
- *Quality that translates into lower cost over the life of your system investment*
- *The convenience of one vendor for all of your transmission line needs – Andrew*

General Information

Availability

HELIAX coaxial cable and cable products are manufactured and stocked worldwide at our manufacturing facilities located in:

Orland Park, Illinois, U.S.A.
Lochgelly, Fife, UK
Soracaba, Sao Paulo, Brazil

Products are also stocked at our facilities in:

Buc, France
Campbellfield, Victoria, Australia
Essen, Germany
Harrisburg, Pennsylvania, U.S.A.
Hayward, California, U.S.A.
Hong Kong
Johannesburg, South Africa
Tokyo, Japan
Whitby, Ontario, Canada

Andrew products are also stocked by a number of authorized distributors, worldwide. With these resources, Andrew is uniquely positioned to coordinate and fulfill your international communications requirements.

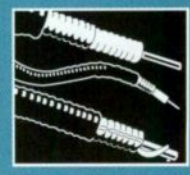
Shipping

HELIAX coaxial cables are shipped in boxes, cartons or on disposable or returnable reels. When connector-fitted cable assemblies are ordered, the antenna end of the cable is wound on the outside of the coil and may be hoisted directly up the tower. Any necessary trimming of excess cable is done at the transmitter end. Factory-attached flange connectors are shipped with a blank cover to retain pressure during shipment. The cover also affords protection to the connector face and prevents entry of foreign matter.

Connector Attachment

Cables can be supplied in bulk or cut to length and fitted with connectors. Connectors can be readily attached in the field with standard hand tools. Cable lengths are measured from the connector flange face or end. Standard cable cutting tolerance is +2%, -0%. Closer tolerances are available on special order.

HELIAX® Accessories



HELIAX® Accessories

Andrew offers the industry's widest range of accessories which are designed to be compatible with HELIAX cable. Together, HELIAX cables and accessories form a lasting and effective transmission line system. System designers and installation crews can rely on Andrew for high quality, easy to install components and reliable maintenance-free performance.

Some of our key accessories are:

Arrestor Plus™ Premium Surge Protectors. Lightning surge protectors incorporate quarter-wave stub technology. Designed to deliver optimum system performance and reliable equipment protection you can count on strike after strike. Arrestor Plus is available in the slim profile, universal, T-Series versions or the Integrated versions which install directly onto LDF or FSJ series HELIAX cable. Both versions incorporate silver plated components and high pressure components throughout to ensure low levels of intermodulation and excellent VSWR performance. Arrestor Plus surge protectors are also fully weatherproof, making them suitable for a variety of outdoor applications.

Gas Tube Lightning Surge Protectors. These new multi-stage, gas tube lightning surge protectors provide a dc path via the center conductor of the coaxial cable. They are ideal for use in systems having antenna-mounted preamplifiers. The surge arrestors can provide robust multi-strike lightning protection without sacrificing excellent microwave performance. They are universal versions and facilitate easy retrofitting of existing systems. Gas tube surge protectors are designed for indoor use only.

Grounding Kits. All Andrew grounding kits are designed to withstand 99% of all possible lightning strikes for certainty of continued operation. The non-braided, solid copper construction of our grounding kits eliminates corrosion caused by moisture retention and "wicking". The new SureGround kits offer even greater installation ease than standard grounding kits. The new grounding kits are factory-assembled into one component and feature a pre-formed, clip-on ground strap for easy snap-on installation. A standard weatherproofing kit (tape) is provided with SureGround versions.

ArrestorPort-Plus™ Integrated Wall Entry/Ground System. Building entry and transmission line grounding/lightning protection is redefined and simplified with the ArrestorPort-Plus. The integrated design of the ArrestorPort-Plus features an external ground bar that facilitates direct mounting of the Arrestor Plus Integrated Surge Protectors. This external mounting configuration has been proven to be a most effective method for protecting valuable radio equipment because it diverts the damaging effects of lightning current to ground before it enters the equipment shelter. Entry ports are provided for elliptical waveguide or additional coaxial cable runs to accommodate the unique design of today's wireless systems.

Incorporating this integrated approach into your system saves installation time, cuts costs, reduces acquisition time, but most importantly, protects personnel and valuable equipment from the damaging effects induced by lightning strikes.

Hangers. Stainless steel construction of both the standard and snap-in hangers ensures corrosion resistance and long life. Snap-in hangers feature quick, easy attachment - no hardware required. Hanger Blox™ are manufactured from Polycarbonate for excellent UV resistance and long life. They are stackable and designed to adapt to most any application. Click-On hangers are yet another durable, cost-effective option for accommodating multiple runs of cable in stackable configurations.

3M™ Cold Shrink™ Weatherproofing Kits. The fastest, easiest way to seal connector interfaces from the environment Cold Shrink requires no tools, no heat, and there is no taping to slow you down. It is simply placed onto the cable prior to completing the connection, slipped over the interface and then installed by unwinding its plastic core. Once installed, it maintains constant compression and forms an absolute seal that prevents moisture from entering the system. Cold Shrink kits are available in a variety of sizes to accommodate cable with Type N or 7-16 DIN interfaces at the antenna output, dissimilar size cable connections, and cable to Arrestor Plus Surge Protector.

EASIAX® Cutting Tools. Provide quick and easy preparation of cable for connector attachment. Provides a flush, burr-free cut of outer conductor. Precision cuts, consistently and reliably, time after time. In addition, we also offer the same specialized tools used by our factory technicians to make connector attachment even faster and easier. These tools may be purchased individually or as part of our connector attachment tool kit.

Ordering Information

HELIAX® coaxial cables are available with connectors attached at one or both ends or with both connectors unattached.

To order, please specify the following:

1. *Specify cable or waveguide Type Number and length in feet or metres.*
2. *For low-VSWR cables and for elliptical waveguides, specify the operating frequency band when requested. VSWR specifications for various frequency bands are presented on the product informationpages.*

   Frequency band codes, which are included in the identifying Andrew Type Number, are used with most standard bands of low VSWR cable and premium elliptical waveguide. For example, the -59 suffix for EWP52-59 designates a frequency band of 5.925 - 6.425 GHz. Please use these codes, where applicable.
3. *Specify connector Type Numbers and "attached" or "unattached". When attached connectors on an assembly are different, specify which is "first off" the reel.*
4. *Specify any special requirements:*
   - *Special marking on packages*
   - *Packaging requirements (standard, export or special)*
   - *Special inspection requirements, such as customer, government, certificate of compliance*
5. *Specify mode of shipment (surface, air or ocean) and requested ship date*

Sample orders are illustrated below.

Sample Orders

	Andrew Type Number	Description	Frequency (where) applicable)	Quantity	Length Each	Total Length	Unit or Per Foot Price	Extended Price
Cable, Factory Assembly	LDF5R-50A-78	HELIAX Coaxial Cable Assy 1850-1990 MHz		1	290ft.	290ft.		
	L45F	Connector, attached, first off		1				
	L5NM	Connector, attached, last off		1				
Bulk Cable and Connectors	LDF5-50A	HELIAX Coaxial Cable		2	700ft.	1400ft.		
	L5NM	Connector, unattached		8				
Cable with One Attached Connector	LDF5-50A	HELIAX Coaxial Cable		1	310ft.	310ft.		
	L5NM	Connector, attached, first off		1				
	L5NM	Connector, unattached		1				
Elliptical Waveguide Factory Assembly	EWP52-59	Elliptical Waveguide 5.925-6.425 GHz		1	290ft.	290ft.		
	252DET	Connector, attached, first off		1				
	152DET	Connector, attached, last off		1				
Bulk Elliptical Waveguide and Connectors	EWP52-59	Elliptical Waveguide 5.925-6.425 GHz		2	700ft.	1400ft.		
	252DET	Connector, unattached		8				
Elliptical Waveguide with One Attached Connector	EWP52-59	Elliptical Waveguide 5.925-6.425 GHz		1	310ft.	310ft.		
	252DET	Connector, attached, first off		1				
	152DET	Connector, unattached		1				

*For cables and waveguides, specify whether connectors should be factory attached or shipped loose. When attached connectors on an assembly are different, specify which is first off the reel.

For microwave antennas, specify any desired options.

Packing requirements: ☒ Standard ☐ Export

Special (specify) _____

Ship by: ☒ Surface ☐ Air ☐ Ocean

Requested Carrier _____
(If none specified, we will use the most economical method)

Shipping charges: ☐ Collect ☒ Prepay and bill ☐ Quoted fixed freight amount

Requested ship date: _____

OK to ship early? ☒ Yes ☐ No Partials OK? ☒ Yes ☐ No

Sales: ☐ Applicable ☐ Not Applicable

Resale no.

Specify special inspection requirements, such as customer, government, certificate of compliance.

50-ohm

1/4" Superflexible Foam Dielectric, FSJ Series

FSJ1-50A

Cable Ordering Information

Description	Type No.
Standard Superflexible Cable	
1/4" Standard Cable, Standard Jacket	**FSJ1-50A**
Fire Retardant Cables	
1/4" Fire Retardant Jacket (CATVX)	**FSJ1RN-50A**
1/4" Fire Retardant Jacket (CATVR)	**FSJ1RN-50A**
Low VSWR and Specialized Cables	
1/4" Low VSWR, specify operating band	**FSJ1P-50A-(**)**
Phase Stabilized and Phase Measured Cable	See page 456
Jumper Cable Assemblies	
Standard Jumper Assemblies	See page 545
VALUFLEX Cable Assemblies	See page 544

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	20.4
Velocity, percent	84
Peak Power Rating, kW	6.4
dc Resistance, ohms/1000 ft (1000 m)	
Inner	3.0 (9.8)
Outer	2.0 (6.5)
dc Breakdown, volts	1600
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	24.2 (79.4)
Inductance, µH/ft (m)	0.061 (0.200)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Cu-Clad Al
Diameter over Jacket, standard jacket, in (mm)	0.29 (7.4)
Diameter over Jacket, fire-retardant jacket, in (mm)	0.29 (7.4)
Diameter Copper Outer Conductor, in (mm)	0.25 (6.4)
Diameter Inner Conductor, in (mm)	0.075 (1.9)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	0.8 (1.1)
Cable Weight, lb/ft (kg/m)	0.045 (0.067)
Tensile Strength, lb (kg)	150 (68)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.125	0.404	6.4
1	0.177	0.574	6.4
1.5	0.217	0.705	6.4
2	0.251	0.814	6.4
10	0.563	1.84	3.96
20	0.799	2.62	2.79
30	0.980	3.22	2.28
50	1.27	4.17	1.76
88	1.69	5.54	1.32
100	1.81	5.94	1.23
108	1.88	6.17	1.18
150	2.23	7.32	1.00
174	2.41	7.91	0.929
200	2.58	8.46	0.865
300	3.19	10.5	0.701
400	3.70	12.1	0.603
450	3.93	12.9	0.567
500	4.16	13.7	0.537
512	4.21	13.8	0.530
600	4.58	15.0	0.488
700	4.97	16.3	0.450
800	5.33	17.5	0.419
824	5.42	17.8	0.412
894	5.66	18.6	0.395
960	5.87	19.3	0.380
1000	6.00	19.7	0.372
1250	6.77	22.2	0.330
1500	7.47	24.5	0.299
1700	7.99	26.2	0.279
2000	8.73	28.6	0.256
2300	9.43	30.9	0.237
3000	10.9	35.8	0.204
4000	12.8	42.0	0.174
5000	14.6	47.9	0.153
6000	16.2	53.2	0.138
8000	19.1	62.7	0.117
10000	21.8	71.5	0.102
12000	24.3	79.7	0.092
14000	26.7	86.3	0.084
16000	29.0	95.2	0.077
18000	31.2	102	0.072
19000	32.3	106	0.069
20000	33.3	109	0.067

Standard Conditons:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For Average Power. VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F); no solar loading.

HELIAX® Coaxial Cables

N Male
F1PNM-H

N Male
Right Angle
F1PNR-H

N Female
Bulkhead
F1PNF-BH

SMA Male
F1PSM

SMA Male
Right Angle
F1PSR

SMA Female
Bulkhead
F1PSF

BNC Male
F1PBM

TNC Male
F1PTM-HF

UHF Male
41SP

Connectors on this page, except F1PNM-HF, F1PTM-HF, and 41AENT, are intended for indoor use and do not have a weatherproof seal at the connector to cable interface. For outdoor applications, Andrew recommends Type LDF1-50 foam dielectric cable and connectors, see page 456.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male	Hex Head	**F1PNM-H†**	C41SW	Solder	Self-Clamping	SG	2.1 (53)	0.95 (24.1)
N Male	High Freq.	**F1PNM-HF**	41PW	Solder	Tab Flare	SG	1.3 (33)	0.81 (20.5)
N Male	Right Angle Hex Head	**F1PNR-H**	C41ASW-RA	Captivated	Self-Clamping	SG	1.7/1.3 (43/33)	0.95 (24.1)
N Female		**F1PNF-BH†**	C41SPN-BH	Solder	Self-Clamping	SG	2.3 (58)	0.94 (23.9)
BNC Male		**F1PBM**	C41SWB	Solder	Self-Clamping	SS	2.0 (50)	0.69 (17.5)
UHF Male		**41SP**		Solder	Solder	BB	1.8 (46)	0.77 (19.6)
UHF Female		**41U**		Solder	Solder	BS	2.1 (53)	0.77 (19.6)
SMA Male	Up to 6 GHz	**F1PSM†**	C41SWS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Right Angle	**F1PSR**	C41ASWS-RA	Solder	Self-Clamping	PG	1.6/.75 (41/19)	0.50 (12.7)
SMA Female	Up to 6 GHz, Bulkhead	**F1PSF**	C41SNS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Up to 18 GHz	**41EWS***		Solder	Tab Flare	G	0.94 (23.9)	0.40 (10.2)
SMA Female	Up to 18 Ghz	**41ENS***		Solder	Tab Flare	G	1.00 (25.4)	0.40 (10.2)
TNC Male	11 GHz and Below	**F1PTM†**		Solder	Self-Clamping	SG	1.68 (43)	0.57 (14.5)
TNC Female		**41AENT**		Captivated	Tab Flare	NG	1.5 (38)	0.70 (17.8)
TNC Male	Hi Freq, Above 11 GHz	**F1PTM-HF**	41AEWT	Captivated	Tab Flare	NG	1.9 (48.8)	0.70 (17.8)
Mini-UHF Male		**F1MU**	41ASPM	Captivated	Crimp	BB	1.53 (39)	0.47 (11.9)
7-16 DIN Male		**F1PDM**		Solder	Self-Clamping	SS	1.82 (46.3)	1.25 (31.75)
7-16 DIN Female		**F1PDF**		Solder	Self-Clamping	SS	1.85 (47)	0.551 (14)
7-16 DIN Female		**F1PDF-PM**		Solder	Self-Clamping	SS	1.85 (47)	1.26 (32)

* Stainless steel body † See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, PG - Passivated Body and Gold Plated Pin+A135, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin, G - Stainless Steel Body and Gold Plated Pin.

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F1PNM-H	**242881**
For C41SW	**241051-3**
Bulkhead Adapter, for UHF Female	**26016-2**
End Terminal Adapter, use with N Male connector	**13074A**

Assemblies

For complete information on assemblies, see page 545

	Lengths feet	Type Number
N Male/N Male, premium	3, 6, 8 or variable	**F1-PNMNM-(*)**
N Male/Right Angle		
N Male, premium	3, 6, 8 or variable	**F1-PNMNR-(*)**

Low VSWR Specifications, Type FSJ1P-50A-( )

Frequency Band, GHz	Type No.	Using Connector Type No.**	Assembly VSWR, Maximum (R.L., dB) to 10 ft (3 m)	10-20 ft (3-6 m)	20-200 ft (6-60 m)
Up to 2.3 GHz*	**FSJ1P-50A-1A**	N Male: **F1PNM-H**	1.07 (29.4)	1.13 (24.3)	1.27 (18.5)
		Right Angle N Male: **F1PNR-H**	1.31 (17.5)	1.35 (16.6)	1.30 (17.7)
		SMA Male: **F1PSM**	1.12 (25.0)	1.25 (19.1)	1.35 (16.6)
		Right Angle SMA Male: **F1PSR**	1.30 (17.7)	1.30 (17.7)	1.40 (15.6)
		SMA Female: **F1PSF**	1.12 (25.0)	1.25 (19.1)	1.35 (16.6)
Up to 4.2 GHz*	**FSJ1P-50A-2A**	N Male: **F1PNM-H**	1.15 (23.1)	1.18 (21.7)	1.31 (17.4)
		Right Angle N Male: **F1PNR-H**	1.38 (16.0)	1.40 (15.6)	1.50 (14.0)
		SMA Male: **F1PSM**	1.17 (22.0)	1.40 (15.6)	1.45 (14.7)
		Right Angle SMA Male: **F1PSR**	1.40 (15.6)	1.45 (14.7)	1.50 (14.0)
		SMA Female: **F1PSF**	1.17 (22.0)	1.40 (15.6)	1.45 (14.7)
Up to 10.2 GHz*	**FSJ1P-50A-3A**	N Male: **F1PNM-H**	1.40 (15.6)	1.45 (14.7)	1.50 (14.0)
		SMA Male: **41EWS**	1.35 (16.6)	1.40 (15.6)	1.45 (14.7)
		SMA Female: **41ENS**	1.40 (15.6)	1.45 (14.7)	1.50 (14.0)
Up to 18.0 GHz*	**FSJ1P-50A-4A**	N Male: **F1PNM-HF**	1.55 (13.3)	1.55 (13.3)	1.63 (12.4)
		SMA Male: **41EWS**	1.50 (14.0)	1.55 (13.3)	1.55 (13.3)
		SMA Female: **41ENS**	1.50 (14.0)	1.55 (13.3)	1.55 (13.3)

* Specify operating band. ** Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional	**APT-#-***
#,* *Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#,* *Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool, FSJ1/FSJ4	**207865**
Installer Pax. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570	

HELIAX® Coaxial Cables

50-ohm

1/4" Superflexible High Power, High Temperature, Plenum, Fluoropolymer Foam Dielectric, ETS Series

ETS1-50T

Cable Ordering Information

Description	Type No.
High Power, Plenum Cables	
1/4" Fire Retardant Jacket (CATVP, UL910)	ETS1-50T
1/4" Unjacketed, Fire Retardant (CATVP, UL910)	ETS1-50
Jumper Cable Assemblies	
VALUFLEX Cable Assemblies	See page 544

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	20.0
Velocity, percent	82
Peak Power Rating, kW	6.4
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.9 (6.2)
Outer	2.0 (6.5)
dc Breakdown, volts	1600
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (pf/m)	24.6 (80.6)
Inductance, µH/ft (µH/m)	0.063 (0.205)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Silver plated copper
Diameter over Jacket, in (mm)	0.29 (7.4)
Diameter over Copper Outer Conductor, in (mm)	0.25 (6.4)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	0.6 (0.8)
Cable Weight, lb/ft (kg/m)	0.066 (0.098)
Tensile Strength, lb (kg)	150 (68)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power Ratings

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	ETS1-50T[1] Avg. Power kW	ETS1-50[2] Avg. Power kW
0.5	0.125	0.410	6.4	6.4
1	0.177	0.582	6.4	6.4
1.5	0.217	0.712	6.4	6.4
2	0.251	1.85	6.4	6.4
20	0.798	2.62	6.4	6.4
30	0.979	3.21	5.48	6.13
50	1.27	4.16	4.23	4.73
88	1.69	5.54	3.18	3.55
100	1.80	5.91	2.98	3.33
108	1.87	6.14	2.86	3.20
150	2.21	7.26	2.42	2.71
174	2.39	7.84	2.24	2.51
200	2.56	8.41	2.09	2.34
300	3.16	10.4	1.70	1.90
400	3.66	12.0	1.46	1.64
450	3.89	12.8	1.38	1.54
500	4.11	13.5	1.30	1.46
512	4.16	13.6	1.29	1.44
600	4.52	14.8	1.19	1.33
700	4.89	16.1	1.09	1.22
800	5.25	17.2	1.02	1.14
824	5.33	17.5	1.00	1.12
894	5.56	18.2	0.964	1.08
960	5.76	18.9	0.928	1.04
1000	5.90	19.4	0.909	1.02
1250	6.64	21.8	0.808	0.904
1500	7.31	24.0	0.733	0.821
1700	7.81	25.6	0.686	0.768
2000	8.52	28.0	0.629	0.704
2300	9.19	30.2	0.584	0.653
3000	10.6	34.8	0.506	0.566
4000	12.4	40.7	0.432	0.484
5000	14.0	46.0	0.382	0.428
6000	15.5	50.9	0.345	0.386
8000	18.2	59.9	0.294	0.329
10000	20.7	68.0	0.259	0.289
12000	23.0	75.5	0.233	0.261
14000	25.2	82.6	0.213	0.238
16000	27.2	89.3	0.197	0.220
18000	29.2	95.7	0.184	0.206
19000	30.1	98.9	0.178	0.199
20000	31.1	102.0	0.173	0.193

Standard Conditions:
For Attenuation: VSWR 1.0, ambient temperature 24°C (75°F).

1. For Average Power, Type ETS1-50T (jacketed): VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 200°C (392°F); no solar loading.
2. For Average Power, Type ETS1-50 (unjacketed): VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 250°C (482°F); no solar loading.

HELIAX® Coaxial Cables

N Male
F1PNM-H

N Male
Right Angle
F1PNR-H

N Female
Bulkhead
F1PNF-BH

SMA Male
F1PSM

SMA Male
Right Angle
F1PSR

SMA Female
Bulkhead
F1PSF

BNC Male
F1PBM

TNC Male
F1PTM-HF

UHF Male
41SP

Connectors on this page, except F1PNM-HF, F1PTM-HF, and 41AENT, are intended for indoor use and do not have a weatherproof seal at the connector to cable interface. For outdoor applications, Andrew recommends Type LDF1-50 foam dielectric cable and connectors, see page 456.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male	Hex Head	**F1PNM-H†**	C41SW	Solder	Self-Clamping	SG	2.1 (53)	0.95 (24.1)
N Male	High Freq.	**F1PNM-HF**	41PW	Solder	Tab Flare	SG	1.3 (33)	0.81 (20.5)
N Male	Right Angle Hex Head	**F1PNR-H**	C41ASW-RA	Captivated	Self-Clamping	SG	1.7/1.3 (43/33)	0.95 (24.1)
N Female		**F1PNF-BH†**	C41SPN-BH	Solder	Self-Clamping	SG	2.3 (58)	0.94 (23.9)
BNC Male		**F1PBM**	C41SWB	Solder	Self-Clamping	SS	2.0 (50)	0.69 (17.5)
UHF Male		**41SP**		Solder	Solder	BB	1.8 (46)	0.77 (19.6)
UHF Female		**41U**		Solder	Solder	BS	2.1 (53)	0.77 (19.6)
SMA Male	Up to 6 GHz	**F1PSM†**	C41SWS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Right Angle	**F1PSR**	C41ASWS-RA	Solder	Self-Clamping	PG	1.6/.75 (41/19)	0.50 (12.7)
SMA Female	Up to 6 GHz, Bulkhead	**F1PSF**	C41SNS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Up to 18 GHz	**41EWS***		Solder	Tab Flare	G	0.94 (23.9)	0.40 (10.2)
SMA Female	Up to 18 Ghz	**41ENS***		Solder	Tab Flare	G	1.00 (25.4)	0.40 (10.2)
TNC Male	11 GHz and Below	**F1PTM†**		Solder	Self-Clamping	SG	1.68 (43)	0.57 (14.5)
TNC Female		**41AENT**		Captivated	Tab Flare	NG	1.5 (38)	0.70 (17.8)
TNC Male	Hi Freq, Above 11 GHz	**F1PTM-HF**	41AEWT	Captivated	Tab Flare	NG	1.9 (48.8)	0.70 (17.8)
Mini-UHF Male		**F1MU**	41ASPM	Captivated	Crimp	BB	1.53 (39)	0.47 (11.9)
7-16 DIN Male		**F1PDM**		Solder	Self-Clamping	SS	1.82 (46.3)	1.25 (31.75)
7-16 DIN Female		**F1PDF**		Solder	Self-Clamping	SS	1.85 (47)	0.551 (14)
7-16 DIN Female		**F1PDF-PM**		Solder	Self-Clamping	SS	1.85 (47)	1.26 (32)

* Stainless steel body † See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, PG - Passivated Body and Gold Plated Pin+A135, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin, G - Stainless Steel Body and Gold Plated Pin.

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F1PNM-H	**242881**
For C41SW	**241051-3**
Bulkhead Adapter, for UHF Female	**26016-2**
End Terminal Adapter, use with N Male connector	**13074A**

HELIAX®
Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional	**APT-#-***
#, Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#, Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool, FSJ1/FSJ4	**207865**
Installer Pax. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

50-ohm

3/8" Superflexible Foam Dielectric, FSJ Series

FSJ2-50

Cable Ordering Information

Description	Type No.
Standard Superflexible Cable	
3/8" Standard Cable, Standard Jacket	**FSJ2-50**
Fire Retardant Cables	
3/8" Fire Retardant Jacket (CATVX)	**FSJ2RN-50**
3/8" Fire Retardant Jacket (CATVR)	**FSJ2RN-50**
Low VSWR and Specialized Cables	
3/8" Low VSWR, specify operating band	**FSJ2P-50-(**)**
Phase Stabilized and Phase Measured Cable	See page 585
Jumper Cable Assemblies	
VALUFLEX Cable Assemblies	See page 544

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	13.4
Velocity, percent	83
Peak Power Rating, kW	13.2
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.29 (4.23)
Outer	1.52 (4.99)
dc Breakdown, volts	2300
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	24.3 (79.7)
Inductance, µH/ft (m)	0.061 (0.200)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, standard jacket, in (mm)	0.415 (10.5)
Diameter over Jacket, fire-retardant jacket, in (mm)	0.425 (10.8)
Diameter over Copper Outer Conductor, in (mm)	0.375 (9.5)
Diameter Inner Conductor, in (mm)	0.110 (2.8)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	20 (50)
Bending Moment, lb-ft (N•m)	1.7 (2.3)
Cable Weight, lb/ft. (kg/m)	0.078 (0.12)
Tensile Strength, lb (kg)	210 (95)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power Ratings

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100 m	Average Power (kW)
0.5	0.083	0.272	13.2
1	0.118	0.386	13.2
1.5	0.144	0.473	13.2
2	0.167	0.546	13.2
10	0.375	1.23	6.92
20	0.532	1.75	4.87
30	0.654	2.14	3.97
50	0.848	2.78	3.06
88	1.13	3.72	2.29
100	1.21	3.97	2.14
108	1.26	4.13	2.06
150	1.49	4.90	1.74
174	1.61	5.29	1.61
200	1.73	5.69	1.49
300	2.15	7.04	1.21
400	2.50	8.20	1.04
450	2.66	8.73	0.975
500	2.81	9.23	0.922
512	2.85	9.35	0.910
600	3.10	10.2	0.836
700	3.37	11.1	0.769
800	3.62	11.9	0.716
824	3.68	12.1	0.704
894	3.85	12.6	0.674
960	4.00	13.1	0.648
1000	4.09	13.4	0.634
1250	4.63	15.2	0.560
1500	5.12	16.8	0.507
1700	5.49	18.0	0.472
2000	6.01	19.7	0.431
2300	6.51	21.4	0.398
3000	7.58	24.9	0.342
4000	8.96	29.4	0.290
5000	10.2	33.5	0.254
6000	11.4	37.4	0.228
8000	13.6	44.5	0.191
10000	15.6	51.1	0.166
12000	17.5	57.3	0.148
13000	18.4	60.3	0.141
13400	18.7	61.5	0.138

Standard Conditions:
For attenuation, VSWR 1.0, ambient temperature 24°C (75°F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

HELIAX® Coaxial Cables


N Male
F2PNM-H


7-16 DIN Female
F2PDF


7-16 DIN Male
F2PDM-C


N Female
F2PNF


7-16 DIN Male
Right Angle
F2PDR-C

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length In (mm)	Max. Dia. In (mm)
N Male		**F2NM**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2NM-H**		Solder	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2NM-HC**		Captivated	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male		**F2NM-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male		**F2PNM†**	42SPW	Solder	Self-Flare	SG	1.9 (48)	0.81 (20.6)
N Male		**F2PNM-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2PNM-H**		Solder	Self-Flare	SG	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2PNM-HC**		Captivated	Self-Flare	SG	1.9 (48)	0.94 (23)
N Female		**F2NF**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2NF-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2PNF**		Solder	Self-Flare	SG	2.1 (53)	0.67 (17)
N Female		**F2PNF-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Female	Bulkhead	**F2PNF-BH**		Solder	Self-Flare	SG	2.1 (53)	0.95 (24)
7-16 DIN Male		**F2PDM**		Solder	Self-Flare	SS	2.2 (57)	1.4 (36)
7-16 DIN Male		**F2PDM-C**	42BDM	Captivated	Self-Flare	SS	2.1 (53)	1.4 (36)
7-16 DIN Female		**F2PDF**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Female		**F2PDF-C**		Captivated	Self-Flare	SS	2.1 (51.6)	0.79 (20)
7-16 DIN Female	Panel Mt.	**F2PDF-PM**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Male	Right Angle	**F2PDR-C**	42BDM-RA	Captivated	Self-Flare	SS	1.7/1.3 (43/34)	1.4 (36)

† See page 570 for bulk packs.

Plating Codes: SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin, BS - Brass Body and Silver Plated Pin.

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F2NM, F2NM-H	**242075-3**
For F2PNM, F2PNM-H	**242075-4**
For F2PDM	**114402-2**
End Terminal Adapter, use with N Male connector	**13074A**

Assemblies

For complete information on assemblies, see page 545

	Lengths feet	Type Number
N Male/N Male, premium	6, 8 or variable	**F2-PNMNM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**F2-PDMDM-(*)**

Low VSWR Specifications, Type FSJ2P-50-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) to 10 ft (3 m)	10-20 ft (3-6 m)	20-200 ft (6-60 m)
Up to 2.3 GHz*	**FSJ2P-50-1**	N Male: **F2PNM**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
Up to 5.0 GHz*	**FSJ2P-50-2**	N Male: **F2PNM**	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
Up to 8.5 GHz*	**FSJ2P-50-3**	N Male: **F2PNM**	1.40 (15.6)	1.40 (15.6)	1.40 (15.6)
Up to 13.4 GHz*	**FSJ2P-50-4**	N Male: **F2PNM**	1.50 (14.0)	1.50 (14.0)	1.50 (14.0)

* Specify operating band. ** Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Accessories –

Photos and descriptions on pages 544-572.

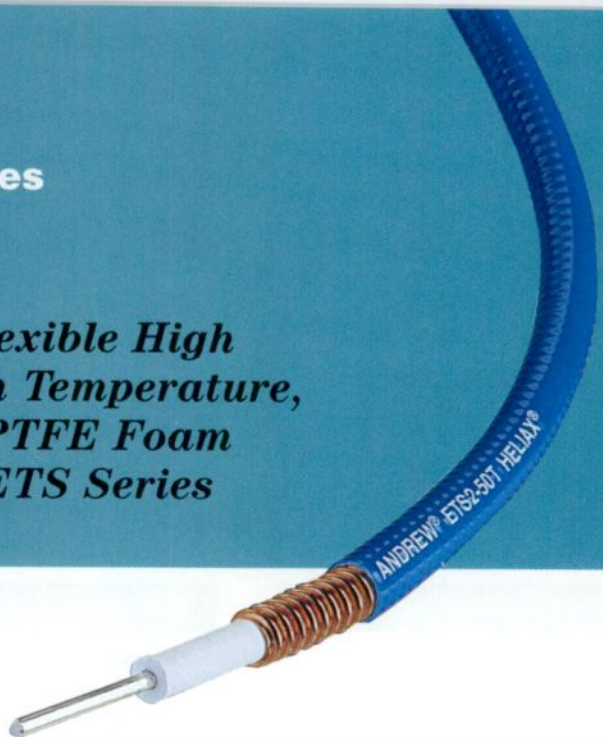
Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	11662-3
Angle Adapter, for insulated hanger	40430-1
Stainless Steel Wraplock, for round tower members	12395-1
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	40417
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	CT-K350
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	VCT8-10
Kit of 50	VCT8-50
Grounding and Surge Protection - for more information, see pages 559-564.	

Description	Type No.
Grounding Kit - factory attached, one-hole lug, 24 in (610 mm) lead	223158
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional	APT-#-*
#,* *Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability	SA-#-*
#,* *Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Cold-Shrink Weatherproofing Kit	
3/8" Coax-Type N to 3/8" Coax-Type N	241474-3
3/8" Coax-Type N to Antenna Output	241548-3
Connector/Splice Weatherproofing Kit	221213
Tools - for more tools see page 569.	
EASIAX® Cutting Tool, FSJ2/FSJ4	241372
Installer Pax. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

HELIAX®
Coaxial Cables

50-ohm

3/8" Superflexible High Power, High Temperature, Expanded PTFE Foam Dielectric, ETS Series



ETS2-50T

Cable Ordering Information

Description	Type No.
High Power, Plenum Cables	
3/8" Fire Retardant Jacket (CATVP)	**ETS2-50T**
3/8" Unjacketed, Fire Retardant (CATVP)	**ETS2-50**

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	13.4
Velocity, percent	83
Peak Power Rating, kW	13.2
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.29 (4.23)
Outer	1.52 (4.99)
dc Breakdown, volts	2300
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (m)	24.3 (79.7)
Inductance, µH/ft (m)	0.061 (0.200)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Siver Plated, Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.415 (10.54)
Diameter over Copper Outer Conductor, in (mm)	0.375 (9.53)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	20 (50)
Bending Moment, lb-ft (N•m)	1.7 (2.3)
Cable Weight, lb/ft. (kg/m)	0.087 (0.13)
Tensile Strength, lb (kg)	210 (95)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power Ratings

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100 m	ETS2-50T[1] Avg. Pwr. (kW)	ETS2-50[2] Avg. Pwr. (kW)
0.5	0.083	0.273	13.2	13.2
1	0.118	0.386	13.2	13.2
1.5	0.144	0.474	13.2	13.2
2	0.167	0.547	13.2	13.2
10	0.376	1.23	13.2	13.2
20	0.535	1.76	12.1	13.2
30	0.658	2.16	9.89	11.3
50	0.856	2.81	7.61	8.67
88	1.15	3.76	5.67	6.47
100	1.23	4.02	5.31	6.05
108	1.28	4.19	5.10	5.82
150	1.52	4.97	4.29	4.89
174	1.64	5.40	3.97	4.52
200	1.77	5.79	3.69	4.20
300	2.19	7.19	2.97	3.39
400	2.56	8.40	2.54	2.90
450	2.73	8.95	2.38	2.72
500	2.89	9.48	2.25	2.57
512	2.93	9.61	2.22	2.53
600	3.19	10.5	2.04	2.32
700	3.48	11.4	1.87	2.13
800	3.75	12.3	1.74	1.98
824	3.81	12.5	1.71	1.95
894	3.99	13.1	1.63	1.86
960	4.15	13.6	1.57	1.79
1000	4.24	13.9	1.53	1.75
1250	4.82	15.8	1.35	1.54
1500	5.35	17.5	1.21	1.39
1700	5.75	18.9	1.13	1.29
2000	6.32	20.7	1.03	1.17
2300	6.86	22.5	0.950	1.08
3000	8.03	26.4	0.811	0.924
4000	9.56	31.4	0.681	0.776
5000	11.0	36.0	0.593	0.676
6000	12.3	40.4	0.529	0.603
8000	14.8	48.5	0.441	0.502
10000	17.1	56.1	0.381	0.434
12000	19.3	63.3	0.338	0.385
13000	20.3	66.8	0.320	0.365
13400	20.8	68.1	0.314	0.358

Standard Conditions:
For attenuation. VSWR 1.0, ambient temperature 24°C (75°F).

1 Average Power, ETS2-50T (jacketed): VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 200°C (392°F).

2 Average Power, ETS2-50 (unjacketed): VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 250°C (482°F), no solar loading.

N Male
F2PNM-H

7-16 DIN Female
F2PDF

7-16 DIN Male
F2PDM-C

N Female
F2PNF

7-16 DIN Male
Right Angle
F2PDR-C

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F2NM**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2NM-H**		Solder	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2NM-HC**		Captivated	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male		**F2NM-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male		**F2PNM†**	42SPW	Solder	Self-Flare	SG	1.9 (48)	0.81 (20.6)
N Male		**F2PNM-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2PNM-H**		Solder	Self-Flare	SG	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2PNM-HC**		Captivated	Self-Flare	SG	1.9 (48)	0.94 (23)
N Female		**F2NF**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2NF-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2PNF**		Solder	Self-Flare	SG	2.1 (53)	0.67 (17)
N Female		**F2PNF-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Female	Bulkhead	**F2PNF-BH**		Solder	Self-Flare	SG	2.1 (53)	0.95 (24)
7-16 DIN Male		**F2PDM**		Solder	Self-Flare	SS	2.2 (57)	1.4 (36)
7-16 DIN Male		**F2PDM-C**	42BDM	Captivated	Self-Flare	SS	2.1 (53)	1.4 (36)
7-16 DIN Female		**F2PDF**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Female		**F2PDF-C**		Captivated	Self-Flare	SS	2.1 (56)	0.79 (20)
7-16 DIN Female	Panel Mt.	**F2PDF-PM**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Male	Right Angle	**F2PDR-C**	42BDM-RA	Captivated	Self-Flare	SS	1.7/1.3 (43/34)	1.4 (36)

† See page 570 for bulk packs.

Plating Codes: SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin, BS - Brass Body and Silver Plated Pin.

Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for Insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and Ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	**CT-K350**

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F2NM, F2NM-H	**242075-3**
For F2PNM, F2PNM-H	**242075-4**
For F2PDM	**114402-2**
End Terminal Adapter, use with N Male connector	**13074A**

Description	Type No.
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit - factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional	**APT-#-***
#,* *Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#,* *Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Cold-Shrink Weatherproofing Kit	
3/8" Coax-Type N to 3/8" Coax-Type N	**241474-3**
3/8" Coax-Type N to Antenna Output	**241548-3**
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool, FSJ2/FSJ4	**241372**
Installer Pax. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

HELIAX® Coaxial Cables

50-ohm *1/2" Superflexible Foam Dielectric, FSJ Series*

FSJ4-50B

Cable Ordering Information

Description	Type No.
Standard Superflexible Cable	
1/2" Standard Cable, Standard Jacket	**FSJ4-50B**
Fire Retardant Cables	
1/2" Fire Retardant Jacket (CATVX)	**FSJ4RN-50B**
1/2" Fire Retardant Jacket (CATVR)	**FSJ4RN-50B**
Low VSWR and Specialized Cables	
1/2" Low VSWR, specify operating band	**FSJ4P-50B-(**)**
Phase Stabilized and Phase Measured Cable	See page 585
Jumper Cable Assemblies	
Standard Jumper Assemblies	See page 545
Low VSWR Jumper Assemblies for Cellular	See page 46

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	10.2
Velocity, percent	81
Peak Power Rating, kW	15.6
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.82 (2.69)
Outer	1.00 (3.28)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	25.2 (82.7)
Inductance, µH/ft (m)	0.0625 (0.205)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, standard jacket, in (mm)	0.52 (13.2)
Diameter over Jacket, fire-retardant jacket, in (mm)	0.53 (13.5)
Diameter over Copper Outer Conductor, in (mm)	0.48 (12.2)
Diameter Inner Conductor, in (mm)	0.142 (3.6)
Minimum Bending Radius, in (mm)	1.25 (32)
Number of Bends, minimum (typical)	20 (50)
Bending Moment, lb-ft (N•m)	2.0 (2.7)
Cable Weight, lb/ft. (kg/m)	0.14 (0.21)
Tensile Strength, lb (kg)	175 (80)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (1.9)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.071	0.234	15.6
1	0.101	0.331	15.6
1.5	0.124	0.406	15.6
2	0.143	0.469	15.6
10	0.321	1.05	10.0
20	0.456	1.50	7.07
30	0.561	1.84	5.75
50	0.730	2.39	4.42
88	0.979	3.21	3.30
100	1.05	3.44	3.08
108	1.09	3.58	2.96
150	1.29	4.23	2.49
174	1.39	4.57	2.30
200	1.50	4.92	2.14
300	1.87	6.12	1.72
400	2.18	7.14	1.48
450	2.32	7.61	1.38
500	2.46	8.06	1.31
512	2.49	8.17	1.29
600	2.73	8.95	1.18
700	2.97	9.74	1.09
800	3.20	10.5	1.01
824	3.25	10.7	0.991
894	3.40	11.2	0.947
960	3.55	11.6	0.910
1000	3.63	11.9	0.889
1250	4.12	13.5	0.783
1500	4.57	15.0	0.705
1700	4.92	16.1	0.656
2000	5.41	17.7	0.597
2300	5.87	19.3	0.549
3000	6.88	22.6	0.469
4000	8.20	26.9	0.394
5000	9.41	30.9	0.343
6000	10.6	34.8	0.306
8000	12.7	41.7	0.254
10000	14.7	48.2	0.220
10200	14.9	48.9	0.217

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75° F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212° F), no solar loading.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F4NM†**	44ASW	Solder	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male		**F4NM-C†**		Captivated	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4NM-H**		Solder	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4NM-HC**		Captivated	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male		**F4PNM**	44SEW	Solder	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male		**F4PNM-C†**		Captivated	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4PNM-H†**	44SEW-12	Solder	Self-Flare	SG	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4PNM-HC**		Captivated	Self-Flare	SG	2.1 (53.3)	0.92 (23.4)
N Male	Right Angle	**F4PNR†**	49593	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Male	Rt Angle, Hex Hd	**F4PNR-H**	49588	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Female		**F4NF†**	44ASN	Solder	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4NF-C**		Captivated	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF†**	44SPN	Solder	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF-C**		Captivated	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female	Bulkhead	**F4PNF-BH**	44BSPN-BH	Solder	Self-Flare	SG	2.3 (58)	0.95 (24.1)
4.1/9.5 DIN Male	Indoor Use	**F4PKM-IC**	44KM	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Outdoor Use	**F4PKM-C**	44KME	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Indoor use	**F4PKR-IC**	44KM-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Outdoor Use	**F4PKR-C**	44KME-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
7-16 DIN Male		**F4PDM-C†**	44SDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male		**F4PDM†**	44ASDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male	Right Angle	**F4PDR**		Solder	Self-Flare	SS	2.4.1.8 (61/46)	1.4 (35.6)
7-16 DIN Male	Right Angle	**F4PDR-C**	44SDM-RA	Captivated	Self-Flare	SS	2.1/2.0 (53/50)	1.4 (35.6)
7-16 DIN Female		**F4PDF-C**	44SDF	Captivated	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female		**F4PDF**	44ASDF	Solder	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female	Bulkhead	**F4PDF-BH**		Solder	Self-Flare	SS	2.01 (51.1)	1.50 (38)
7-16 DIN Female	Panel Mount	**F4PDF-PM**		Solder	Self-Flare	SS	2.01 (51.1)	1.26 (32)
7-16 DIN Female	Bulkhead	**F4PDF-BHC**		Captivated	Self-Flare	SS	2.0 (50)	1.8 (45.7)
7-16 DIN Female	Panel Mount	**F4PDF-PMC**		Captivated	Self-Flare	SS	2.0 (50)	1.3 (33)
7/8" EIA Flange		**44ASR**		Solder	Tab Flare	BS	3.3 (84)	1.4 (35.6)
UHF Male		**44ASP**		Solder	Tab Flare	BS	2.1 (53)	0.84 (21.3)
UHF Female		**44ASU**		Solder	Tab Flare	BS	2.3 (58)	0.84 (21.3)
HN Male		**44ASJ**		Solder	Tab Flare	BB	2.4 (61)	0.84 (21.3)
SC Male		**44SPCW**		Solder	Tab Flare	SG	2.7 (69)	0.88 (22.4)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pln, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F4NM, F4NM-H	**241455-3**
For F4PNM, F4PNM-H	**241455-4**
For F4PDM	**14417-2**
Connector Reattachment Kit	**34767A-39**
Bulkhead Adapter, for N or UHF Females	**26016-2**

Assemblies

For complete information on assemblies, see page 545

	Lengths feet	Type Number
N Male/N Male	3, 6, 8 or variable	**F4-NMNM-(*)**
N Male/N Male, premium	3, 6, 8 or variable	**F4-PNMNM-(*)**
7-16 DIN Male/7-16 DIN Male	3, 6, 8 or variable	**F4-PDMDM-(*)**
N Male, premium/7-16 DIN Male	3, 6, 8 or variable	**F4-PNMDM-(*)**

HELIAX®
Coaxial Cables

Low VSWR Specifications, Type FSJ4P-50B-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) 0-10 ft (0-3 m)	10-20 ft (3-6 m)	20-100 ft 6-30 m)	Above 100 ft (Above 30 m)
0.01-2.3*	**FSJ4P-50B-1**	N Males: **F4NM, F4PNM**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.15 (23.1)
		N Females: **F4NF, F4PNF**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Male: **F4PDM-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Female: **F4PDF-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		Rt. Angle N Male: **F4PNR**	1.15 (23.1)	1.18 (21.6)	1.30 (17.7)	1.50 (14.0)
0.01-4.2*	**FSJ4P-50B-2**	N Males: **F4NM, F4PNM**	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		N Females: **F4NF, F4PNF**	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.30 (17.7)
		7-16 DIN Male: **F4PDM-C**	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.30 (17.7)
		7-16 DIN Female: **F4PDF-C**	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.30 (17.7)
		Rt. Angle N Male: **F4PNR**	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)	1.50 (14.0)
0.01-7.1*	**FSJ4P-50B-3**	N Males: **F4NM, F4PNM**	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
		N Females: **F4NF, F4PNF**	1.35 (16.5)	1.35 (16.5)	1.40 (15.6)	1.50 (14.0)
		7-16 DIN Male: **F4PDM-C**	1.35 (16.5)	1.35 (16.5)	1.40 (15.6)	1.50 (14.0)
		7-16 DIN Female: **F4PDF-C**	1.35 (16.5)	1.35 (16.5)	1.40 (15.6)	1.50 (14.0)
0.8-0.96	**FSJ4P-50B-4**	N Males: **F4NM, F4PNM**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.15 (23.1)
		N Females: **F4NF, F4PNF**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.15 (23.1)
		7-16 DIN Male: **F4PDM-C**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.15 (23.1)
		7-16 DIN Female: **F4PDF-C**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.15 (23.1)
		Rt. Angle N Male: **F4PNR**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
0.87-0.96 and 1.7-1.9	**FSJ4P-50B-23**	7-16 DIN Male: **F4PDM, F4PDM-C**	1.10 (26.4)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		7-16 DIN Female: **F4PDF, F4PDF-C**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
1.7-1.9	**FSJ4P-50B-12**	N Males: **F4NM, F4PNM**	1.08 (28.3)	1.08 (28.3)	1.15 (23.1)	1.15 (23.1)
		N Females: **F4NF, F4PNF**	1.08 (28.3)	1.08 (28.3)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Male: **F4PDM-C**	1.08 (28.3)	1.08 (28.3)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Female: **F4PDF-C**	1.08 (28.3)	1.08 (28.3)	1.15 (23.1)	1.15 (23.1)
		Rt. Angle N Male: **F4PNR**	1.10 (26.4)	1.12 (24.9)	1.20 (20.8)	1.20 (20.8)
1.7-2.3	**FSJ4P-50B-16**	N Males: **F4NM, F4PNM**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		N Females: **F4NF, F4PNF**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Male: **F4PDM-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Female: **F4PDF-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		Rt. Angle N Male: **F4PNR**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
0.87-0.96	**FSJ4P-50B-5**	N Males: **F4NM, F4PNM**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)
		N Females: **F4NF, F4PNF**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)
		7-16 DIN Male: **F4PDM-C**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)
		7-16 DIN Female: **F4PDF-C**	1.06 (30.7)	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)
		Rt. Angle N Male: **F4PNR**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
0.3-1.7	**FSJ4P-50B-6**	N Males: **F4NM, F4PNM**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		N Females: **F4NF, F4PNF**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Male: **F4PDM-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Female: **F4PDF-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		Rt. Angle N Male: **F4PNR**	1.20 (20.8)	1.20 (20.8)	1.30 (17.7)	1.40 (15.6)
1.7-2.7	**FSJ4P-50B-7**	N Males: **F4NM, F4PNM**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		N Females: **F4NF, F4PNF**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Male: **F4PDM-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Female: **F4PDF-C**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)
		Rt. Angle N Male: **F4PNR**	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
4.0-8.0*	**FSJ4P-50B-8**	N Males: **F4NM, F4PNM**	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)	1.40 (15.6)
		N Females: **F4NF, F4PNF**	1.50 (14.0)	1.50 (14.0)	1.50 (14.0)	1.40 (15.6)
		7-16 DIN Male: **F4PDM-C**	1.50 (14.0)	1.50 (14.0)	1.50 (14.0)	1.40 (15.6)
		7-16 DIN Female: **F4PDF-C**	1.50 (14.0)	1.50 (14.0)	1.50 (14.0)	1.40 (15.6)

* Specify operating band. ** Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25) mm long	31769-1
Angle Adapter, kit of 10.	
Stainless Steel	31768A
Galvanized	242774
Galvanized, metric hardware	242774-M
Round Member Adapter Kit of 10. Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
6-8 (150-200)	31670-6
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	206706-1
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	206929-1
4 cable runs, 2 connections required	206929-4
8 cable runs, 3 connections required	206929-8
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	206930
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	40417
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1.5 ft (0.5 m)	CT-K350
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	VCT8-10
Kit of 50	VCT8-50
Hanger Blox and Insulated Hangers - please refer to pages 554-557.	
Hoisting Grip	43094
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	204989-1
factory attached, two-hole lug, 24 in (610 mm) lead	241088-1
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	204989-21
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	241088-6

Description	Type No.
Crimping Tool to field attach lug to Grounding Kit	207270
Arrestor Plus® Lightning Surge Protector Connector/surge protector. *#,* Interface and frequency band information. See page 562 for details and more interface types.*	APPF4-#-*
Arrestor Plus® T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional *#,* Interface and frequency band information. See page 563 for details.*	APT-#-*
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability *#,* Interface and frequency band information. See page 564 for details.*	SA-#-*
Weatherproofing - for more information, see page 565.	
Cold-Shrink Weatherproofing Kit	
1/2" Coax-Type N to 1/2" Coax-Type N	241474-4
7/8" Coax-Type N to1/2" Coax-Type N	241475-1
1-1/4" or 1-5/8" Coax-Type N to 1/2" Coax-Type N	241475-2
7/8" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	241475-6
1-1/4" or 1-5/8" Coax-7-16 DIN to FSJ4 -7-16 DIN	241475-7
1/2" Coax -Type N to Antenna Output	241548-4
1/2" FSJ4 -7-16 DIN to Antenna Output	241548-7
Connector/Splice Weatherproofing Kit	221213
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	40656A-3

Feed-Thru Plates and Boots. order separately, see pages 566-567.

Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	204673-1	48940-1
1	204673-2	
2		48940-2
3		48940-3
4	204673-4	48940-4
6		48940-6
8	204673-8	
12	204673-12	

	4 in Boots	5 In Boots
One Hole:	204679-5	48939-6
Three Hole:	204679-7	48939-8

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. Use with Arrestor Plus surge protector series. Available in many configurations see page 562 for available options and ordering information. ** Number of surge arrestor openings in the plate. ** Number of cable feed thru ports at the top.* — APPORT-(*)-(**)

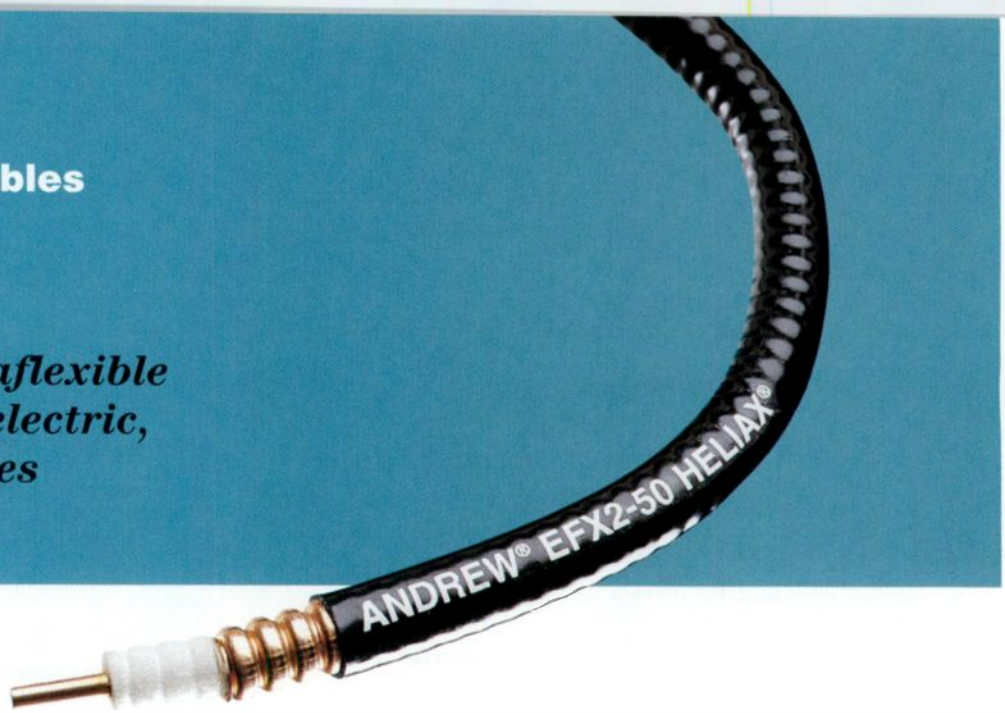
Tools - for more tools see page 569.

EASIAX® Cutting Tool, FSJ4/FSJ1	207865
EASIAX Cutting Tool, FSJ4/FSJ2	241372
Cutoff Guide, 7/32" (5.5 mm)	224361

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

HELIAX® Coaxial Cables

50-ohm *3/8" Extraflexible Foam Dielectric, EFX Series*



NEW!

EFX2-50

Cable Ordering Information

Description	Type No.
Extraflexible Cable	
3/8" Extraflexible Cable, Standard Jacket	**EFX2-50**

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	13.5
Velocity, percent	85
Peak Power Rating, kW	15.6
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.1 (3.6)
Outer	0.92 (3.0)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	24.1 (79.0)
Inductance, µH/ft (m)	0.06 (0.20)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.45 (11.3)
Diameter over Copper Outer Conductor, in (mm)	0.38 (9.7)
Minimum Bending Radius, in (mm)	1.75 (45)
Number of Bends, minimum (typical)	15
Bending Moment, lb-ft (N•m)	1.7 (2.3)
Cable Weight, lb/ft (kg/m)	0.09 (0.13)
Tensile Strength, lb (kg)	175 (79)
Flat Plate Crush Strength, lb/in (kg/mm)	120 (2.1)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.075	0.246	15.6
1	0.106	0.348	15.6
1.5	0.130	0.427	15.6
2	0.150	0.492	15.6
10	0.337	1.11	6.97
20	0.479	1.57	4.90
30	0.589	1.93	3.99
50	0.765	2.51	3.07
88	1.02	3.35	2.30
100	1.09	3.58	2.15
108	1.14	3.74	2.07
150	1.35	4.43	1.74
174	1.46	4.79	1.61
200	1.57	5.15	1.50
300	1.94	6.37	1.21
400	2.26	7.42	1.04
450	2.40	7.87	0.978
500	2.54	8.33	0.924
512	2.57	8.43	0.913
600	2.80	9.19	0.838
700	3.05	10.0	0.771
800	3.28	10.8	0.717
824	3.33	10.9	0.706
860	3.41	11.2	0.689
894	3.48	11.4	0.675
960	3.62	11.9	0.649
1000	3.70	12.1	0.635
1250	4.19	13.7	0.561
1500	4.63	15.2	0.507
1700	4.97	16.3	0.473
2000	5.45	17.9	0.431
2300	5.90	19.4	0.398
3000	3.88	12.7	0.342
4000	8.13	26.7	0.289
5000	9.29	30.5	0.253
6000	10.4	34.1	0.227
8000	12.4	40.7	0.190
10000	14.2	46.6	0.165
12000	15.9	52.2	0.147
13000	16.8	55.1	0.140
13500	17.2	56.4	0.137

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F)
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

E2PNM-H
N Male

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length In (mm)	Max. Dia. In (mm)
N Male	Hex Head	**E2PNM-H**		Solder	Self-Flare	SG	2.0 (52)	0.94 (23.9)
N Female		**E2PNF**		Solder	Self-Flare	SG	2.4 (61)	0.69 (17.6)
7-16 DIN Male		**E2PDM-C**		Captivated	Self-Flare	SS	2.1 (53)	1.41 (35.9)
7-16 DIN Female		**E2PDF-C**		Captivated	Self-Flare	SS	2.1 (53)	1.10 (27.9)
TNC Male		**E2PTM**		Solder	Self-Flare	SG	2.2 (56)	0.63 (16.1)
TNC Female		**E2PTF**		Solder	Self-Flare	NG	1.9 (49)	0.63 (16.1)
UHF Male		**E2UM**		Solder	Self-Flare	BB	2.2 (56)	0.77 (19.6)
UHF Female		**E2UF**		Solder	Self-Flare	BS	2.1 (53)	0.68 (17.3)
SMA Male		**E2SM**		Solder	Self-Flare	BG	2.2 (56)	0.68 (17.3)

Plating Codes: BG - Brass Body and Gold Plated Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding and Surge Protection - for more information, see pages 559-564.	

Description	Type No.
Grounding Kit - factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional	**APT-#-***
#,* *Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#,* *Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
3/8" Coax-Type N to 3/8" Coax-Type N	**241474-3**
3/8" Coax-Type N to Antenna Output	**241548-3**
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

HELIAX®
Coaxial Cables

50-ohm
1/4" Foam Dielectric, LDF Series

LDF1-50

Cable Ordering Information

Description	Type No
Standard Cable	
1/4" Standard Cable, Standard Jacket	**LDF1-50**
Fire Retardant Cables	
1/4" Fire Retardant Jacket (CATVX)	**LDF1RN-50**
1/4" Fire Retardant Jacket (CATVR)	**LDF1RN-50**

Characteristics

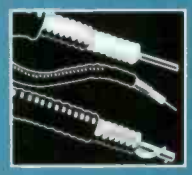
Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	15.8
Velocity, percent	86
Peak Power Rating, kW	12.1
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.57 (5.15)
Outer	1.02 (3.33)
dc Breakdown, volts	2200
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	23.4 (76.8)
Inductance, µH/ft (m)	0.059 (0.19)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.345 (8.8)
Diameter over Copper Outer Conductor, in (mm)	0.31 (7.7)
Diameter Inner Conductor, in (mm)	0.102 (2.6)
Minimum Bending Radius, in (mm)	3.0 (76)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	0.98 (1.33)
Cable Weight, lb/ft (kg/m)	0.06 (0.09)
Tensile Strength, lb (kg)	200 (91)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.085	0.280	12.1
1	0.121	0.397	12.1
1.5	0.148	0.487	12.1
2	0.171	0.562	12.1
10	0.381	1.264	5.85
20	0.539	1.794	4.13
30	0.661	2.20	3.38
50	0.953	2.86	2.61
88	1.132	3.82	1.97
100	1.206	4.08	1.85
108	1.254	4.24	1.78
150	1.477	5.03	1.51
174	1.591	5.43	1.40
300	2.09	7.22	1.07
400	2.41	8.40	0.924
450	2.56	8.94	0.871
500	2.67	9.46	0.827
512	2.73	9.58	0.817
600	2.96	10.42	0.755
700	3.19	11.32	0.699
800	3.41	12.17	0.654
824	3.46	12.36	0.644
894	3.61	12.92	0.618
960	3.74	13.43	0.597
1000	3.82	13.73	0.585
1250	4.27	15.51	0.523
1500	4.67	17.15	0.477
1700	4.97	18.38	0.448
2000	5.40	20.13	0.413
2300	5.79	21.77	0.385
3000	6.61	25.32	0.338
4000	7.63	29.89	0.292
5000	8.53	34.06	0.261
6000	9.34	37.94	0.239
8000	10.79	45.11	0.207
10000	12.06	51.72	0.185
12000	13.21	57.92	0.169
14000	14.27	63.83	0.156
15000	14.77	66.68	0.151
15800	15.16	68.93	0.147

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F).
For Average Power. VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F),no solar loading.



N Male
L1PNM-H

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male	Hex Head	**L1PNM-H†**		Solder	Self-Flare	SG	1.9 (49)	0.94 (23.9)
N Female		**L1PNF**		Solder	Self-Flare	SG	2.1 (52)	0.62 (15.7)
N Female	Bulkhead	**L1PNF-BH**		Solder	Self-Flare	SG	2.1 (52)	0.88 (22.4)

† See page 570 for bulk packs.
Plating Codes: SG - Silver Plated Body and Gold Plated Pin

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit - factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional #,* *Interface and frequency band information. See page 563 for details.*	**APT-#-***
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability #,* *Interface and frequency band information. See page 564 for details.*	**SA-#-***
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

HELIAX®
Coaxial Cables

50-ohm
3/8" Foam Dielectric, LDF Series

LDF2-50

Cable Ordering Information

Description	Type No.
Standard Cable	
3/8" Standard Cable, Standard Jacket	LDF2-50
Fire Retardant Cables	
3/8" Fire Retardant Jacket (CATVX)	LDF2RN-50
3/8" Fire Retardant Jacket (CATVR)	LDF2RN-50
Low VSWR and Specialized Cables	
3/8" Low VSWR, specify operating band	LDF2P-50-(**)
Phase Stabilized and Phase Measured Cable	See page 585

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	13.5
Velocity, percent	88
Peak Power Rating, kW	15.6
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.06 (3.48)
Outer	0.87 (2.85)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	23.0 (75.5)
Inductance, µH/ft (m)	0.058 (0.19)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.44 (11)
Diameter over Copper Outer Conductor, in (mm)	0.38 (9.7)
Diameter Inner Conductor, in (mm)	0.122 (3.1)
Minimum Bending Radius, in (mm)	3.75 (95)
Number of Bends, minimum (typical)	15 (60)
Bending Moment, lb-ft (N•m)	1.4 (1.9)
Cable Weight, lb/ft (kg/m)	0.08 (0.12)
Tensile Strength, lb (kg)	250 (113)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (2.0)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.072	0.236	15.6
1	0.102	0.335	15.6
1.5	0.125	0.410	15.6
2	0.145	0.476	15.6
10	0.325	1.07	7.23
20	0.462	1.52	5.09
30	0.567	1.86	4.14
50	0.736	2.41	3.19
88	0.984	3.23	2.38
100	1.05	3.44	2.23
108	1.09	3.59	2.15
150	1.30	4.27	1.81
174	1.40	4.59	1.67
200	1.50	4.92	1.56
300	1.86	6.09	1.26
400	2.16	7.09	1.08
450	2.30	7.56	1.02
500	2.44	8.00	0.963
512	2.47	8.11	0.951
600	2.69	8.84	0.874
700	2.93	9.61	0.804
800	3.13	10.3	0.748
824	3.19	10.5	0.736
894	3.34	11.0	0.704
960	3.47	11.4	0.678
1000	3.55	11.6	0.663
1250	4.01	13.2	0.586
1500	4.43	14.6	0.530
1700	4.75	15.6	0.494
2000	5.21	17.1	0.451
2300	5.63	18.4	0.417
3000	6.56	21.5	0.358
4000	7.74	25.4	0.303
5000	8.84	29.0	0.266
6000	9.85	32.3	0.239
8000	11.8	38.6	0.200
10000	13.5	44.3	0.175
12000	15.2	49.8	0.156
13000	16.0	52.5	0.148
13500	16.4	53.7	0.145

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For average power, VSWR 1.0 ambient temperature 40°C (104°F), Inner conductor temperature 100°C (212°F), no solar loading.

Connectors

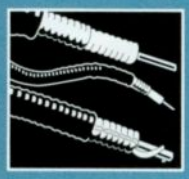
Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L2NM**	L42W	Solder	Self-Flare	BS	2.1 (53)	0.81 (20.6)
N Male	Hex Head	**L2NM-H**		Solder	Self-Flare	BS	2.1 (53)	0.94 (23.9)
N Male		**L2PNM†**	L42PW	Solder	Self-Flare	SG	2.1 (53)	0.81 (20.6)
N Male	Hex Head	**L2PNM-H**		Solder	Self-Flare	SG	2.1 (53)	0.94 (23.9)
N Female		**L2NF**	L42N	Solder	Self-Flare	BS	2.4 (61)	0.63 (16.0)
N Female		**L2PNF**	L42PN	Solder	Self-Flare	SG	2.4 (61)	0.63 (16.0)
N Female	Bulk Head	**L2PNF-BH**		Solder	Self-Flare	SG	2.4 (61)	0.88 (22.4)
4.1/9.5 DIN	Indoor Use	**L2PKM-IC**	L42KM	Captivated	Self-Flare	SS	1.9 (48)	0.95 (24.1)
4.1/9.5 DIN	Indoor Use	**L2PKM-I**	L42KMS	Solder	Self-Flare	SS	1.9 (48)	0.95 (24.1)
4.1/9.5 DIN	Outdoor Use	**L2PKM-C**	L42KME	Captivated	Self-Flare	SS	1.9 (48)	0.95 (24.1)
4.1/9.5 DIN	Outdoor Use	**L2PKM**	L42KMSE	Solder	Self-Flare	SS	1.9 (48)	0.95 (24.1)
4.1/9.5 DIN	Right Angle	**L2PKR-IC**	L42KM-RA	Captivated	Self-Flare	SS	2.0/1.5 (50/38)	0.95 (24.1)
4.1/9.5 DIN	Right Angle	**L2PKR-C**	L42KME-RA	Captivated	Self-Flare	SS	2.0/1.5 (50/38)	0.95 (24.1)
7-16 DIN Male		**L2PDM-C**	L42ADM	Captivated	Self-Flare	SS	1.9 (48)	1.1 (27.9)
7-16 DIN Male		**L2PDF-C**	L42ADF	Captivated	Self-Flare	SS	1.9 (48)	1.4 (35.6)
7-16 DIN Male	Panel Mount	**L2PDF-PMC**	L42ADF-PM	Captivated	Self-Flare	SS	1.9 (48)	1.25 (31.8)
UHF Male		**L42P**		Solder	Self-Flare	BB	2.3 (58)	0.68 (17.3)
UHF Female		**L42U**		Solder	Self-Flare	BB	2.3 (58)	0.91 (23.1)
SMA Male		**L42WS**		Solder	Self-Flare	BG	2.2 (56)	0.68 (17.3)
TNC Male		**L42WT**		Solder	Self-Flare	BB	2.1 (53)	0.68 (17.3)
TNC Male		**L42EWT†**		Solder	Self-Flare	NG	2.1 (53)	0.68 (17.3)
TNC Female		**L42NT**		Solder	Self-Flare	BS	1.9 (48)	0.68 (17.3)
TNC Female		**L42ENT**		Solder	Self-Flare	NG	1.9 (48)	0.68 (17.3)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For L2NM, L2NM-H	**48335-3**
For L2PNM, L2PNM-H	**48335-4**
Connector Reattachment Kit	**34767A-38**
Bulkhead Adapter, for N or UHF Females	**26016-2**
End Terminal Adapter, use with N Male connector	**13074A**



HELIAX® Coaxial Cables

Low VSWR Specifications, Type LDF2P-50-( )

Frequency Band, GHz	Type No.	Using Connector Type No.**	Assembly VSWR, Maximum (R.L., dB) to 10 ft (3 m)	10-20 ft (3-6 m)
1.7 - 2.3	**LDF2P-50-5**	N Male: **L2PNM** N Female: **L2PNF** TNC Male: **L42EWT**	1.10 (26.5) 1.10 (26.5) 1.10 (26.5)	1.10 (26.5) 1.15 (23.1) 1.15 (23.1)
Up to 2.3 GHz*	**LDF2P-50-1**	N Male: **L2PNM** N Female: **L2PNF** TNC Male: **L42EWT**	1.15 (23.1) 1.15 (23.1) 1.20 (20.8)	1.20 (20.8) 1.25 (19.9) 1.30 (17.7)
Up to 4.2 GHz*	**LDF2P-50-2**	N Male: **L2PNM** N Female: **L2PNF**	1.20 (20.8) 1.35 (16.6)	1.35 (16.6) 1.45 (14.7)
Up to 8.5 GHz*	**LDF2P-50-3**	N Male: **L2PNM**	1.25 (19.9)	1.35 (16.6)
Up to 13.5 GHz*	**LDF2P-50-4**	N Male: **L2PNM**	1.30 (17.7)	1.35 (16.6)

* Specify operating band. ** Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2 ft (0.61 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit - factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Arrestor Plus® T-Series Lightning Surge Protector. Connectors on each end (universal version). Non-directional *#,* Interface and frequency band information. See page 563 for details.*	**APT-#-***
Gas Tube Surge Arrestor. Connectors on each end (universal version). Directional, dc pass capability *#,* Interface and frequency band information. See page 564 for details.*	**SA-#-***
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
3/8" Coax-Type N to 3/8" Coax-Type N	**241474-3**
3/8" Coax-Type N to Antenna Output	**241548-3**
Connector/Splice Weatherproofing Kit	**221213**
Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

50-ohm

1/2" Foam Dielectric, LDF Series

HELIAX® Coaxial Cables

LDF4-50A

Cable Ordering Information

Description	Type No.
Standard Cable	
1/2" Standard Cable, Standard Jacket	**LDF4-50A**
Fire Retardant Cables	
1/2" Fire Retardant Jacket (CATVX)	**LDF4RN-50A**
1/2" Fire Retardant Jacket (CATVR)	**LDF4RN-50A**
Low VSWR and Specialized Cables	
1/2" Low VSWR, specify operating band	**LDF4P-50A-(**)**
Cable for Cellular, standard jacket	
824-960 MHz, 1.20 VSWR, max.	**LDF4P-50A-1**
880-960 MHz, 1.20 VSWR, max.	**LDF4P-50A-2**
Cable for Cellular, fire retardant jacket (CATVR)	
824-894 MHz, 1.20 VSWR	**41690-74**
Qualified to MIL-C-28830/3	**202071-1**
Phase Stabilized and Phase Measured Cable	See page 585
Jumper Cable Assemblies	
Standard Jumper Assemblies	See page 545
Low VSWR Jumper Assemblies for Cellular	See page 46
Low VSWR Jumper Assemblies for Microwave	See page 171

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	8.8
Velocity, percent	88
Peak Power Rating, kW	40
dc resistance, ohms/1000 ft (1000 m)	
Inner	0.45 (1.48)
Outer	0.58 (1.90)
dc Breakdown, volts	4000
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	23.1 (75.8)
Inductance, µ/ft (m)	0.058 (0.190)
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.63 (16)
Diameter over Copper Outer Conductor, in (mm)	0.55 (14)
Diameter Inner Conductor, in (mm)	0.189 (4.6)
Nominal Inside Transverse Dimensions, cm	1.11
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	2.8 (3.8)
Cable Weight, lb/ft (kg/m)	0.15 (0.22)
Tensile Strength, lb (kg)	250 (113)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (2.0)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.046	0.152	40.0
1	0.066	0.217	35.1
1.5	0.081	0.266	28.6
2	0.094	0.308	24.8
10	0.211	0.692	11.0
20	0.300	0.985	7.75
30	0.369	1.21	6.31
50	0.479	1.57	4.85
88	0.641	2.10	3.63
100	0.684	2.24	3.39
108	0.712	2.34	3.26
150	0.845	2.77	2.75
174	0.914	3.00	2.54
200	0.983	3.23	2.36
300	1.22	4.00	1.91
400	1.42	4.66	1.64
450	1.51	4.96	1.53
500	1.60	5.26	1.45
512	1.62	5.32	1.43
600	1.77	5.80	1.31
700	1.92	6.31	1.21
800	2.07	6.79	1.12
824	2.10	6.90	1.10
894	2.20	7.22	1.05
960	2.29	7.51	1.01
1000	2.34	7.68	0.994
1250	2.65	8.69	0.878
1500	2.93	9.61	0.793
1700	3.15	10.3	0.738
2000	3.45	11.3	0.673
2300	3.74	12.3	0.621
3000	4.38	14.4	0.532
4000	5.18	17.0	0.448
5000	5.93	19.5	0.392
6000	6.64	21.8	0.351
8000	7.94	26.0	0.293
8800	8.42	27.6	0.276

Standard Conditions:
For Attenuation, VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), Inner conductor temperature 100°C (212°F), no solar loading.

N Male
L4PNM

N Female
L4NF

7-16 DIN Male
L4PDM-C

TNC Female
L4NT

7-16 DIN Female
L4PDF

7/8" EIA Flange
L44R

UHF Male
L44P

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length In (mm)	Max. Dia. In (mm)
N Male		**L4NM†**	L44AW	Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male		**L4NM-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4NM-H**		Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male	Hex Head	**L4NM-HC**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male		**L4PNM†**	L44PW	Solder	Self-Flare	SG	2.6 (66)	0.91 (23.1)
N Male		**L4PNM-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4PNM-H†**	L44PW-12	Solder	Self-Flare	SG	2.6 (66)	0.95 (24.1)
N Male	Hex Head	**L4PNM-HC**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Right Angle	**L4PNR**	43716-7	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.94 (23.9)
N Male	Rt. Angle, Hex	**L4PNR-H**	43716-12	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.95 (24.1)
N Female		**L4NF†**	L44N	Solder	Self-Flare	BS	2.6 (66)	0.94 (23.9)
N Female		**L4NF-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Female		**L4PNF†**	L44PN	Solder	Self-Flare	SG	2.6 (66)	0.94 (23.9)
N Female		**L4PNF-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Female	Bulk Head	**L4PNF-BH**	L44PN-BH	Solder	Self-Flare	SG	2.6 (66)	0.96 (24.4)
N Female	Panel Mount	**L4PNF-PM**	L44PN-PM	Solder	Self-Flare	SG	2.6 (66)	1.0 (25.4)
7-16 DIN Male		**L4PDM†**	L44ADM	Solder	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDM-C†**	L44BDM	Captivated	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDR**		Solder	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Male		**L4PDR-C**		Captivated	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Female		**L4PDF†**	L44PDF	Solder	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female		**L4PDF-C†**	L44BDF	Captivated	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female	Bulk Head	**L4PDF-BHC**		Captivated	Self-Flare	SS	2.9 (74)	1.63 (41.4)
7-16 DIN Female	Panel Mount	**L4PDF-PM**		Solder	Self-Flare	SS	2.7 (69)	1.2 (29.4)
7/8" EIA Flange		**L44R**		Solder	Self-Flare	BB	3.2 (81)	2.25 (57.2)
7/8" EIA Flange	Right Angle	**124990-1**		Solder	Self-Flare	BB	2.3/1.6 (58/41)	2.25 (57.2)
F Flange Male		**L44F**		Solder	Self-Flare	BB	2.3 (58)	2.25 (57.2)
F Flange Female		**209865**		Solder	Self-Flare	BS	2.3 (58)	2.25 (57.2)
UHF Male		**L44P**		Solder	Self-Flare	BB	2.3 (58)	0.91 (23.1)
UHF Female		**L44U**		Solder	Self-Flare	BS	2.3 (58)	0.91 (23.1)
TNC Female		**L44NT**		Solder	Self-Flare	BB	2.8 (71)	0.94 (23.9)
LC Male		**L44M**		Solder	Self-Flare	BB	3.6 (91)	0.91 (23.1)
HN Male		**L44J**		Solder	Self-Flare	BB	2.5 (64)	0.91 (23.1)
SC Male		**L44PCW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
SC Male	Right Angle	**L44PCW-RA**		Solder	Self-Flare	NG	2.6/1.6 (66/41)	0.91 (23.1)
SC Female		**L44PCN**		Solder	Tab Flare	SG	1.6 (41)	0.86 (21.8)
C Male		**L44PDW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
End Terminal		**L44T**		Solder	Self-Flare	BB	4.0 (102)	0.91 (23.1)
Splice		**L44Z**		Solder	Self-Flare	BB	3.2 (81)	1.1 (27.9)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For L4NM, L4NM-H	**241730-3**
For L4PNM, L4PNM-H	**241730-4**
For L4PDM	**222483-2**
For L4NF	**242855**
For L4PNF	**242855-2**
Connector Reattachment Kit	
For L4 and L44, except L4NM, L44PCW, L44PCN	**34767A-27**
For L4NM, L44PCW, L44PCN	**34767A-51**
Bulkhead Adapter, for N or UHF Females	**26016-2**

Assemblies

For complete information on assemblies, see page 545

	Lengths feet	Type Number
N Male/N Male	3, 6, 8 or variable	**L4-NMNM-(*)**
N Male/N Male, premium	3, 6, 8 or variable	**L4-PNMNM-(*)**
7-16 DIN Male/7-16 DIN Male	3, 6, 8 or variable	**L4-PDMDM-(*)**
N Male, premium/7-16 DIN Male	3, 6, 8 or variable	**L4-PNMDM-(*)**

Low VSWR Specifications, Type LDF4P-50A-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) 1-25 ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
0.824-0.960	LDF4P-50A-1	N Males: L4NM, L4PNM	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.12 (24.9)
		N Females: L4NF, L4PNF	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.12 (24.9)
		7/8" EIA: L44R	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.12 (24.9)
		7-16 DIN Male: L4PDM-C	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.12 (24.9)
		SC Male: L44PCW	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.12 (24.9)
		7-16 DIN Female: L4PDF	1.12 (24.9)	1.12 (24.9)	1.13 (24.3)	1.15 (23.1)	1.15 (23.1)
		TNC Female: L44NT	1.12 (24.9)	1.12 (24.9)	1.13 (24.3)	1.15 (23.1)	1.15 (23.1)
		LC Male: L44M	1.25 (19.1)	1.25 (19.1)	1.22 (20.1)	1.20 (20.8)	1.20 (20.8)
		Right Angle N Male: L4PNR	1.25 (19.1)	1.25 (19.1)	1.22 (20.1)	1.20 (20.8)	1.20 (20.8)
0.824–0.960 and 1.85–1.99	LDF4P-50A-13	N Males†	1.12 (24.9)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		N Females †	1.12 (24.9)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Males †	1.12 (24.9)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Females †	1.12 (24.9)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
0.87–0.96 and 1.7–1.9	LDF4P-50P-14	7-16 DIN: L4PDM, L4PDM-C	1.09 (27.3)	1.11 (25.7)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN: L4PDF, L4PDF-C	1.09 (27.3)	1.11 (25.7)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
0.880-960	LDF4P-50A-2	N Males: L4NM, L4PNM	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		N Females: L4NF, L4PNF	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		F Flange: L44F; 7/8" EIA: L44R	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		7-16 DIN Male: L4PDM-C; Female: L4PDF	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		SC Male: L44PCW	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		LC Male: L44M	1.25 (19.1)	1.25 (19.1)	1.22 (20.1)	1.20 (20.8)	1.20 (20.8)
		Right Angle N Male: L4PNR	1.25 (19.1)	1.25 (19.1)	1.22 (20.1)	1.20 (20.8)	1.20 (20.8)
		TNC Female: L4NT	1.25 (19.1)	1.25 (19.1)	1.22 (20.1)	1.20 (20.8)	1.20 (20.8)
1.427-1.535	LDF4P-50A-4	N Males: L4NM, L4PNM	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		N Females: L4NF, L4PNF	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		F Flange: L44F; 7/8" EIA L44R	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Male: L4PDM-C; Female: L4PDF	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		SC Male: L44PCW; TNC Female L4NT	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		LC Male: L44M	1.35 (16.5)	1.35 (16.5)	1.32 (17.2)	1.30 (17.7)	1.30 (17.7)
		Right Angle N Male: L4PNR	1.35 (16.5)	1.35 (16.5)	1.32 (17.2)	1.30 (17.7)	1.30 (17.7)
1.6-12.3	LDF4P-50A-10	N Males: L4NM, L4PNM, L4PNM-H	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		N Females: L4NF, L4PNF, L4PNF-BH, L4PNF-PM	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		F Flange: L44F; 7/8" EIA: L44R	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN: L4PDM	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN: L4PDF, L4PDF-C	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		241476	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)
		F Flange Female, 209865	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		SC Male: L44PCW	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		Right Angle N Male: L4PNR, L4PNR-H	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		TNC Female, L44NT	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		LC Male: L44M	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
1.7-1.9	LDF4P-50A-15	7-16 DIN: L4PDM, L4PDM-C	1.09 (27.3)	1.10 (26.4)	1.12 (24.9)	1.14 (23.7)	1.15 (23.1)
		7-16 DIN: L4PDM, L4PDF, L4PDF-C	1.09 (27.3)	1.10 (26.4)	1.12 (24.9)	1.14 (23.7)	1.15 (23.1)
0.940-2.7	LDF4P-50A-3	N Males: L4NM, L4PNM	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.20 (20.8)
		N Females: L4NF, L4PNF	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.20 (20.8)
		F Flange: L44F; 7/8" EIA: L44R	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.20 (20.8)
		7-16 DIN Male: L4PDM-C	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.20 (20.8)
		SC Male: L44PCW	1.20 (20.8)	1.20 (20.8)	1.22 (20.1)	1.22 (20.1)	1.22 (20.1)
		7-16 DIN Female: L4PDF	1.20 (20.8)	1.20 (20.8)	1.22 (20.1)	1.22 (20.1)	1.22 (20.1)
		LC Male: L44M	1.40 (15.6)	1.40 (15.6)	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)
		Right Angle N Male: L4PNR	1.40 (15.6)	1.40 (15.6)	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)
		TNC Female: L4NT	1.40 (15.6)	1.40 (15.6)	1.35 (16.5)	1.35 (16.5)	1.30 (17.7)
0.01-0.806	LDF4P-50A-6	N Males: L4NM, L4PNM	1.06 (30.7)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		N Females: L4NF, L4PNF	1.06 (30.7)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		7/8" EIA: L44R	1.06 (30.7)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Male: L4PDM-C; Female: L4PDF	1.06 (30.7)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		SC Male: L44PCW	1.06 (30.7)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		LC Male: L44M, TNC Female: L4NT	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.30 (17.7)	1.30 (17.7)
		Right Angle N Male: L4PNR	1.25 (19.1)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)	1.32 (17.2)
0.01-2.7*	LDF4P-50A-7	N Males: L4NM, L4PNM	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.25 (19.1)
		N Females: L4NF, L4PNF	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		7/8" EIA: L44R	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Male: L4PDM-C; Female: L4PDF	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		SC Male: L44PCW	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)
		Right Angle N Male: L4PNR	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		TNC Female: L4NT	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		LC Male: L44M	1.35 (16.5)	1.32 (17.2)	1.32 (17.2)	1.32 (17.2)	1.32 (17.2)
3.6-6.5*	LDF4P-50A-5	N Males: L4NM, L4PNM	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)
		N Females: L4NF, L4PNF	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)
		7/8" EIA: L44R	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)
		SC Male: L44PCW	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
0.1-4.2*	LDF4P-50A-8	N Males: L4NM, L4PNM	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		N Females: L4NF, L4PNF	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Male: L4PDM-C	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		SC Male: L44PCW	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		TNC Female: L4NT	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
0.1-8.4*	LDF4P-50A-9	N Males: L4NM, L4PNM	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		N Females: L4NF, L4PNF	1.40 (15.6)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)

* Specify operating band ** Connectors ordered separately † Does not apply for right angle connectors.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 3 ft (0.91 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Angle Adapter Kit of 10. Stainless steel. For attaching TowerHanger/Adapter to angle tower members.	**31768A**
Hanger Blox™ Kit of 3. Injection molded plastic, stackable. 6 runs per unit; 18 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 3 ft (0.91 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**HB-4**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-456**
Extender Kit	**HBEH-456**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters - please refer to pages 554-555.	
Hoisting Grip	**43094**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Arrestor Plus® Lightning Surge Protector Connector/surge protector. *#,* Interface and frequency band information. See page 562 for details and more interface types.*	**APPL4-#-***
Arrestor Plus T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional *#,* Interface and frequency band information. See page 563 for details.*	**APT-#-***
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability *#,* Interface and frequency band information. See page 564 for details.*	**SA-#-***
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
1/2" Coax-Type N to 1/2" Coax-Type N	**241474-4**
7/8" Coax-Type N to1/2" Coax-Type N	**241475-1**
1-1/4" or 1-5/8" Coax-Type N to 1/2" Coax-Type N	**241475-2**
7/8" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-4**
1-1/4" or 1-5/8" Coax-7-16 DIN to LDF4 -7-16 DIN	**241475-5**
2-1/4" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-8**
1/2" Coax -Type N to Antenna Output	**241548-4**
1/2" LDF4 -7-16 DIN to Antenna Output	**241548-6**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-5**	**48939-6**
Three Hole:	**204679-7**	**48939-8**

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. Use with Arrestor Plus surge protector series. Available in many configurations see page 562 for available options and ordering information. **APPORT-(*)-(**)**

** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

EASIAX® Cutting Tool	**207866**
Cable Flare Tool	**224363**
Cutoff Guide, 7/32" (5.5 mm)	**224361**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

50-ohm
7/8" Foam Dielectric, LDF Series

LDF5-50A

Cable Ordering Information

Description	Type No.
Standard Cable	
7/8" Standard Cable, Standard Jacket	LDF5-50A
Fire Retardant Cable	
7/8" Fire Retardant Jacket (CATVR)	LDF5RN-50A
Low VSWR and Specialized Cables	
7/8" Low VSWR, specify operating band	LDF5P-50A-(**)
Cable for Cellular, standard jacket 824-960 MHz, 1.10 VSWR, max.	LDF5P-50A-9A
Cable for Cellular, fire retardant jacket, (CATVR) 824-894 MHz, 1.20 VSWR, max.	41690-75
Qualified to MIL-C-28830/4	202071-2
Phase Stabilized and Phase Measured Cable	See page 585

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	5.0
Velocity, percent	89
Peak Power Rating, kW	91
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.32 (1.05)
Outer	0.32 (1.05)
dc Breakdown, volts	6000
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	22.8 (75.0)
Inductance, µH/ft (m)	0.057 (0.187)

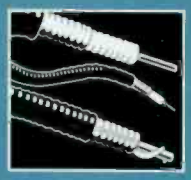
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.09 (28)
Diameter over Copper Outer Conductor, in (mm)	0.98 (24.9)
Diameter Inner Conductor, in (mm)	0.355 (4.0)
Nominal Inside Transverse Dimensions, cm	2.11
Minimum Bending Radius, in (mm)	10 (250)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	12 (16.3)
Cable Weight, lb/ft (kg/m)	0.33 (0.49)
Tensile Strength, lb (kg)	325 (147)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)

* A 75-ohm 7/8" diameter cable is available. Contact Andrew for further information.

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.025	0.0804	91.0
1	0.035	0.115	78.9
1.5	0.043	0.141	64.3
2	0.050	0.164	55.6
10	0.112	0.367	24.6
20	0.160	0.525	17.3
30	0.197	0.646	14.0
50	0.257	0.843	10.7
88	0.345	1.13	8.01
100	0.369	1.21	7.49
108	0.384	1.26	7.19
150	0.458	1.50	6.04
174	0.496	1.63	5.58
200	0.535	1.76	5.18
300	0.666	2.18	4.15
400	0.781	2.56	3.55
450	0.834	2.74	3.32
500	0.883	2.90	3.13
512	0.896	2.94	3.09
600	0.979	3.21	2.83
700	1.07	3.50	2.59
800	1.15	3.78	2.40
824	1.17	3.85	2.36
894	1.23	4.03	2.25
960	1.28	4.20	2.16
1000	1.31	4.30	2.11
1250	1.49	4.90	1.85
1500	1.66	5.45	1.66
1700	1.79	5.87	1.54
2000	1.97	6.46	1.40
2300	2.15	7.05	1.29
3000	2.53	8.31	1.09
4000	3.03	9.94	0.914
5000	3.50	11.5	0.792

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.



HELIAX® Coaxial Cables

7-16 DIN Female
L5PDF-RC

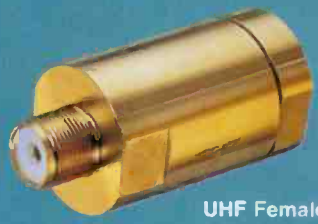
7-16 DIN Male
L5PDM

N Male
L5NM

N Female
L5NF

7/8" EIA Flange
L45R

F Flange Male
L45F



UHF Female
L45U

Connectors

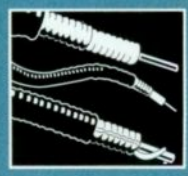
Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L5NM**	L45W	Self-Tapping	Self-Flare	BB	2.8 (71)	1.4 (36)
N Male		**L5PNM†**	L45PW	Self-Tapping	Self-Flare	SG	2.8 (71)	1.4 (36)
N Male	Hex Head	**L5PNM-H**		Self-Tapping	Self-Flare	SG	3.0 (76)	1.36 (34.5)
N Female		**L5NF**	L45N	Self-Tapping	Self-Flare	BB	2.8 (71)	1.4 (36)
N Female		**L5PNF†**	L454PN	Self-Tapping	Self-Flare	SG	2.8 (71)	1.4 (36)
7-16 DIN Male		**L5PDM†**	L45ADM	Self-Tapping	Self-Flare	SS	2.6 (66)	1.4 (36)
7-16 DIN Male	Right Angle	**L5PDR†**	L45ADM-RA	Self-Tapping	Self-Flare	SS	3.3/2.5 (85/64)	1.4 (36)
7-16 DIN Female		**L5PDF†**	L45PDF	Self-Tapping	Self-Flare	SS	2.7 (69)	1.4 (36)
7-16 DIN Female	Bulkhead	**L5PDF-BH**	L45ADF-BH	Self-Tapping	Self-Flare	SS	2.7 (69)	1.9 (47)
7-16 DIN Female	Panel Mount	**L5PDF-PM**		Self-Tapping	Self-Flare	SS	2.7 (69)	1.35 (34.4)
7-16 DIN Female	Ring Flare	**L5PDF-RC†**		Captivated	Ring-Flare	SS	2.9 (74)	1.36 (34.5)
7/8" EIA Flange		**L45R**		Self-Tapping	Self-Flare	BB	3.3 (84)	2.25 (57)
7/8" EIA Flange	Right Angle	**124800-1**		Self-Tapping	Self-Flare	BB	3.9/1.3 (99/33)	2.25 (57)
F Flange Male		**L45F**		Self-Tapping	Self-Flare	BB	1.8 (46)	2.25 (57)
F Flange Female		**48041**		Self-Tapping	Self-Flare	BB		
UHF Male		**L45P**		Self-Tapping	Self-Flare	BS	2.7 (69)	1.4 (36)
UHF Female		**L45U**		Self-Tapping	Self-Flare	BS	2.7 (69)	1.4 (36)
LC Male		**L45M**		Self-Tapping	Self-Flare	BB	3.7 (94)	1.4 (36)
LC Female		**L45L**		Self-Tapping	Self-Flare	BB	3.4 (86)	1.4 (36)
HN Male		**L45J**		Self-Tapping	Self-Flare	BB	3.0 (76)	1.4 (36)
End Terminal		**L45T**		Self-Tapping	Self-Flare	BB	4.9 (124)	1.4 (36)
Splice		**L45Z**		Self-Tapping	Self-Flare	BB	3.3 (84)	1.5 (38)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For L5NM	**43158-5**
For L5PNM, L5PNM-H	**241495**
For L5NF	**43157-2**
For L5PNF	**241092**
For L5PDM	**114105**
For L5PDF and L5PDF-BH	**114105-2**
Connector Reattachment Kit for L45 Series	**34767A-28**
Bulkhead Adapter, for N or UHF Females	**26016-2**



Low VSWR Specifications, Type LDF5P-50A-( )

Frequency Band GHz	Type No.	Using Connector Type*	Assembly VSWR, Maximum (R.L., dB) 1-25 ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
0.824-0.960	**LDF5P-50A-9A**	Type N: **L5NM, L5NF, L5PNM, L5PNF**	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		7/8" EIA: **L45R**	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		7-16 DIN: **L5PDM, L5PDF**	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		F Flange: **L45F**	1.06 (30.7)	1.07 (29.4)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
		LC: **L45M**	1.08 (28.3)	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)
0.824–0.960 and 1.85–1.99	**LDF5P-50A-16A**	N Males†	1.10 (26.4)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		N Females †	1.10 (26.4)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Males †	1.10 (26.4)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Females †	1.10 (26.4)	1.12 (24.9)	1.13 (24.2)	1.15 (23.1)	1.15 (23.1)
1.38-1.540	**LDF5P-50A-11A**	Type N: **L5NM, L5NF, L5PNM, L5PNF**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7/8" EIA: **L45R**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN: **L5PDM, L5PDF**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		F Flange: **L45F**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
1.60-2.3	**LDF5P-50A-12A**	Type N Male: **L5NM, L5PNM**	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
		Type N Female: **L5NF, L5PNF**	1.12 (24.9)	1.12 (24.9)	1.12 (24.9)	1.12 (24.9)	1.12 (24.9)
		7/8" EIA: **L45R**	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
		7-16 DIN: **L5PDM, L5PDF**	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
		F Flange: **L45F**	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
2.3-2.7	**LDF5P-50A-13A**	Type N Male: **L5NM, L5PNM**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		Type N Female: **L5NF, L5PNF**	1.15 (23.1)	1.15 (23.1)	1.15 (23.1)	1.18 (21.6)	1.18 (21.6)
		7/8" EIA: **L45R**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN: **L5PDM, L5PDF**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		F Flange: **L45F**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
0.01-1.0	**LDF5P-50A-5A**	Type N: **L5NM, L5NF, L5PNM, L5PNF**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)
		7/8" EIA: **L45R**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)
		7-16 DIN: **L5PDM, L5PDF**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)
		LC: **L45M**	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)
1.7-4.2	**LDF5P-50A-7A**	Type N Male: **L5NM, L5PNM**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		Type N Female: **L5NF, L5PNF**	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)
		7/8" EIA: **L45R**	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)
		7-16 DIN Male: **L5PDM**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		7-16 DIN Female: **L5PDF**	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)
0.01-4.2	**LDF5P-50A-14A**	Type N Male: **L5NM, L5PNM**	1.10 (26.4)	1.20 (20.8)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
		Type N Female: **L5NF, L5PNF**	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
		7/8" EIA: **L45R**	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
		7-16 DIN Male: **L5PDM**	1.10 (26.4)	1.20 (20.8)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
		7-16 DIN Female: **L5PDF**	1.15 (23.1)	1.20 (20.8)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
		LC: **L45M**	1.25 (19.1)	1.30 (17.7)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)
0.01-5.0	**LDF5P-50A-15A**	Type N: **L5NM, L5NF, L5PNM, L5PNF**	1.15 (23.1)	1.20 (20.8)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
		7/8" EIA: **L45R**	1.30 (17.7)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
		7-16 DIN Male: **L5PDM**	1.15 (23.1)	1.20 (20.8)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
		7-16 DIN Female: **L5PDF**	1.30 (17.7)	1.30 (17.7)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)

* Connectors ordered separately. † Does not apply for right angle connectors.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 5.5 ft (1.68 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-2**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Hanger Blox™ Kit of 3. Injection molded plastic, stackable. 4 runs per unit; 12 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**HB-5**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-456**
Extender Kit	**HBEH-456**
Insulated Hangers and Adapters - please refer to pages 554-555.	
Support/Hoisting Grip. Use at 200 ft (60 m) intervals.	
Grip with one clamp	**L5SGRIP**
Support clamp kit of 10	**L5SGRIP-51K**
Installation tool with 10 support clamps	**L5SGRIP-51KT**
Hoisting Grip	**19256B**
Grounding and Surge Protection - for more information, see pages 559-564.	
SureGround Grounding Kit, with tape weatherproofing kit.	
factory attached, one-hole lug, 600 mm lead	**SGL5-06B1**
factory attached, two-hole lug, 600 mm lead	**SGL5-06B2**
field attachable crimp-on, one-hole lug,1000 mm lead	**SGL5-10B3**
field attachable crimp-on, two-hole lug,1000 mm lead	**SGL5-10B4**

Description	Type No.
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Arrestor Plus® Lightning Surge Protector Connector/surge protector. *#,* Interface and frequency band information. See page 562 for details and more interface types.*	**APPL5-#-***
Arrestor Plus T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional *#,* Interface and frequency band information. See page 563 for details.*	**APT-#-***
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability *#,* Interface and frequency band information. See page 564 for details.*	**SA-#-***
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
7/8" Coax-Type N to 1/2" Coax-Type N	**241475-1**
7/8" Coax-Type N to 7/8" Coax-Type N	**241474-5**
1-1/4" or 1-5/8" Coax-Type N to 7/8" Coax-Type N	**241475-3**
7/8" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-4**
7/8" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	**241475-6**
AAPL5 to 7/8" LDF5-50A	**241474-5**
7/8" Coax-Type N to Antenna Output	**241548-5**
FSJ2-LDF5	**241475-10**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-1**

Feed-Thru Plates and Boots. Order separately.

Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-2**	**48939-1**
Three Hole:	**204679-15**	**48939-2**

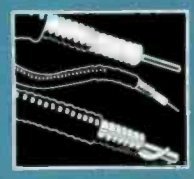
ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. Use with Arrestor Plus surge protector series. Available in many configurations see page 562. for available options and ordering information. **APPORT-(*)-(**)**

** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

EASIAX® Cutting Tool	**222951**
Cable Flare Tool	**224368**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.



50-ohm
1-1/4" Foam Dielectric, LDF Series

LDF6-50

Cable Ordering Information

Description	Type No.
Standard Cable	
1-1/4" Standard Cable, Standard Jacket	LDF6-50
Fire Retardant Cable	
1-1/4" Fire Retardant Jacket (CATVR)	LDF6RN-50
Low VSWR and Specialized Cables	
1-1/4" Low VSWR, specify operating band	LDF6P-50-(**)
Cable for Cellular, standard jacket	
824-894 MHz, 1.20 VSWR, max.	LDF6P-50-1A
880-960 MHz, 1.20 VSWR, max.	LDF6P-50-3A
870-960 MHz, 1.10 VSWR, max (up to 300 ft)	LDF6P-50-2A
Cable for Cellular, fire retardant jacket (CATVR)	
824-894 MHz, 1.20 VSWR	41690-76

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	3.3
Velocity, percent	89
Peak Power Rating, kW	205
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.22 (0.72)
Outer	0.15 (0.49)
dc Breakdown, volts	9000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	22.9 (75.1)
Inductance, µH/ft (m)	0.056 (0.184)

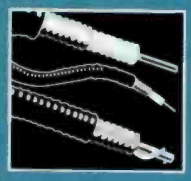
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.55 (39.4)
Diameter over Copper Outer Conductor, in (mm)	1.41 (35.8)
Diameter Inner Conductor, in (mm)	0.516 (13.1)
Nominal Inside Transverse Dimensions, cm	3.11
Minimum Bending Radius, in (mm)	15 (380)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	39 (53)
Cable Weight, lb/ft (kg/m)	0.66 (0.98)
Tensile Strength, lb (kg)	1500 (678)
Flat Plate Crush Strength, lb/in (kg/mm)	138 (2.4)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.018	0.0599	167
1	0.026	0.0853	118
1.5	0.032	0.105	96.4
2	0.037	0.122	83.4
10	0.084	0.275	36.9
20	0.119	0.391	25.9
30	0.147	0.481	21.1
50	0.191	0.627	16.2
88	0.257	0.844	12.0
100	0.275	0.901	11.2
108	0.286	0.939	10.8
150	0.340	1.12	9.09
174	0.368	1.21	8.40
200	0.397	1.30	7.79
300	0.494	1.62	6.26
400	0.578	1.90	5.35
450	0.617	2.02	5.01
500	0.654	2.15	4.73
512	0.663	2.18	4.66
600	0.724	2.38	4.27
700	0.789	2.59	3.92
800	0.851	2.79	3.63
824	0.866	2.84	3.57
894	0.907	2.98	3.41
960	0.945	3.10	3.27
1000	0.967	3.17	3.20
1250	1.10	3.61	2.81
1500	1.22	4.02	2.52
1700	1.32	4.31	2.34
2000	1.45	4.77	2.13
2300	1.58	5.18	1.95
3000	1.86	6.10	1.66
3300	1.97	6.47	1.56

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

Pressure Path
Type LDF6-50 has a tubular inner conductor which can be used as a pressure path for pressurization of air-dielectric feeds and other pressurizable components.
Type N, 7-16 DIN and LC connectors do not allow gas to pass through the connector interface. Connectors with -PR suffix include a pressure port. When using these connectors, use polyethylene tubing to reroute the pressurized gas and complete the pressure path. Connect the tubing to the pressure ports on the connector and the mating component.
7/8" EIA and 1-5/8" EIA connectors allow gas to pass through the connector and rerouting is not necessary.
F Flange connectors are designed for use in non-pressurized systems and do not have a pressure port.



HELIAX®
Coaxial Cables

N Male
L6PNM-PR

N Female
L6PNF

1-5/8" EIA Flange
L46R

7/8" EIA Flange
L46S

F Flange Male
L46F

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L6PNM**	L46PW	Self-Tapping	Self-Flare	SG	3.8 (97)	2.0 (51)
N Male	Pressure port	**L6PNM-PR***		Self-Tapping	Self-Flare	SG	3.8 (97)	2.0 (51)
N Male	Hex Head	**L6PNM-H**		Self-Tapping	Self-Flare	SG	3.7 (94)	2.0 (50.8)
N Female		**L6PNF**	L46PN	Self-Tapping	Self-Flare	SG	3.7 (94)	2.0 (50.8)
N Female	Pressure port	**L6PNF-PR***		Self-Tapping	Self-Flare	SG	3.7 (94)	2.0 (50.8)
7-16 DIN Male		**L6PDM**	L46ADM	Self-Tapping	Self-Flare	SS	3.9 (99)	2.0 (50.8)
7-16 DIN Male	Pressure port	**L6PDM-PR***		Self-Tapping	Self-Flare	SS	3.9 (99)	2.0 (50.8)
7-16 DIN Female		**L6PDF**	L46ADF	Self-Tapping	Self-Flare	SS	4.1 (104)	2.0 (50.8)
7-16 DIN Female	Pressure port	**L6PDF-PR***		Self-Tapping	Self-Flare	SS	4.1 (104)	2.0 (50.8)
7-16 DIN Female	Bulkhead	**L6PDF-BH**	L46ADF-BH	Self-Tapping	Self-Flare	SS	4.1 (104)	2.0 (50.8)
1-5/8" EIA Flange	Gas Pass	**L46R**		Self-Tapping	Self-Flare	BB	5.1 (130)	3.5 (89)
7/8" EIA Flange	Gas Pass	**L46S**		Self-Tapping	Self-Flare	BB	4.6 (117)	2.25 (57)
F Flange Male	No Pressure Pt.	**L46F**		Self-Tapping	Self-Flare	BB	4.0 (102)	2.25 (57)
LC Male		**L46M**		Self-Tapping	Self-Flare	BB	4.9 (124)	2.0 (50.8)
LC Male	Pressure port	**L46M-PR***		Self-Tapping	Self-Flare	BB	4.9 (124)	2.0 (50.8)
LC Female		**L46L**		Self-Tapping	Self-Flare	BB	4.7 (119)	2.0 (50.8)
LC Female	Pressure port	**L46L-PR***		Self-Tapping	Self-Flare	BB	4.7 (119)	2.0 (50.8)
Splice		**L46Z**		Self-Tapping	Self-Flare	BB	3.0 (76)	2.0 (50.8)

* Connectors with -PR suffix have a gas barrier at interface, unless otherwise noted, and include a 1/8" NPT pressure port.

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, two replacement pins	
For L6PNF	**241057**
For L6PDM	**114105-3**
For L6PDF and L6PDF-BH	**114105-4**
Connector Reattachment Kit L46 Series	**34767A-43**
7/8" EIA Gas Barrier	**1260A**
1-5/8" EIA Gas Barrier	**1261B**
1-5/8" EIA End Terminal, for strap connection to center conductor, includes inner connector. Use with L46R.	**2061**
Elbow, F Flange male and F Flange female	**203361**
Test Adapter, F Flange female and Type N female. For testing of feeder terminated with F Flange female	**104300-2**

Low VSWR Specifications, Type LDF6P-50-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) 1-25 ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
0.824-0.894	**LDF6P-50-1A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)
		N Male: **L6PNM**	1.08 (28.3)	1.09 (27.3)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		"F" Flange: **L46F**	1.08 (28.3)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		7-16 DIN: **L6PDM, L6PDF**	1.08 (28.3)	1.09 (27.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		LC: **L46L, L46M**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
0.824–0.960 and 1.85–1.99	**LDF6P-50-15A**	N Males	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		N Females	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Males	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Females	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
0.870-0.960	**LDF6P-50-2A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		N Male: **L6PNM**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.10 (26.4)	1.15 (23.1)
		"F" Flange: **L46F**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN: **L6PDM, L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		LC: **L46L, L46M**	1.10 (26.4)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.25 (19.1)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)
0.880-0.960	**LDF6P-50-3A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		N Male: **L6PNM**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		"F" Flange: **L46F**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN: **L6PDM, L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.08 (28.3)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		LC Male: **L46M**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		LC Female: **L46L**	1.10 (26.4)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.25 (19.1)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)
1.427-1.535	**LDF6P-50-4A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.17 (22.1)	1.20 (20.8)
		N Male: **L6PNM**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		"F" Flange: **L46F**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Male: **L6PDM**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Female: **L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		LC Male: **L46M**	1.20 (20.8)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)	1.30 (17.7)
		LC Female: **L46L**	1.20 (20.8)	1.25 (19.1)	1.30 (17.7)	1.30 (17.7)	1.30 (17.7)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.15 (23.1)	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)
1.7-1.9	**LDF6P-50-5A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.09 (27.3)	1.10 (26.4)	1.10 (26.4)
		N Male: **L6PNM**	1.06 (30.7)	1.08 (28.3)	1.09 (27.3)	1.10 (26.4)	1.10 (26.4)
		"F" Flange: **L46F**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Male: **L6PDM**	1.10 (26.4)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		7-16 DIN Female: **L6PDF**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		N Female: **L6PNF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		LC: **L46L, L46M**	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
1.7-2.11	**LDF6P-50-6A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		N Male: **L6PNM**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		"F" Flange: L46F	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		7-16 DIN Male: **L6PDM**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		7-16 DIN Female: **L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		N Female: **L6PNF**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		LC: **L46L, L46M**	1.20 (20.8)	1.22 (20.1)	1.24 (19.3)	1.25 (19.1)	1.25 (19.1)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)	1.20 (20.8)
1.85-2.2	**LDF6P-50-7A**	7/8" EIA: **L46S**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		N Male: **L6PNM**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		"F" Flange: L46F	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Male: **L6PDM**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		7-16 DIN Female: **L6PDF**	1.06 (30.7)	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
		N Female: **L6PNF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		LC: **L46L, L46M**	1.20 (20.8)	1.22 (20.1)	1.24 (19.3)	1.25 (19.1)	1.25 (19.1)
		1-5/8" EIA: **L46R**	1.10 (26.4)	1.12 (24.9)	1.14 (23.7)	1.18 (21.6)	1.20 (20.8)

* Specify operating band ** Connectors ordered separately

Continued on next page

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Low VSWR Specifications, Type LDF6P-50-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) 1-25 ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
1.9-2.3	**LDF6P-50-8A**	7/8" EIA: **L46S**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Male: **L6PNM**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.15 (23.1)
		"F" Flange: **L46F**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		7-16 DIN Male: **L6PDM**	1.12 (24.9)	1.22 (20.1)	1.24 (19.3)	1.25 (19.1)	1.25 (19.1)
		7-16 DIN Female: **L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.12 (24.9)	1.15 (23.1)	1.18 (21.6)	1.25 (19.1)	1.25 (19.1)
		LC Male: **L46M**	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)
		LC Female: **L46L**	1.20 (20.8)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)	1.35 (16.6)
		1-5/8" EIA: **L46R**	1.20 (20.8)	1.22 (20.1)	1.24 (19.4)	1.25 (19.1)	1.25 (19.1)
2.3-2.7	**LDF6P-50-9A**	7/8" EIA: **L46S**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Male: **L6PNM**	1.08 (28.3)	1.10 (26.4)	1.15 (23.1)	1.18 (21.6)	1.20 (20.8)
		"F" Flange: **L46F**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Male: **L6PDM**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		7-16 DIN Female: **L6PDF**	1.08 (28.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)
		N Female: **L6PNF**	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)	1.20 (20.8)	1.25 (19.1)
		LC Female: **L46L**	1.30 (17.7)	1.30 (17.7)	1.32 (17.2)	1.35 (16.6)	1.35 (16.6)
		LC Male: **L46M**	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)	1.28 (18.2)	1.30 (17.7)
		1-5/8" EIA: **L46R**	1.20 (20.8)	1.20 (20.8)	1.22 (20.1)	1.25 (19.1)	1.25 (19.1)
0.010-2.7	**LDF6P-50-10A**	7/8" EIA: **L46S**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	2.10 (9.0)	2.10 (9.0)
		N: **L6PNM, L6PNF**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	2.10 (9.0)	2.10 (9.0)
		"F" Flange: **L46F**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	2.10 (9.0)	2.10 (9.0)
		7-16 DIN: **L6PDM, L6PDF**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
		LC Female: **L46L**	1.30 (17.7)	1.35 (16.6)	1.40 (15.6)	1.80 (10.9)	2.10 (9.0)
		LC Male: **L46M**	1.20 (20.8)	1.25 (19.1)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
		1-5/8" EIA: **L46R**	1.20 (20.8)	1.30 (17.7)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
0.010-3.3	**LDF6P-50-11A**	7/8" EIA: **L46S**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
		N Male: **L6PNM**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	2.10 (9.0)	2.10 (9.0)
		"F" Flange: **L46F**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
		7-16 DIN: **L6PDM, L6PDF**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	1.80 (10.9)	2.10 (9.0)
		N Female: **L6PNF**	1.10 (26.4)	1.20 (20.8)	1.35 (16.6)	2.10 (9.0)	2.10 (9.0)
		LC: **L46L, L46M**	1.30 (17.7)	1.40 (15.6)	1.50 (14.0)	1.80 (10.9)	2.10 (9.0)

* Specify operating band ** Connectors ordered separately

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**42396A-1**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-3**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Angle Adapter Kit of 10. Stainless steel. For attaching TowerHanger/Adapter to angle tower members.	**31768A**
Hanger Blox™ Kit of 3. Injection molded plastic, stackable. 3 runs per unit; 9 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**HB-6**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-456**
Extender Kit	**HBEH-456**
Insulated Hangers and Adapters - please refer to pages 554-555.	
Support/Hoisting Grip. Use at 200 ft (60 m) intervals.	
Grip with one clamp	**L6SGRIP**
Support clamp kit of 10	**L6SGRIP-61K**
Installation tool with 10 support clamps	**L6SGRIP-61KT**
Hoisting Grip	**29961**
Grounding and Surge Protection - for more information, see pages 559-564.	

Description	Type No.
SureGround™ Grounding Kit with tape weatherproofing kit	
factory attached, one-hole lug, 600 mm lead	**SGL6-06B1**
factory attached, two-hole lug, 600 mm lead	**SGL6-06B2**
field attachable crimp-on, one-hole lug, 1000 mm lead	**SGL6-10B3**
field attachable crimp-on, two-hole lug, 1000 mm lead	**SGL6-10B4**
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-3**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-3**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-23**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-8**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Arrestor Plus® Lightning Surge Protector Connector/surge protector.	**APPL6-#-***
#,* *Interface and frequency band information.* *See page 562 for details and more interface types.*	
Arrestor Plus T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional	**APT-#-***
#,* *Interface and frequency band information.* *See page 563 for details.*	
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#,* *Interface and frequency band information.* *See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
1-1/4" Coax-Type N to 1/2" Coax-Type N	**241475-2**
1-1/4" Coax-Type N to 7/8" Coax-Type N	**241475-3**
1-1/4" Coax-Type N to 1-1/4" Coax-Type N	**241474-6**
1-1/4" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-5**
1-1/4" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	**241475-7**
AAPL6 to 1-1/4" LDF6-50	**241474-6**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-5**

Feed-Thru Plates and Boots. Order separately.

Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

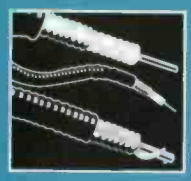
	4 in Boots	5 in Boots
One Hole:	**204679-3**	**48939-3**

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. **APPORT-(*)-(**)**
Use with Arrestor Plus surge protector series.
Available in many configurations see page 562.
for available options and ordering information.
** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

Cable Flare Tool	**224373**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.



HELIAX®
Coaxial Cables

50-ohm
1-5/8" Foam Dielectric, LDF Series

LDF7-50A

Cable Ordering Information

Description	Type No.
Standard Cable	
1-5/8" Standard Cable, Standard Jacket	LDF7-50A
Fire Retardant Cable	
1-5/8" Fire Retardant Jacket (CATVR)	LDF7RN-50A
Low VSWR Cables	
1-5/8" Low VSWR, specify operating band	LDF7P-50A-(**)
Cable for Cellular, standard jacket	
824-894 MHz, 1.20 VSWR, max.	LDF7P-50A-1A
880-960 MHz, 1.20 VSWR, max.	LDF7P-50A-3A
870-960 MHz, 1.10 VSWR, max. (up to 300 ft)	LDF7P-50A-2A
Cable for Cellular, fire retardant jacket (CATVR)	
824-894 MHz, 1.20 VSWR, max.	41690-73
Qualified to MIL-C-28830/5	202071-3

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	2.5
Velocity, percent	88
Peak Power Rating, kW	315
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.21 (0.69)
Outer	0.10 (0.33)
dc Breakdown, volts	11000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	23.1 (75.8)
Inductance, µH/ft (m)	0.058 (0.190)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.98 (50)
Diameter over Copper Outer Conductor, in (mm)	1.83 (46.5)
Diameter Inner Conductor, in (mm)	0.681 (17.3)
Nominal Inside Transverse Dimensions (cm)	(4.05)
Minimum Bending Radius, in (mm)	20 (510)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	50 (68)
Cable Weight, lb/ft (kg/m)	0.92 (1.36)
Tensile Strength, lb (kg)	1000 (455)
Flat Plate Crush Strength, lb/in (kg/mm)	150 (2.7)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.015	0.048	231
1	0.021	0.069	163
1.5	0.026	0.085	133
2	0.030	0.098	115
10	0.068	0.223	50.8
20	0.097	0.319	35.6
30	0.120	0.394	28.9
50	0.156	0.512	22.1
88	0.210	0.690	16.4
100	0.225	0.738	15.3
108	0.235	0.769	14.7
150	0.280	0.919	12.3
174	0.304	0.997	11.3
200	0.328	1.08	10.5
300	0.411	1.35	8.42
400	0.482	1.58	7.17
450	0.515	1.69	6.71
500	0.547	1.79	6.31
512	0.556	1.82	6.23
600	0.607	1.99	5.69
700	0.664	2.18	5.20
800	0.718	2.36	4.81
824	0.731	2.40	4.73
894	0.767	2.52	4.51
960	0.800	2.62	4.32
1000	0.819	2.69	4.22
1250	0.936	3.07	3.69
1500	1.05	3.44	3.30
1700	1.13	3.72	3.06
2000	1.25	4.10	2.76
2300	1.37	4.48	2.53
2500	1.44	4.72	2.40

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power, VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

HELIAX®
Coaxial Cables

N Female
L7PNF

7-16 DIN Female
L7PDF

7-16 DIN Male
L7PDM

1-5/8" EIA Flange
L47R

7/8" EIA Flange
L47S

F Flange Male
L47F

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L7PNM**		Self-Tapping	Self-Flare	SG	4.8 (122)	2.4 (61)
N Male	Hex Head	**L7PNM-H**		Self-Tapping	Self-Flare	SG	5.0 (127)	2.38 (60.5)
N Female	Bulkhead	**L7NF-BH**	200220	Tab Flare	Self-Flare	BB	4.8 (122)	2.4 (61)
N Female		**L7PNF**	L47APN	Self-Tapping	Self-Flare	SG	4.8 (122)	2.4 (61)
7-16 DIN Male		**L7PDM**	L47ADM	Self-Tapping	Self-Flare	SS	5.3 (135)	2.4 (61)
7-16 DIN Female		**L7PDF**	L47ADF	Self-Tapping	Self-Flare	SS	5.3 (135)	2.4 (61)
7-16 DIN Female	Bulkhead	**L7PDF-BH**		Self-Tapping	Self-Flare	SS	4.7 (118)	2.37 (60.1)
1-5/8" EIA Flange		**L47R**		Tab Flare	Self-Flare	BB	5.1 (130)	3.5 (89)
7/8" EIA Flange		**L47S**		Tab Flare	Self-Flare	BB	5.1 (130)	2.25 (57)
F Flange Male		**L47F**		Tab Flare	Self-Flare	BB	5.9 (150)	2.25 (57)
F Flange Female		**201942**		Tab Flare	Self-Flare	BB	5.5 (140)	2.25 (57)
LC Male		**L47M**		Tab Flare	Self-Flare	BB	5.3 (135)	2.4 (61)
LC Female		**L47L**		Tab Flare	Self-Flare	BB	4.8 (122)	2.4 (61)
Splice		**L47Z**		Tab Flare	Self-Flare	BB	5.1 (130)	2.9 (74)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, two replacement pins	
For L7PNF	**241056**
For L7PNM	**243371**
Connector Reattachment Kit for L47 Series	**34767A-35**
7/8" EIA Gas Barrier	**1260A**
1-5/8" EIA Gas Barrier	**1261B**
1-5/8" EIA End Terminal, for strap connection to center conductor, includes inner connector. Use with L47R.	**2061**
Elbow, F Flange male and F Flange female	**203361**
Test Adapter, F Flange female and Type N female. For testing of feeder terminated with F Flange female	**104300-2**

• U.K. 0800-250055 • Republic of Ireland 1-800-535358 • Australia 1800-803 219 • New Zealand 0800-441-747 ANDREW.

Accessories – Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	42396A-2
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25) mm long	31769-1
Angle Adapter, kit of 10.	
Stainless Steel	31768A
Galvanized	242774
Galvanized, metric hardware	242774-M
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
6-8 (150-200)	31670-6
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 4 ft (1.22 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	206706-4
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	206929-1
4 cable runs, 2 connections required	206929-4
8 cable runs, 3 connections required	206929-8
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	206930
Hanger Blox™ Kit of 3. Injection molded plastic, stackable. 2 runs per unit; 6 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different mounting, wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	HB-7
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	HBSH-7
Extender Kit	HBEH-7
Insulated Hangers and Adapters - please refer to pages 554-555.	
Support/Hoisting Grip. Use at 200 ft (60 m) intervals.	
Grip with one clamp	L7SGRIP
Support clamp kit of 10	L7SGRIP-71K
Installation tool with 10 support clamps	L7SGRIP-71KT
Hoisting Grip	24312A
Grounding and Surge Protection - for more information, see pages 559-564.	

Description	Type No.
SureGround™ Grounding Kit, with tape weatherproofing kit.	
factory attached, one-hole lug, 600 mm lead	SGL7-06B1
factory attached, two-hole lug, 600 mm lead	SGL7-06B2
field attachable crimp-on, one-hole lug,1000 mm lead	SGL7-10B3
field attachable crimp-on, two-hole lug,1000 mm lead	SGL7-10B4
field attachable crimp-on, two-hole lug,1500 mm lead	SGL7-15B4
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	204989-4
factory attached, two-hole lug, 24 in (610 mm) lead	241088-4
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	204989-24
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	241088-9
Crimping Tool to field attach lug to Grounding Kit	207270
Arrestor Plus® Lightning Surge Protector Connector/surge protector. *#,* Interface and frequency band information. See page 562 for details and more interface types.*	APPL7-#-*
Arrestor Plus T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional *#,* Interface and frequency band information. See page 563 for details.*	APT-#-*
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability *#,* Interface and frequency band information. See page 564 for details.*	SA-#-*
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
1-5/8" Coax-Type N to 1/2" Coax-Type N	241475-2
1-5/8" Coax-Type N to 7/8" Coax-Type N	241475-3
1-5/8" Coax-Type N to 1-5/8" Coax-Type N	241474-6
1-5/8" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	241475-5
1-5/8" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	241475-7
AAPL7 to 1-5/8" LDF7-50A	241474-6
Connector/Splice Weatherproofing Kit	221213
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	40656A-2

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	204673-1	48940-1
1	204673-2	
2		48940-2
3		48940-3
4	204673-4	48940-4
6		48940-6
8	204673-8	
12	204673-12	

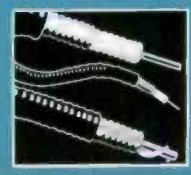
	4 in Boots	5 in Boots
One Hole:	204679-4	48939-1

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. Use with Arrestor Plus surge protector series. Available in many configurations see page 562 for available options and ordering information. APPORT-(*)-(**)

** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.



50-ohm
2-1/4" Foam Dielectric, LDF Series

LDF12-50

Cable Ordering Information

Description	Type No.
Standard Cable	
2-1/4" Standard Cable, Standard Jacket	LDF12-50
Fire Retardant Cable	
2-1/4" Fire Retardant Jacket (CATVR)	LDF12RN-50
Low VSWR Cable	
2-1/4" Low VSWR, specify operating band	LDF12P-50-**

** Insert suffix number from "Low VSWR Specification" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	2.2
Velocity, percent	88
Peak Power Rating, kW	425
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.16 (0.53)
Outer	0.077 (0.25)
dc Breakdown, volts	13000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	22.7 (74.6)
Inductance, µH/ft (m)	0.058 (0.189)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, In (mm)	2.35 (60)
Diameter over Copper Outer Conductor, in (mm)	2.2 (55.9)
Diameter Inner Conductor, in (mm)	0.835 (21.2)
Minimum Bending Radius, in (mm)	24 (610)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	60 (81)
Cable Weight, lb/ft (kg/m)	1.29 (1.91)
Tensile Strength, lb (kg)	1500 (681)
Flat Plate Crush Strength, lb/in (kg/mm)	150 (2.7)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.012	0.039	313
1	0.017	0.055	226
1.5	0.020	0.067	184
2	0.024	0.078	159
10	0.054	0.176	69.9
20	0.077	0.253	48.8
30	0.095	0.312	39.5
50	0.125	0.409	30.2
88	0.169	0.554	22.2
100	0.181	0.594	20.8
108	0.189	0.619	19.9
150	0.226	0.742	16.6
174	0.245	0.805	15.4
200	0.265	0.871	14.2
300	0.334	1.10	11.3
400	0.394	1.29	9.45
450	0.422	1.38	8.91
500	0.449	1.47	8.38
512	0.455	1.49	8.26
600	0.500	1.64	7.52
700	0.549	1.80	6.85
800	0.595	1.95	6.32
824	0.605	1.984	6.21
894	0.636	2.088	5.91
960	0.665	2.187	5.66
1000	0.682	2.24	5.52
1250	0.783	2.57	4.80
1500	0.879	2.88	4.28
1700	0.952	3.123	3.95
1900	1.023	3.356	3.67
2000	1.06	3.47	3.55
2200	1.13	3.69	3.34

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F).
For Average Power, VSWR 1.0, ambient temperature 40°C (104° F), inner conductor temperature 100°C (212°F), no solar load.

HELIAX®
Coaxial Cables

7-16 DIN Female
L12PDF

3-1/8" EIA Flange
L12FB-302

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Female		**L12PNF**		Self-Tapping	Self-Flare	SS	5.1 (130)	2.75 (69.9)
7-16 DIN Male		**L12PDM**		Self-Tapping	Self-Flare	SS	5.8 (147)	2.75 (69.9)
7-16 DIN Female		**L12PDF**		Self-Tapping	Self-Flare	SS	5.5 (139)	2.75 (69.9)
3 1/8" EIA Flange	Gas Pass	**L12FP-302**		Self-Tapping	Self-Flare	BS	7.6 (192)	5.19 (131.8)
3 1/8" EIA Flange	Gas Barrier	**L12FB-302**		Self-Tapping	Self-Flare	BS	7.6 (192)	5.19 (131.8)
Splice		**L12Z**		Self-Tapping	Self-Flare	BB	5.8 (147)	3.00 (76.2)

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

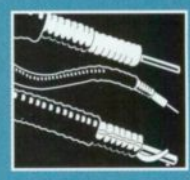
	Type Number
3-1/8" EIA Inner Conductor, with anchor bead	**ACX350-20**

Low VSWR Specifications, Type LDF12P-50A-( )

Frequency Band, GHz	Type No.	Using Connector Type**	Assembly VSWR, Maximum (R.L., dB) 1-25 ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
0.824-0.96	**LDF12P-50-1**	N Female: **L12PNF**	1.08 (28.3)	1.09 (27.3)	1.10 (26.4)	1.12 (24.9)	1.15 (23.1)
0.824-0.96 and 1.85-1.99	**LDF12P-50-2**	N Female: **L12PNF**	1.15 (23.1)	1.15 (23.1)	1.20 (20.8)	1.23 (19.7)	1.28 (18.2)
1.7-1.9	**LDF12P-50-3**	N Female: **L12PNF**	1.13 (24.2)	1.13 (24.2)	1.14 (23.7)	1.14 (23.7)	1.15 (23.1)

* Connectors ordered separately

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.



Accessories – Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-4**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Hanger Blox™ Kit of 3. Injection molded plastic, stackable. 2 runs per unit; 6 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different mounting, wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**HB-12**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-12**
Extender Kit	**HBEH-12**
Insulated Hangers and Adapters - please refer to page 554-555.	
Support/Hoisting Grip. Use at 200 ft (60 m) intervals.	
Grip with one clamp	**L12SGRIP**
Support clamp kit of 10	**L12SGRIP-121K**
Installation tool with 10 support clamps	**L12SGRIP-121KT**
Hoisting Grip	**31535**
Grounding and Surge Protection - for more information, see pages 559-564.	

Description	Type No.
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-5**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-5**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-25**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-10**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Arrestor Plus® T-Series Lightning Surge Protector Connectors on each end (universal version). Non-directional	**APT-#-***
#,* *Interface and frequency band information. See page 563 for details.*	
Gas Tube Surge Arrestor Connectors on each end (universal version). Directional, dc pass capability	**SA-#-***
#,* *Interface and frequency band information. See page 564 for details.*	
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
2-1/4" Coax-Type N to 1/2" LDF4 - 7-16 DIN	**241475-8**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-6**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-8**	**48939-9**

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. **APPORT-(*)-(**)**
Use with Arrestor Plus surge protector series.
Available in many configurations see page 562 for available options and ordering information.
** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

HELIAX®
Coaxial Cables

50-ohm
1/4" Air Dielectric, Plenum Rated (CATVP), HS Series

HS1RP-50A

Cable Ordering Information

Description	Type No.
Plenum Cable	
1/4" Fire Retardant Cable, Fire Retardant Jacket (CATVP)	**HS1RP-50A**

Characteristics

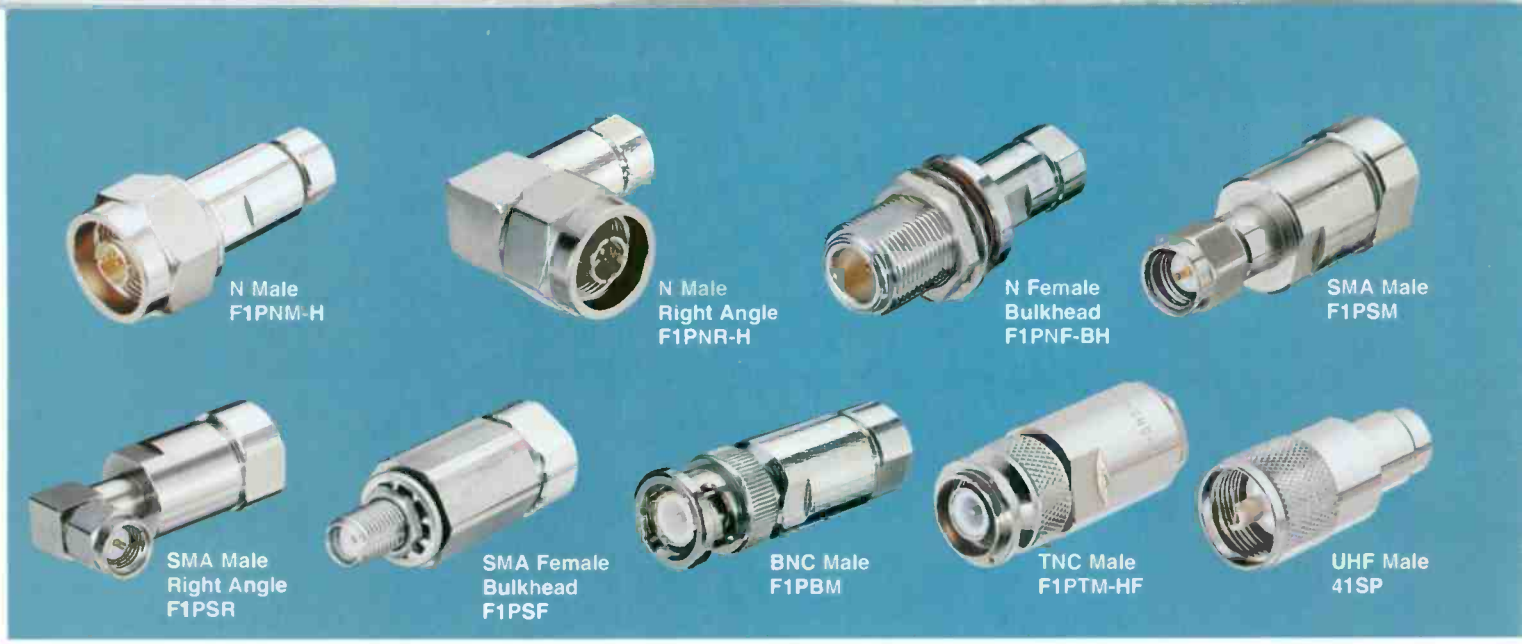
Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	10
Velocity, percent	84
Peak Power Rating, kW	6.4
dc Resistance, ohms/1000 ft (1000 m)	
Inner	2.1 (6.8)
Outer	2.0 (6.5)
dc Breakdown, volts	1600
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (m)	23.8 (78.0)
Inductance, µH/ft (m)	0.061 (0.202)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	0.29 (7.4)
Diameter over Copper Outer Conductor, in (mm)	0.25 (6.4)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	1.9 (2.6)
Cable Weight, lb/ft (kg/m)	0.063 (45)
Tensile Strength, lb (kg)	100 (45)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.121	0.398	6.40
1	0.172	0.564	6.40
1.5	0.210	0.691	6.40
2	0.243	0.798	6.10
10	0.545	1.79	2.72
20	0.773	2.54	1.92
30	0.949	3.11	1.56
50	1.23	4.03	1.21
88	1.64	5.37	0.907
100	1.75	5.73	0.850
108	1.82	5.96	0.817
150	2.15	7.05	0.691
174	2.32	7.60	0.640
200	2.49	8.16	0.596
300	3.07	10.1	0.484
400	3.56	11.7	0.417
450	3.78	12.4	0.393
500	3.99	13.1	0.372
512	4.04	13.3	0.367
600	4.39	14.4	0.338
700	4.76	15.6	0.312
800	5.10	16.7	0.291
824	5.18	17.0	0.286
894	5.41	17.8	0.274
960	5.62	18.4	0.264
1000	5.74	18.8	0.259
1250	6.46	21.2	0.230
1500	7.12	23.3	0.209
1700	7.61	25.0	0.195
2000	8.30	27.2	0.179
2300	8.95	29.4	0.166
3000	10.34	33.9	0.144
4000	12.11	39.7	0.123
5000	13.71	45.0	0.108
6000	15.18	49.8	0.098
8000	17.87	58.6	0.083
10000	20.31	66.6	0.073

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.



Connectors on this page, except F1PNM-HF, F1PTM-HF, and 41AENT, are intended for indoor use and do not have a weatherproof seal at the connector to cable interface. For outdoor applications, Andrew recommends Type LDF1-50 foam dielectric cable and connectors, see page 456.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male	Hex Head	**F1PNM-H†**	C41SW	Solder	Self-Clamping	SG	2.1 (53)	0.95 (24.1)
N Male	High Freq.	**F1PNM-HF**	41PW	Solder	Tab Flare	SG	1.3 (33)	0.81 (20.5)
N Male	Right Angle Hex Head	**F1PNR-H**	C41ASW-RA	Captivated	Self-Clamping	SG	1.7/1.3 (43/33)	0.95 (24.1)
N Female		**F1PNF-BH†**	C41SPN-BH	Solder	Self-Clamping	SG	2.3 (58)	0.94 (23.9)
BNC Male		**F1PBM**	C41SWB	Solder	Self-Clamping	SS	2.0 (50)	0.69 (17.5)
UHF Male		**41SP**		Solder	Solder	BB	1.8 (46)	0.77 (19.6)
UHF Female		**41U**		Solder	Solder	BS	2.1 (53)	0.77 (19.6)
SMA Male	Up to 6 GHz	**F1PSM**	C41SWS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Right Angle	**F1PSR**	C41ASWS-RA	Solder	Self-Clamping	PG	1.6/.75 (41/19)	0.50 (12.7)
SMA Female	Up to 6 GHz, Bulkhead	**F1PSF**	C41SNS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Up to 18 GHz	**41EWS***		Solder	Tab Flare	G	.94 (23.9)	0.40 (10.2)
SMA Female	Up to 18 Ghz	**41ENS***		Solder	Tab Flare	G	1.00 (25.4)	0.40 (10.2)
TNC Male	11 GHz and Below	**F1PTM†**		Solder	Self-Clamping	SG	1.68 (43)	0.57 (14.5)
TNC Female		**41AENT**		Captivated	Tab Flare	NG	1.5 (38)	0.70 (17.8)
TNC Male	Hi Freq, Above 11 GHz	**F1PTM-HF**	41AEWT	Captivated	Tab Flare	NG	1.9 (48.8)	0.70 (17.8)
Mini-UHF Male		**F1MU**	41ASPM	Captivated	Crimp	BB	1.53 (39)	0.47 (11.9)
7-16 DIN Male		**F1PDM**		Solder	Self-Clamping	SS	1.82 (46.3)	1.25 (31.75)
7-16 DIN Female		**F1PDF**		Solder	Self-Clamping	SS	1.85 (47)	0.551 (14)
7-16 DIN Female	Panel Mount	**F1PDF-PM**		Solder	Self-Clamping	SS	1.85 (47)	1.26 (32)

* Stainless steel body † See page 570 for bulk packs. **Plating Codes:** BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, PG - Passivated Body and Gold Plated Pin+A135, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin G - Stainless Steel Body and Gold Plated Pin.

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F1PNM-H	**242881**
For C41SW	**241051-3**
Bulkhead Adapter, for UHF Female	**26016-2**
End Terminal Adapter, use with N Male connector	**13074A**

Accessories –

Photos and descriptions on pages 544-572.

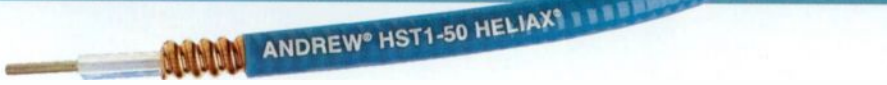
Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**

Accessories – Continued

Description	Type No.
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool	**207865**
Installer Pax™. Bulk packs are available for grounding kits. See page 570.	

HELIAX®
Coaxial Cables

50-ohm
1/4" High Power Temperature, Air Dielectric, HST Series



NEW!

HST1-50

Cable Ordering Information

Description	Type No.
High Power, High Temperature Cable	
1/4" Cable	**HST1-50**

Characteristics

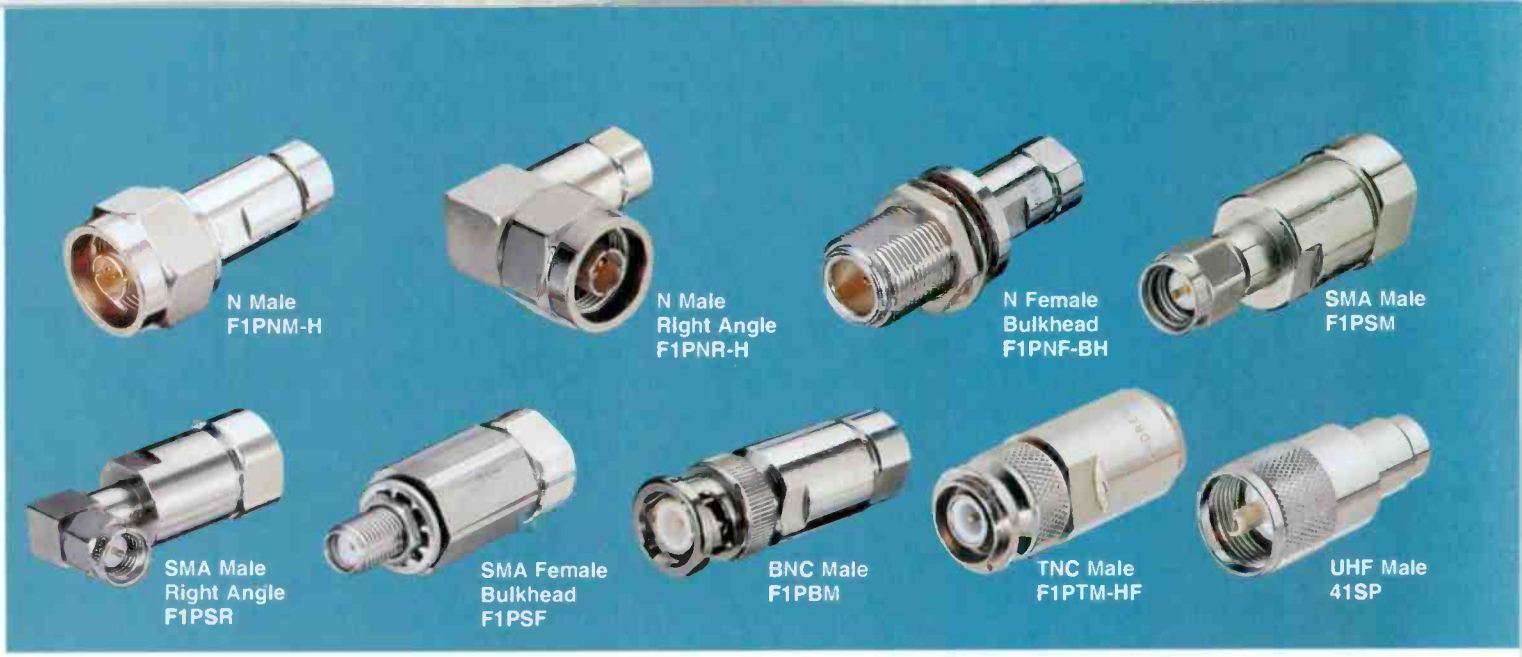
Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	18
Velocity, percent	82
Peak Power Rating, kW	6.4
dc Resistance, ohms/1000 ft (1000 m)	
Inner	2.05 (6.71)
Outer	2.0 (6.5)
dc Breakdown, volts	1600
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (m)	25.1 (82.4)
Inductance, µH/ft (m)	0.061 (0.201)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Silver Plated Copper
Diameter over Jacket, in (mm)	0.29 (7.4)
Diameter over Copper Outer Conductor, in (mm)	0.25 (6.4)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum	15 (20)
Bending Moment, lb-ft (N•m)	1.7 (2.3)
Cable Weight, lb/ft (kg/m)	0.057 (0.085)
Tensile Strength, lb (kg)	100 (45)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.117	0.385	6.40
1	0.166	0.544	6.40
1.5	0.203	0.667	6.40
2	0.235	0.771	6.40
10	0.527	1.73	6.40
20	0.748	2.45	6.40
30	0.918	3.01	6.40
50	1.19	3.90	5.53
88	1.59	5.20	4.15
100	1.69	5.55	3.89
108	1.76	5.78	3.74
150	2.08	6.84	3.16
174	2.25	7.38	2.93
200	2.42	7.93	2.72
300	2.98	9.78	2.21
400	3.46	11.4	1.90
450	3.68	12.1	1.74
500	3.89	12.8	1.69
512	3.94	12.9	1.67
600	4.28	14.0	1.54
700	4.64	15.2	1.42
800	4.98	16.3	1.32
824	5.06	16.6	1.30
894	5.29	17.3	1.25
960	5.49	18.0	1.20
1000	5.61	18.4	1.17
1250	6.32	20.7	1.04
1500	6.97	22.9	0.944
1700	7.46	24.5	0.882
2000	8.15	26.7	0.807
2300	8.80	28.9	0.748
3000	10.2	33.4	0.646
4000	12.0	39.3	0.550
5000	13.6	44.6	0.485
6000	15.1	49.5	0.437
8000	17.8	58.4	0.370
10000	20.3	66.6	0.324
12000	22.6	74.3	0.291
14000	24.8	81.5	0.265
16000	26.9	88.4	0.244
18000	29.0	95.0	0.227

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24° C (75° F).
For average power, VSWR 1.0 ambient temperature 40° C (104° F), inner conductor temperature 250° C (482° F), no solar loading.



Connectors on this page, except F1PNM-HF, F1PTM-HF, and 41AENT, are intended for indoor use and do not have a weatherproof seal at the connector to cable interface. For outdoor applications, Andrew recommends Type LDF1-50 foam dielectric cable and connectors, see page 456.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male	Hex Head	**F1PNM-H†**	C41SW	Solder	Self-Clamping	SG	2.1 (53)	0.95 (24.1)
N Male	High Freq.	**F1PNM-HF**	41PW	Solder	Tab Flare	SG	1.3 (33)	0.81 (20.5)
N Male	Right Angle Hex Head	**F1PNR-H**	C41ASW-RA	Captivated	Self-Clamping	SG	1.7/1.3 (43/33)	0.95 (24.1)
N Female		**F1PNF-BH†**	C41SPN-BH	Solder	Self-Clamping	SG	2.3 (58)	0.94 (23.9)
BNC Male		**F1PBM**	C41SWB	Solder	Self-Clamping	SS	2.0 (50)	0.69 (17.5)
UHF Male		**41SP**		Solder	Solder	BB	1.8 (46)	0.77 (19.6)
UHF Female		**41U**		Solder	Solder	BS	2.1 (53)	0.77 (19.6)
SMA Male	Up to 6 GHz	**F1PSM**	C41SWS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Right Angle	**F1PSR**	C41ASWS-RA	Solder	Self-Clamping	PG	1.6/.75 (41/19)	0.50 (12.7)
SMA Female	Up to 6 GHz, Bulkhead	**F1PSF**	C41SNS	Solder	Self-Clamping	PG	1.7 (43)	0.49 (12.5)
SMA Male	Up to 18 GHz	**41EWS***		Solder	Tab Flare	G	.94 (23.9)	0.40 (10.2)
SMA Female	Up to 18 Ghz	**41ENS***		Solder	Tab Flare	G	1.00 (25.4)	0.40 (10.2)
TNC Male	11 GHz and Below	**F1PTM†**		Solder	Self-Clamping	SG	1.68 (43)	0.57 (14.5)
TNC Female		**41AENT**		Captivated	Tab Flare	NG	1.5 (38)	0.70 (17.8)
TNC Male	Hi Freq, Above 11 GHz	**F1PTM-HF**	41AEWT	Captivated	Tab Flare	NG	1.9 (48.8)	0.70 (17.8)
Mini-UHF Male		**F1MU**	41ASPM	Captivated	Crimp	BB	1.53 (39)	0.47 (11.9)
7-16 DIN Male		**F1PDM**		Solder	Self-Clamping	SS	1.82 (46.3)	1.25 (31.75)
7-16 DIN Female		**F1PDF**		Solder	Self-Clamping	SS	1.85 (47)	0.551 (14)
7-16 DIN Female	Panel Mount	**F1PDF-PM**		Solder	Self-Clamping	SS	1.85 (47)	1.26 (32)

* Stainless steel body † See page 570 for bulk packs. **Plating Codes:** BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NG - Nickel Plated Body and Gold Plated Pin, PG - Passivated Body and Gold Plated Pin+A135, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin G - Stainless Steel Body and Gold Plated Pin.

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F1PNM-H	**242881**
For C41SW	**241051-3**
Bulkhead Adapter, for UHF Female	**26016-2**
End Terminal Adapter, use with N Male connector	**13074A**

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**

Accessories – Continued

Description	Type No.
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	40417
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Weatherproofing - for more information, see page 565	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool	**207865**
Installer Pax™. Bulk packs are available for grounding kits. See page 570.	

HELIAX®
Coaxial Cables

50-ohm
3/8" Air Dielectric, Plenum Rated (CATVP), HS Series

NEW!

HS2RP-50

Cable Ordering Information

Description	Type No.
Plenum Cables	
3/8" Fire Retardant Cable	**HS2RP-50**

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	13.4
Velocity, percent	83
Peak Power Rating, kW	13.2
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.41 (4.64)
Outer	1.52 (4.99)
dc Breakdown, volts	2300
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	23.61 (77.47)
Inductance, µH/ft (m)	0.064 (0.208)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.415 (10.5)
Diameter over Copper Outer Conductor, in (mm)	0.375 (9.5)
Minimum Bending Radius, in (mm)	1 (50)
Number of Bends, minimum	20 (50)
Bending Moment, lb-ft (N•m)	1.80 (2.45)
Cable Weight, lb/ft (kg/m)	0.076 (0.113)
Tensile Strength, lb (kg)	210 (95)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.084	0.275	13.2
1	0.118	0.389	13.2
1.5	0.145	0.476	12.1
2	0.168	0.550	10.5
10	0.376	1.24	4.68
20	0.534	1.75	3.30
30	0.655	2.15	2.69
50	0.849	2.79	2.07
88	1.13	3.72	1.55
100	1.21	3.97	1.46
108	1.26	4.13	1.40
150	1.49	4.88	1.18
174	1.61	5.27	1.10
200	1.73	5.66	1.02
300	2.13	6.98	0.827
400	2.47	8.11	0.712
450	2.63	8.62	0.670
500	2.78	9.11	0.634
512	2.81	9.23	0.626
600	3.06	10.0	0.576
700	3.31	10.9	0.531
800	3.56	11.7	0.495
824	3.61	11.9	0.487
894	3.77	12.4	0.466
960	3.92	12.9	0.449
1000	4.01	13.1	0.439
1250	4.51	14.8	0.390
1500	4.98	16.3	0.354
1700	5.33	17.5	0.330
2000	5.82	19.1	0.302
2300	6.28	20.6	0.280
3000	7.28	23.9	0.242
4000	8.54	28.0	0.206
5000	9.69	31.8	0.182
6000	10.8	35.3	0.164
8000	12.7	41.7	0.138
10000	14.5	47.5	0.121
12000	16.2	53.0	0.109
13000	16.9	55.6	0.104
13400	17.3	56.6	0.102

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24° C (75° F).
For average power, VSWR 1.0 ambient temperature 40° C 104° F), inner conductor temperature 100° C (212° F), no solar loading.

HELIAX® Coaxial Cables

N Male
F2PNM-H

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F2NM**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2NM-H**		Solder	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2NM-HC**		Captivated	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male		**F2NM-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male		**F2PNM†**	42SPW	Solder	Self-Flare	SG	1.9 (48)	0.81 (20.6)
N Male		**F2PNM-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2PNM-H**		Solder	Self-Flare	SG	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2PNM-HC**		Captivated	Self-Flare	SG	1.9 (48)	0.94 (23)
N Female		**F2NF**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2NF-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2PNF**		Solder	Self-Flare	SG	2.1 (53)	0.67 (17)
N Female		**F2PNF-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Female	Bulkhead	**F2PNF-BH**		Solder	Self-Flare	SG	2.1 (53)	0.95 (24)
7-16 DIN Male		**F2PDM**		Solder	Self-Flare	SS	2.2 (57)	1.4 (36)
7-16 DIN Male		**F2PDM-C**	42BDM	Captivated	Self-Flare	SS	2.1 (53)	1.4 (36)
7-16 DIN Female		**F2PDF**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Female		**F2PDF-C**		Captivated	Self-Flare	SS	2.1 (53)	0.79 (20)
7-16 DIN Female	Panel Mt.	**F2PDF-PM**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Male	Right Angle	**F2PDR-C**	42BDM-RA	Captivated	Self-Flare	SS	1.7/1.3 (43/34)	1.4 (36)

† See page 570 for bulk packs.

Plating Codes: BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F2NM, F2NM-H	**242075-3**
For F2PNM, F2PNM-H	**242075-4**
For F2PDM	**114402-2**
End Terminal Adapter, use with N Male connector	**13074A**

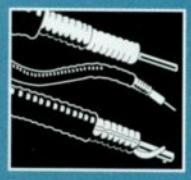
Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2 ft (0.61 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**

Accessories – Continued

Description	Type No.
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding - for more information, see pages 559-564.	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool	**241372**
Installer Pax. Bulk packs are available for grounding kits. See page 570.	



HELIAX®
Coaxial Cables

50-ohm

3/8" High Power, High Temperature, Air Dielectric HST Series

NEW!

HST2-50

Cable Ordering Information

Description	Type No.
High Power, High Temperature Cable	
3/8" Cable	**HST2-50**

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	13.4
Velocity, percent	83
Peak Power Rating, kW	13.2
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.41 (4.64)
Outer	1.52 (4.99)
dc Breakdown, volts	2300
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (m)	23.61 (77.47)
Inductance, µH/ft (m)	0.064 (0.208)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Silver Plated, Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.415 (10.54)
Diameter over Copper Outer Conductor, in (mm)	0.375 (9.53)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum	20 (50)
Bending Moment, lb-ft (N•m)	1.80 (2.45)
Cable Weight, lb/ft (kg/m)	0.094 (0.140)
Tensile Strength, lb (kg)	210 (95)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.086	0.281	13.2
1	0.121	0.398	13.2
1.5	0.149	0.487	13.2
2	0.172	0.563	13.2
10	0.386	1.27	13.2
20	0.547	1.80	12.3
30	0.672	2.21	9.98
50	0.872	2.86	7.70
88	1.16	3.82	5.77
100	1.24	4.08	5.40
108	1.29	4.24	5.19
150	1.53	5.03	4.38
174	1.65	5.43	4.06
200	1.78	5.83	3.78
300	2.20	7.21	3.06
400	2.55	8.38	2.63
450	2.72	8.92	2.47
500	2.87	9.43	2.34
512	2.91	9.55	2.31
600	3.17	10.4	2.12
700	3.44	11.3	1.95
800	3.69	12.1	1.82
824	3.75	12.3	1.79
894	3.92	12.9	1.71
960	4.07	13.4	1.65
1000	4.16	13.7	1.61
1250	4.70	15.4	1.43
1500	5.19	17.0	1.29
1700	5.56	18.3	1.21
2000	6.09	20.0	1.10
2300	6.58	21.6	1.02
3000	7.64	25.1	0.878
4000	9.01	29.5	0.745
5000	10.2	33.6	0.655
6000	11.4	37.4	0.588
8000	13.5	44.4	0.496
10000	15.5	50.8	0.433
12000	17.3	56.8	0.387
13000	18.2	59.7	0.369
13400	18.6	60.9	0.362

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24° C (75° F).
For average power, VSWR 1.0 ambient temperature 40° C (104° F), inner conductor temperature 250° C (482° F), no solar loading.

HELIAX® Coaxial Cables

N Male
F2PNM-H

7-16 DIN Female
F2PDF

7-16 DIN Male
F2PDM-C

N Female
F2PNF

7-16 DIN Male
Right Angle
F2PDR-C

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F2NM**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2NM-H**		Solder	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2NM-HC**		Captivated	Self-Flare	BS	1.9 (48)	0.94 (23)
N Male		**F2NM-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Male		**F2PNM†**	42SPW	Solder	Self-Flare	SG	1.9 (48)	0.81 (20.6)
N Male		**F2PNM-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Male	Hex Head	**F2PNM-H**		Solder	Self-Flare	SG	1.9 (48)	0.94 (23)
N Male	Hex Head	**F2PNM-HC**		Captivated	Self-Flare	SG	1.9 (48)	0.94 (23)
N Female		**F2NF**		Solder	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2NF-C**		Captivated	Self-Flare	BS	2.1 (53)	0.64 (16)
N Female		**F2PNF**		Solder	Self-Flare	SG	2.1 (53)	0.67 (17)
N Female		**F2PNF-C**		Captivated	Self-Flare	SG	2.1 (53)	0.64 (16)
N Female	Bulkhead	**F2PNF-BH**		Solder	Self-Flare	SG	2.1 (53)	0.95 (24)
7-16 DIN Male		**F2PDM**		Solder	Self-Flare	SS	2.2 (57)	1.4 (36)
7-16 DIN Male		**F2PDM-C**	42BDM	Captivated	Self-Flare	SS	2.1 (53)	1.4 (36)
7-16 DIN Female		**F2PDF**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Female		**F2PDF-C**		Captivated	Self-Flare	SS	2.1 (53)	0.79 (20)
7-16 DIN Female	Panel Mt.	**F2PDF-PM**		Solder	Self-Flare	SS	2.2 (56)	1.1 (28)
7-16 DIN Male	Right Angle	**F2PDR-C**	42BDM-RA	Captivated	Self-Flare	SS	1.7/1.3 (43/34)	1.4 (36)

† See page 570 for bulk packs.

Plating Codes: BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F2NM, F2NM-H	**242075-3**
For F2PNM, F2PNM-H	**242075-4**
For F2PDM	**114402-2**
End Terminal Adapter, use with N Male connector	**13074A**

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2 ft (0.61 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**

Accessories – Continued

Description	Type No.
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Grounding - for more information, see pages 559-564.	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
EASIAX® Cutting Tool	**241372**
Installer Pax. Bulk packs are available for grounding kits. See page 570.	

HELIAX® Coaxial Cables

50-ohm *1/2" Air Dielectric, HJ Series*

HJ4-50

Cable Ordering Information

Description	Type No.
Standard Cable	
1/2" Standard Cable, Standard Jacket	**HJ4-50**
Fire Retardant Cable	
1/2" Fire Retardant Jacket (CATVR)	**HJ4RN-50**
Low VSWR and Specialized Cables	
1/2" Low VSWR, specify operating band	**HJ4P-50-(**)**
Cable for Cellular, standard jacket 824-960 MHz, 1.20 VSWR, max.	**HJ4P-50-5**

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	10.9
Velocity, percent	91.4
Peak Power Rating, kW	10.0
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.45 (1.48)
Outer	0.40 (1.31)
dc Breakdown, volts	2900
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	22.2 (73.0)
Inductance, µH/ft (m)	0.056 (0.182)

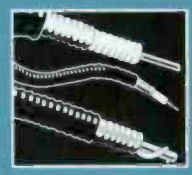
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	0.58 (14.7)
Diameter over Copper Outer Conductor, in (mm)	0.50 (12.7)
Diameter Inner Conductor, in (mm)	0.165 (4.2)
Nominal Inside Transverse Dimensions, cm	0.90
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	8 (10.9)
Cable Weight, lb/ft (kg/m)	0.25 (0.37)
Tensile Strength, lb (kg)	700 (320)
Flat Plate Crush, lb/in (kg/mm)	250 (4.5)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.561	0.184	21.0
1	0.0800	0.262	21.0
1.5	0.0984	0.323	20.0
2	0.114	0.374	17.2
10	0.260	0.853	7.59
20	0.368	1.21	5.36
30	0.450	1.48	4.37
50	0.580	1.90	3.41
88	0.777	2.55	2.57
100	0.830	2.72	2.41
108	0.863	2.83	2.32
150	1.02	3.35	1.96
174	1.10	3.62	1.82
200	1.19	3.90	1.70
300	1.45	4.76	1.38
400	1.67	5.48	1.19
450	1.77	5.82	1.12
500	1.87	6.13	1.06
512	1.89	6.21	1.05
600	2.05	6.72	0.964
700	2.21	7.27	0.889
800	2.37	7.77	0.828
824	2.40	7.89	0.815
894	2.50	8.22	0.780
960	2.60	8.52	0.752
1000	2.65	8.69	0.736
1250	2.99	9.81	0.656
1500	3.30	10.8	0.598
1700	3.53	11.6	0.556
2000	3.85	12.6	0.506
2300	4.20	13.8	0.462
3000	4.94	16.2	0.388
4000	5.90	19.4	0.322
5000†	6.80	22.3	0.276
6000	7.84	25.7	0.243
8000	9.80	32.2	0.201
10000	11.7	38.2	0.173
10900	12.5	40.9	0.163

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power, VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.
† Operation of this cable in the 5350-5500 MHz band is not recommended because of VSWR spikes produced by the dielectric section spacing.

HELIAX® Coaxial Cables



N Male
H4PNM

N Female
H4PNF

7/8" EIA Flange
74ARG

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male		**H4PNM**	74PW	Solder	Self Flare	SG	2.8 (71)	1.0 (25)
N Female		**H4PNF**	74PN	Solder	Self Flare	SG	2.8 (71)	1.0 (25)
7-16 DIN Male		**H4PDM**	74DM	Spring Finger	Self Flare	SS	2.6 (66)	1.3 (33)
7/8" EIA Flange	Gas Pass/Barrier Option	**74ARG**		Solder	Self Flare	BB	3.3 (84)	2.25 (57)
End Terminal		**74T**		Solder	Self Flare	BB	4.6 (117)	0.9 (23)
Splice		**74Z**		Solder	Self Flare	BB	4.9 (124)	1.1 (28)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 428 for further information.

Connector Accessories

	Type Number
Connector Reattachment Kit for H4PNF, H4PNM, 74PN, 74PW	**34767A-22**
Bulkhead Adapter, for N Females	**26016-2**
7/8" EIA Gas Barrier	**1260A**

Low VSWR Specifications, Type HJ4P-50-( )

Frequency Band, GHz	Type Number	Using Connector Type No.**	Assembly VSWR, Maximum (R.L., dB) 1 - 20 ft (0.3 - 6 m)	Above 20 ft (6 m)
0.94-1.45 GHz*	**HJ4P-50-1**	N Male: **H4PNM**, N Female: **74PN**	1.20 (20.8)	1.25 (19.9)
1.7-2.3 GHz	**HJ4P-50-4**	N Male: **H4PNM**	1.10 (26.4)	1.15 (23.1)
		N Female: **H4PNF**	1.15 (23.1)	1.20 (20.8)
		7/8" EIA: **74ARG**	1.10 (26.4)	1.15 (23.1)
3.625-4.2 GHz*	**HJ4P-50-2**	N Male: **H4PNM**, N Female: **74PN**	1.30 (17.7)	1.35 (16.6)

* Specify operating band. ** Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

HELIAX® Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 5 ft (1.52 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**

Description	Type No.
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	**206930**
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	**207030**
Kit of 10	**207030-2**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties	
Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter for insulated hanger	**40430-1**
Stainless Steel Wraplock (Round Tower Members)	**12395-1**
Hoisting Grip	**43094**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-31**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole	**204679-6**	**48939-7**
Three Hole	**204679-1**	**48939-5**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

50-ohm

1/2" High Temp/High Power Air Dielectric, HT Series

HT4-50

Cable Ordering Information

Description	Type No.
Standard Cable	
1/2" Standard Cable, Unjacketed	HT4-50

Characteristics

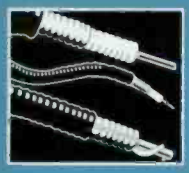
Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	10.9
Velocity, percent	92.0
Peak Power Rating, kW	21.0
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.45 (1.48)
Outer	0.40 (1.31)
dc Breakdown, volts	2900
Capacitance, pF/ft (m)	22 (72.2)
Inductance, µH/ft (m)	0.056 (0.184)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Copper Conductor, in (mm)	0.50 (12.7)
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	7.3 (9.9)
Cable Weight, lb/ft (kg/m)	0.21 (0.31)
Tensile Strength, lb (kg)	830 (380)
Flat Plate Crush Strength, lb/in (kg/mm)	290 (5.3)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0580	0.190	21.0
1	0.0823	0.270	21.0
1.5	0.101	0.331	21.0
2	0.117	0.383	21.0
10	0.265	0.870	20.8
20	0.379	1.25	14.5
30	0.468	1.54	11.7
50	0.613	2.01	9.00
88	0.829	2.72	6.65
100	0.888	2.91	6.21
108	0.926	3.04	5.95
150	1.11	3.63	4.98
174	1.20	3.94	4.58
200	1.30	4.26	4.24
300	1.63	5.36	3.37
400	1.92	6.31	2.86
450	2.06	6.76	2.68
500	2.19	7.19	2.51
512	2.22	7.29	2.48
600	2.44	8.00	2.26
700	2.67	8.75	2.07
800	2.89	9.49	1.91
824	2.94	9.66	1.87
894	3.09	10.1	1.78
960	3.23	10.6	1.71
1000	3.31	10.9	1.66
1250	3.80	12.5	1.45
1500	4.25	13.9	1.30
1700	4.60	15.1	1.12
2000	5.11	16.8	1.08
2300	5.60	18.4	0.984
3000	6.68	21.9	0.825
4000	8.07	26.5	0.683
5000 †	9.41	30.9	0.585
6000	10.7	35.2	0.514
8000	13.2	43.2	0.418
10000	15.5	50.7	0.356
10900	16.5	54.0	0.334

For attenuation: VSWR 1.0, ambient temperature 24°C (75°F) atmospheric pressure, dry air.
For Average Power, VSWR 1.0 inner temperature 200°C (392°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.
† Operation of this cable in the 5400-5600 MHz band is not recommended because of VSWR spikes produced by the dielectric spacing.



HELIAX®
Coaxial Cables

N Male
H4PNM

N Female
H4PNF

7/8" EIA Flange
74ARG

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male		**H4PNM**	74PW	Solder	Self Flare	SG	2.8 (71)	1.0 (25)
N Female		**H4PNF**	74PN	Solder	Self Flare	SG	2.8 (71)	1.0 (25)
7-16 DIN Male		**H4PDM**	74DM	Spring Finger	Self Flare	SS	2.6 (66)	1.3 (33)
7/8" EIA Flange	Gas Pass/Barrier Option	**74ARG**		Solder	Self Flare	BB	3.3 (84)	2.25 (57)
End Terminal		**74T**		Solder	Self Flare	BB	4.6 (117)	0.9 (23)
Splice		**74Z**		Solder	Self Flare	BB	4.9 (124)	1.1 (28)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 362 for further information.

Connector Accessories

	Type Number
Connector Reattachment Kit for H4PNF, H4PNM, 74PN, 74PW	**34767A-22**
Bulkhead Adapter, for N Females	**26016-2**
7/8" EIA Gas Barrier	**1260A**

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 5 ft (1.52 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25) mm long	31769-1
Angle Adapter, kit of 10.	
Stainless Steel	31768A
Galvanized	242774
Galvanized, metric hardware	242774-M
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
6-8 (150-200)	31670-6
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
36 in (915 mm) long, kit of 5	31771-10
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	206706-1
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	206929-1
4 cable runs, 2 connections required	206929-4
8 cable runs, 3 connections required	206929-8

Description	Type No.
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	206930
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	207030
Kit of 10	207030-2
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	40417
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties	
Recommended maximum spacing for outdoor installations is 3 ft (1 m)	CT-K350
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	VCT8-10
Kit of 50	VCT8-50
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	11662-3
Angle Adapter for insulated hanger	40430-1
Stainless Steel Wraplock (Round Tower Members)	12395-1
Hoisting Grip	43094
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	204989-1
factory attached, two-hole lug, 24 in (610 mm) lead	241088-1
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	204989-21
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	241088-6
field attachable screw-on lug, 36 in (915 mm lead)	204989-31
Crimping Tool to field attach lug to Grounding Kit	207270
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	221213
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	40656A-3

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	204673-1	48940-1
1	204673-2	
2		48940-2
3		48940-3
4	204673-4	48940-4
6		48940-6
8	204673-8	
12	204673-12	

	4 in Boots	5 in Boots
One Hole	204679-6	48939-7
Three Hole	204679-1	48939-5

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

HELIAX®
Coaxial Cables

50-ohm

1/2" Air Dielectric, Plenum Rated (CATVP), HL Series

HL4RP-50

Cable Ordering Information

Description	Type No.
Plenum Cable	
1/2" Fire Retardant Cable, Fire Retardant Jacket (CATVP)	**HL4RP-50**

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	8.8
Velocity, percent	88
Peak Power Rating, kW	40.0
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.45 (1.48)
Outer	0.58 (1.90)
dc Breakdown, volts	4000
Capacitance, pF/ft (m)	23 (75.3)
Inductance, µH/ft (m)	0.058 (0.191)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-clad aluminum
Diameter over Jacket, in (mm)	0.61 (15.5)
Diameter over Copper Outer Conductor, in (mm)	0.55 (14)
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	10 (15)
Bending Moment, lb-ft (N•m)	3.0 (4.1)
Cable Weight, lb/ft (kg/m)	0.18 (0.27)
Tensile Strength, lb (kg)	250 (114)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.050	0.163	40.00
1.0	0.070	0.230	37.78
1.5	0.086	0.282	30.82
2.0	0.100	0.326	26.67
10	0.224	0.735	11.83
20	0.319	1.045	8.32
30	0.392	1.285	6.77
50	0.510	1.670	5.21
88	0.683	2.237	3.89
100	0.730	2.391	3.64
108	0.760	2.489	3.49
150	0.902	2.955	2.94
174	0.976	3.195	2.72
200	1.050	3.439	2.53
300	1.302	4.265	2.04
400	1.520	4.978	1.75
450	1.620	5.305	1.64
500	1.715	5.617	1.55
512	1.738	5.690	1.53
600	1.895	6.205	1.40
700	2.062	6.753	1.28
800	2.220	7.270	1.19
824	2.257	7.390	1.17
894	2.361	7.733	1.12
960	2.457	8.046	1.08
1000	2.514	8.232	1.06
1250	2.850	9.333	0.932
1500	3.161	10.353	0.840
1700	3.396	11.122	0.782
2000	3.730	12.217	0.712
2300	4.047	13.254	0.656
3000	4.734	15.504	0.561
4000	5.627	18.429	0.472
5000	6.450	21.123	0.412
6000	7.222	23.653	0.368
7000	7.957	26.058	0.334
8000	8.661	28.365	0.307
8800	9.207	30.152	0.289

Standard Conditons:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For Average Power. VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L4NM†**	L44AW	Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male		**L4NM-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4NM-H**		Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male	Hex Head	**L4NM-HC**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male		**L4PNM†**	L44PW	Solder	Self-Flare	SG	2.6 (66)	0.91 (23.1)
N Male		**L4PNM-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4PNM-H†**	L44PW-12	Solder	Self-Flare	SG	2.6 (66)	0.95 (24.1)
N Male	Hex Head	**L4PNM-HC**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Right Angle	**L4PNR**	43716-7	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.94 (23.9)
N Male	Rt. Angle, Hex	**L4PNR-H**	43716-12	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.95 (24.1)
N Female		**L4NF†**	L44N	Solder	Self-Flare	BS	2.6 (66)	0.94 (23.9)
N Female		**L4NF-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Female		**L4PNF†**	L44PN	Solder	Self-Flare	SG	2.6 (66)	0.94 (23.9)
N Female		**L4PNF-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Female	Bulk Head	**L4PNF-BH**	L44PN-BH	Solder	Self-Flare	SG	2.6 (66)	0.96 (24.4)
N Female	Panel Mount	**L4PNF-PM**	L44PN-PM	Solder	Self-Flare	SG	2.6 (66)	1.0 (25.4)
7-16 DIN Male		**L4PDM†**	L44ADM	Solder	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDM-C†**	L44BDM	Captivated	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDR**		Solder	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Male		**L4PDR-C**		Captivated	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Female		**L4PDF†**	L44PDF	Solder	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female		**L4PDF-C†**	L44BDF	Captivated	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female	Bulk Head	**L4PDF-BHC**		Captivated	Self-Flare	SS	2.9 (74)	163 (41.4)
7-16 DIN Female	Panel Mount	**L4PDF-PM**		Solder	Self-Flare	SS	2.7 (69)	1.2 (29.4)
7/8" EIA Flange		**L44R**		Solder	Self-Flare	BB	3.2 (81)	2.25 (57.2)
7/8" EIA Flange	Right Angle	**124990-1**		Solder	Self-Flare	BB	2.3/1.6 (58/41)	2.25 (57.2)
F Flange Male		**L44F**		Solder	Self-Flare	BB	2.3 (58)	2.25 (57.2)
F Flange Female		**209865**		Solder	Self-Flare	BS	2.3 (58)	2.25 (57.2)
UHF Male		**L44P**		Solder	Self-Flare	BB	2.3 (58)	0.91 (23.1)
UHF Female		**L44U**		Solder	Self-Flare	BS	2.3 (58)	0.91 (23.1)
TNC Female		**L44NT**		Solder	Self-Flare	BB	2.8 (71)	0.94 (23.9)
LC Male		**L44M**		Solder	Self-Flare	BB	3.6 (91)	0.91 (23.1)
HN Male		**L44J**		Solder	Self-Flare	BB	2.5 (64)	0.91 (23.1)
SC Male		**L44PCW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
SC Male	Right Angle	**L44PCW-RA**		Solder	Self-Flare	NG	2.6/1.6 (66/41)	0.91 (23.1)
SC Female		**L44PCN**		Solder	Tab Flare	SG	1.6 (41)	0.86 (21.8)
C Male		**L44PDW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
End Terminal		**L44T**		Solder	Self-Flare	BB	4.0 (102)	0.91 (23.1)
Splice		**L44Z**		Solder	Self-Flare	BB	3.2 (81)	1.1 (27.9)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For L4NM, L4NM-H	**241730-3**
For L4PNM, L4PNM-H	**241730-4**
For L4PDM	**222483-2**
For L4NF	**242855**
For L4PNF	**242855-2**
Connector Reattachment Kit	
For L4 and L44, except L4NM, L44PCW, L44PCN	**34767A-27**
For L4NM, L44PCW, L44PCN	**34767A-51**
Bulkhead Adapter, for N or UHF Females	26016-2

HELIAX® Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 5 ft (1.52 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**

Description	Type No.
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	**206930**
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	**207030**
Kit of 10	**207030-2**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties	
Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 3 ft (0.91 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter for insulated hanger	**40430-1**
Stainless Steel Wraplock (Round Tower Members)	**12395-1**
Hoisting Grip	**43094**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-31**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole	**204679-6**	**48939-7**
Three Hole	**204679-1**	**48939-5**

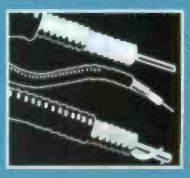
EASIAX® Cutting Tool **207866**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

50-ohm

1/2" Air Dielectric, High Power, High Temperature, HLT Series

HELIAX®
Coaxial Cables



NEW!

HLT4-50T

Cable Ordering Information

Description	Type No.
Plenum Cable	
1/2" Fire Retardant Cable, Fire Retardant Jacket (CATVP, UL910)	HLT4-50T

Characteristics

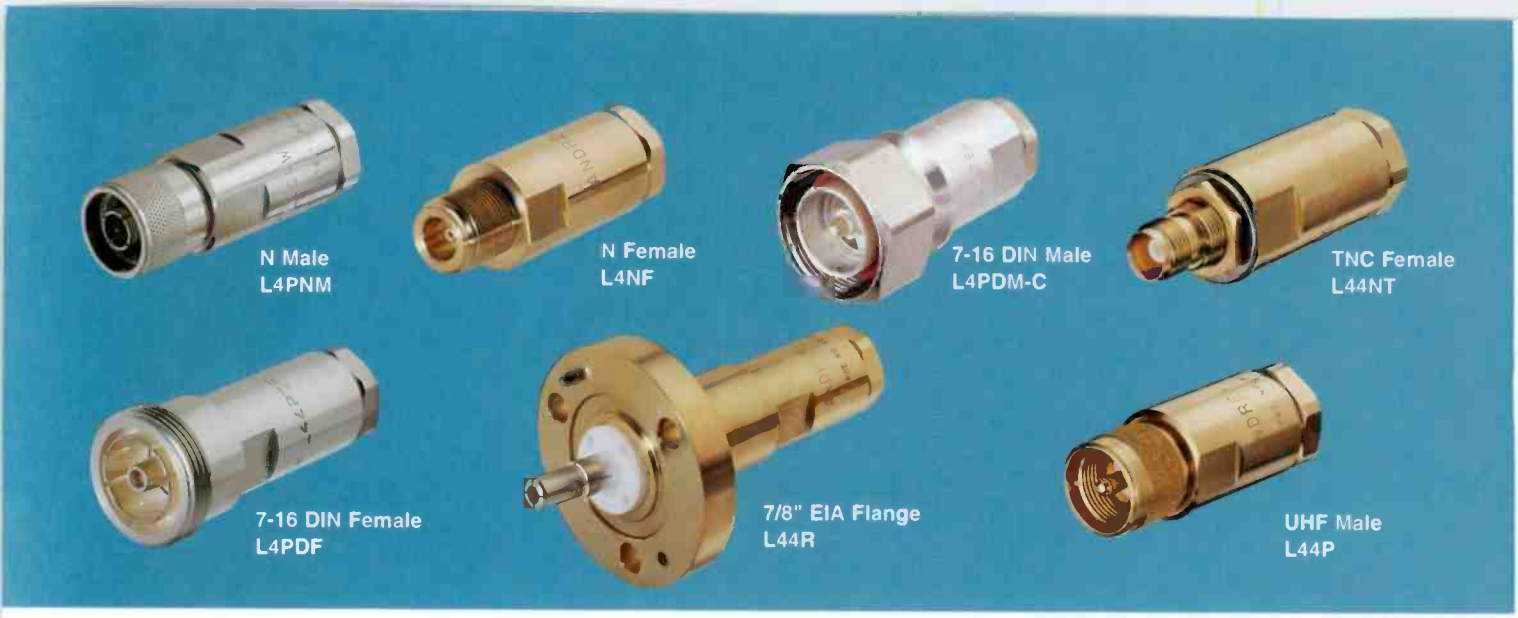
Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	4.0
Velocity, percent	93
Peak Power Rating, kW	21.4
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.45 (1.48)
Outer	0.58 (1.90)
dc Breakdown, volts	3000
Capacitance, pF/ft (m)	20.4 (66.8)
Inductance, µH/ft (m)	0.058 (0.191)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-clad aluminum
Diameter over Jacket, in (mm)	0.61 (15.5)
Diameter over Copper Outer Conductor, in (mm)	0.55 (14)
Diameter Inner Conductor, in (mm)	0.189 (4.8)
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	10 (15)
Bending Moment, lb-ft (N•m)	3.0 (4.1)
Cable Weight, lb/ft (kg/m)	0.18 (0.27)
Tensile Strength, lb (kg)	250 (114)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
1	0.067	0.219	21.4
2	0.095	0.310	21.4
10	0.215	0.705	21.4
20	0.308	1.01	15.7
30	0.380	1.25	12.7
50	0.498	1.63	9.72
100	0.723	2.37	6.70
150	0.902	2.96	5.36
200	1.06	3.47	4.57
300	1.33	4.37	3.64
400	1.57	5.15	3.08
450	1.68	5.52	2.88
500	1.79	5.87	2.70
600	1.99	6.54	2.43
700	2.19	7.17	2.22
800	2.37	7.77	2.04
824	2.41	7.91	2.01
894	2.53	8.30	1.91
960	2.65	8.69	1.83
1000	2.71	8.90	1.78
1250	3.12	10.2	1.55
1500	3.50	11.5	1.38
1700	3.79	12.4	1.28
2000	4.21	13.8	1.15
3000	5.50	18.0	0.881
4000	6.68	21.9	0.724

Standard Conditons:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For Average Power. VSWR 1.0, ambient temperature 40°C (104°F), inner conductor temperature 200°C (392°F), no solar loading.



Connectors

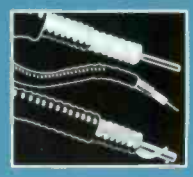
Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**L4NM†**	L44AW	Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male		**L4NM-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4NM-H**		Solder	Self-Flare	BS	2.6 (66)	0.91 (23.1)
N Male	Hex Head	**L4NM-HC**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Male		**L4PNM†**	L44PW	Solder	Self-Flare	SG	2.6 (66)	0.91 (23.1)
N Male		**L4PNM-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Hex Head	**L4PNM-H†**	L44PW-12	Solder	Self-Flare	SG	2.6 (66)	0.95 (24.1)
N Male	Hex Head	**L4PNM-HC**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Male	Right Angle	**L4PNR**	43716-7	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.94 (23.9)
N Male	Rt. Angle, Hex	**L4PNR-H**	43716-12	Solder	Self-Flare	SG	3.2/1.5 (81/38)	0.95 (24.1)
N Female		**L4NF†**	L44N	Solder	Self-Flare	BS	2.6 (66)	0.94 (23.9)
N Female		**L4NF-C**		Captivated	Self-Flare	BS	2.5 (64)	0.91 (23.1)
N Female		**L4PNF†**	L44PN	Solder	Self-Flare	SG	2.6 (66)	0.94 (23.9)
N Female		**L4PNF-C**		Captivated	Self-Flare	SG	2.5 (64)	0.91 (23.1)
N Female	Bulk Head	**L4PNF-BH**	L44PN-BH	Solder	Self-Flare	SG	2.6 (66)	0.96 (24.4)
N Female	Panel Mount	**L4PNF-PM**	L44PN-PM	Solder	Self-Flare	SG	2.6 (66)	1.0 (25.4)
7-16 DIN Male		**L4PDM†**	L44ADM	Solder	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDM-C†**	L44BDM	Captivated	Self-Flare	SS	2.6 (66)	1.4 (35.6)
7-16 DIN Male		**L4PDR**		Solder	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Male		**L4PDR-C**		Captivated	Self-Flare	SS	1.8/2.8 (46/72)	1.41 (35.9)
7-16 DIN Female		**L4PDF†**	L44PDF	Solder	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female		**L4PDF-C†**	L44BDF	Captivated	Self-Flare	SS	2.7 (69)	1.1 (27.9)
7-16 DIN Female	Bulk Head	**L4PDF-BHC**		Captivated	Self-Flare	SS	2.9 (74)	163 (41.4)
7-16 DIN Female	Panel Mount	**L4PDF-PM**		Solder	Self-Flare	SS	2.7 (69)	1.2 (29.4)
7/8" EIA Flange		**L44R**		Solder	Self-Flare	BB	3.2 (81)	2.25 (57.2)
7/8" EIA Flange	Right Angle	**124990-1**		Solder	Self-Flare	BB	2.3/1.6 (58/41)	2.25 (57.2)
F Flange Male		**L44F**		Solder	Self-Flare	BB	2.3 (58)	2.25 (57.2)
F Flange Female		**209865**		Solder	Self-Flare	BS	2.3 (58)	2.25 (57.2)
UHF Male		**L44P**		Solder	Self-Flare	BB	2.3 (58)	0.91 (23.1)
UHF Female		**L44U**		Solder	Self-Flare	BS	2.3 (58)	0.91 (23.1)
TNC Female		**L44NT**		Solder	Self-Flare	BB	2.8 (71)	0.94 (23.9)
LC Male		**L44M**		Solder	Self-Flare	BB	3.6 (91)	0.91 (23.1)
HN Male		**L44J**		Solder	Self-Flare	BB	2.5 (64)	0.91 (23.1)
SC Male		**L44PCW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
SC Male	Right Angle	**L44PCW-RA**		Solder	Self-Flare	NG	2.6/1.6 (66/41)	0.91 (23.1)
SC Female		**L44PCN**		Solder	Tab Flare	SG	1.6 (41)	0.86 (21.8)
C Male		**L44PDW**		Solder	Self-Flare	SG	2.5 (64)	0.91 (23.1)
End Terminal		**L44T**		Solder	Self-Flare	BB	4.0 (102)	0.91 (23.1)
Splice		**L44Z**		Solder	Self-Flare	BB	3.2 (81)	1.1 (27.9)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For L4NM, L4NM-H	**241730-3**
For L4PNM, L4PNM-H	**241730-4**
For L4PDM	**222483-2**
For L4NF	**242855**
For L4PNF	**242855-2**
Connector Reattachment Kit	
For L4 and L44, except L4NM, L44PCW, L44PCN	**34767A-27**
For L4NM, L44PCW, L44PCN	**34767A-51**
Bulkhead Adapter, for N or UHF Females	**26016-2**



Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	43211A
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25) mm long	31769-1
Angle Adapter, kit of 10.	
Stainless Steel	31768A
Galvanized	242774
Galvanized, metric hardware	242774-M
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
6-8 (150-200)	31670-6
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
36 in (915 mm) long, kit of 5	31771-10
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	206706-1
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	206929-1
4 cable runs, 2 connections required	206929-4
8 cable runs, 3 connections required	206929-8

Description	Type No.
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	206930
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	207030
Kit of 10	207030-2
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	40417
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties	
Recommended maximum spacing for outdoor installations is 3 ft (1 m)	CT-K350
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	VCT8-10
Kit of 50	VCT8-50
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	11662-3
Angle Adapter for insulated hanger	40430-1
Stainless Steel Wraplock (Round Tower Members)	12395-1
Hoisting Grip	43094
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	204989-1
factory attached, two-hole lug, 24 in (610 mm) lead	241088-1
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	204989-21
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	241088-6
field attachable screw-on lug, 36 in (915 mm lead)	204989-31
Crimping Tool to field attach lug to Grounding Kit	207270
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	221213
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	40656A-3

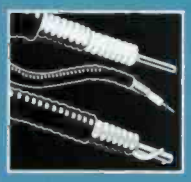
Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	204673-1	48940-1
1	204673-2	
2		48940-2
3		48940-3
4	204673-4	48940-4
6		48940-6
8	204673-8	
12	204673-12	

	4 in Boots	5 in Boots
One Hole	204679-6	48939-7
Three Hole	204679-1	48939-5

EASIAX® Cutting Tool 207866

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.



HELIAX®
Coaxial Cables

50-ohm

1/2" Air Dielectric, Plenum Rated (CATVP), HS Series

NEW!

HS4RP-50

Cable Ordering Information

Description	Type No.
Plenum Cable	
1/2" Fire Retardant Cable	HS4RP-50

Characteristics

Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	10.2
Velocity, percent	81
Peak Power Rating, kW	15.6
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.87 (2.85)
Outer	1.00 (3.28)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	25.04 (82.16)
Inductance, µH/ft (m)	0.063 (0.206)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.52 (13.2)
Diameter over Copper Outer Conductor, in (mm)	0.48 (12.2)
Minimum Bending Radius, in (mm)	1.25 (32)
Number of Bends, minimum	20 (50)
Bending Moment, lb-ft (N•m)	4.5 (6.12)
Cable Weight, lb/ft (kg/m)	0.138 (0.205)
Tensile Strength, lb (kg)	175 (80)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (1.9)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.066	0.216	15.6
1	0.093	0.306	15.6
1.5	0.114	0.375	15.0
2	0.132	0.433	13.0
10	0.296	0.972	5.77
20	0.420	1.38	4.07
30	0.516	1.69	3.31
50	0.669	2.20	2.55
88	0.893	2.93	1.91
100	0.954	3.13	1.79
108	0.992	3.26	1.72
150	1.18	3.86	1.46
174	1.27	4.16	1.35
200	1.36	4.47	1.25
300	1.68	5.52	1.02
400	1.96	6.42	0.874
450	2.08	6.83	0.821
500	2.20	7.22	0.777
512	2.23	7.32	0.767
600	2.43	7.96	0.705
700	2.63	8.64	0.650
800	2.83	9.27	0.605
824	2.87	9.42	0.595
894	3.00	9.84	0.570
960	3.12	10.2	0.549
1000	3.19	10.5	0.537
1250	3.60	11.8	0.476
1500	3.97	13.0	0.431
1700	4.25	14.0	0.402
2000	4.65	15.3	0.368
2300	5.03	16.5	0.340
3000	5.83	19.1	0.293
4000	6.87	22.5	0.249
5000	7.81	25.6	0.219
6000	8.69	28.5	0.197
8000	10.3	33.8	0.166
10000	11.8	38.6	0.145
10200	11.9	39.1	0.144

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24° C (75° F).
For average power, VSWR 1.0 ambient temperature 40° C (104° F), inner conductor temperature 100° C (212° F), no solar loading.

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F4NM†**	44ASW	Solder	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male		**F4NM-C†**		Captivated	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4NM-H**		Solder	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4NM-HC**		Captivated	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male		**F4PNM**	44SEW	Solder	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male		**F4PNM-C†**		Captivated	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4PNM-H†**	44SEW-12	Solder	Self-Flare	SG	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4PNM-HC**		Captivated	Self-Flare	SG	2.1 (53.3)	0.92 (23.4)
N Male	Right Angle	**F4PNR†**	49593	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Male	Rt Angle, Hex Hd	**F4PNR-H**	49588	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Female		**F4NF†**	44ASN	Solder	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4NF-C**		Captivated	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF†**	44SPN	Solder	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF-C**		Captivated	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female	Bulkhead	**F4PNF-BH**	44BSPN-BH	Solder	Self-Flare	SG	2.3 (58)	0.95 (24.1)
4.1/9.5 DIN Male	Indoor Use	**F4PKM-IC**	44KM	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Outdoor Use	**F4PKM-C**	44KME	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Indoor use	**F4PKR-IC**	44KM-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Outdoor Use	**F4PKR-C**	44KME-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
7-16 DIN Male		**F4PDM-C†**	44SDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male		**F4PDM†**	44ASDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male		**F4PDR**		Solder	Self-Flare	SS	2.4/1.8 (61/46)	1.4 (35.6)
7-16 DIN Male	Right Angle	**F4PDR-C**	44SDM-RA	Captivated	Self-Flare	SS	2.1/2.0 (53/50)	1.4 (35.6)
7-16 DIN Female		**F4PDF-C**	44SDF	Captivated	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female		**F4PDF**	44ASDF	Solder	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female	Bulkhead	**F4PDF-BH**		Solder	Self-Flare	SS	2.01 (51.1)	1.50 (38)
7-16 DIN Female	Panel Mount	**F4PDF-PM**		Solder	Self-Flare	SS	2.01 (51.1)	1.26 (32)
7-16 DIN Female	Bulkhead	**F4PDF-BHC**		Captivated	Self-Flare	SS	2.0 (50)	1.8 (45.7)
7-16 DIN Female	Panel Mount	**F4PDF-PMC**		Captivated	Self-Flare	SS	2.0 (50)	1.3 (33)
7/8" EIA Flange		**44ASR**		Solder	Tab Flare	BS	3.3 (84)	1.4 (35.6)
UHF Male		**44ASP**		Solder	Tab Flare	BS	2.1 (53)	0.84 (21.3)
UHF Female		**44ASU**		Solder	Tab Flare	BS	2.3 (58)	0.84 (21.3)
HN Male		**44ASJ**		Solder	Tab Flare	BB	2.4 (61)	0.84 (21.3)
SC Male		**44SPCW**		Solder	Tab Flare	SG	2.7 (69)	0.88 (22.4)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F4NM, F4NM-H	**241455-3**
For F4PNM, F4PNM-H	**241455-4**
For F4PDM	**14417-2**
Connector Reattachment Kit	**34767A-39**
Bulkhead Adapter, for N or UHF Females	**26016-2**

HELIAX® Coaxial Cables

Accessories – Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**

Description	Type No.
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters - please refer to page 554-555.	
Hoisting Grip	**43094**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-5**	**48939-6**
Three Hole:	**204679-7**	**48939-8**

Tools - for more tools see page 569.

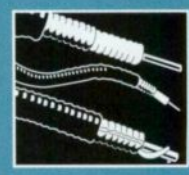
EASIAX® Cutting Tool **207865**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

50-ohm

1/2" High Power, High Temperature, Air Dielectric, HST Series

HELIAX®
Coaxial Cables



NEW!

HST4-50

Cable Ordering Information

Description	Type No.
High Power, High Temperature Cable	
1/2" Cable	HST4-50

Characteristics

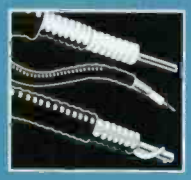
Electrical	
Impedance, ohms	50 ± 2
Maximum Frequency, GHz	10.2
Velocity, percent	81
Peak Power Rating, kW	15.6
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.87 (2.85)
Outer	1.00 (3.28)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	4000
Capacitance, pF/ft (m)	25.04 (82.16)
Inductance, µH/ft (m)	0.063 (0.206)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Silver Plated, Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.52 (13.2)
Diameter over Copper Outer Conductor, in (mm)	0.48 (12.2)
Minimum Bending Radius, in (mm)	1.25 (32)
Number of Bends, minimum	20 (50)
Bending Moment, lb-ft (N•m)	4.57 (6.22)
Cable Weight, lb/ft (kg/m)	0.165 (0.245)
Tensile Strength, lb (kg)	175 (80)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (1.9)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.075	0.245	15.6
1	0.106	0.348	15.6
1.5	0.130	0.426	15.6
2	0.150	0.492	15.6
10	0.338	1.109	15.6
20	0.481	1.577	15.6
30	0.591	1.94	15.6
50	0.768	2.52	13.3
88	1.03	3.37	9.92
100	1.10	3.60	9.29
108	1.14	3.75	8.92
150	1.36	4.45	7.52
174	1.47	4.81	6.95
200	1.58	5.18	6.46
300	1.96	6.42	5.21
400	2.28	7.49	4.47
450	2.43	7.98	4.19
500	2.58	8.45	3.96
512	2.61	8.56	3.91
600	2.85	9.33	3.59
700	3.10	10.2	3.30
800	3.33	10.9	3.06
824	3.39	11.1	3.01
894	3.54	11.6	2.88
960	3.69	12.1	2.77
1000	3.77	12.4	2.71
1250	4.27	14.0	2.39
1500	4.74	15.5	2.15
1700	5.09	16.7	2.01
2000	5.59	18.3	1.83
2300	6.06	19.9	1.68
3000	7.08	23.2	1.44
4000	8.41	27.6	1.21
5000	9.63	31.6	1.06
6000	10.8	35.4	0.947
8000	12.9	42.4	0.790
10000	14.9	48.9	0.685
10200	15.1	49.5	0.676

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24° C (75° F).
For average power, VSWR 1.0 ambient temperature 40° C (104° F), inner conductor temperature 250° C (482° F), no solar loading.



HELIAX® Coaxial Cables

Connectors

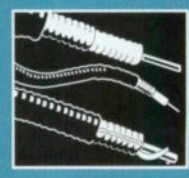
Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Max. Length in (mm)	Max. Dia. in (mm)
N Male		**F4NM†**	44ASW	Solder	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male		**F4NM-C†**		Captivated	Self-Flare	BS	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4NM-H**		Solder	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4NM-HC**		Captivated	Self-Flare	BS	2.1 (53.3)	0.91 (23.1)
N Male		**F4PNM**	44SEW	Solder	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male		**F4PNM-C†**		Captivated	Self-Flare	SG	2.1 (53.3)	0.88 (22.4)
N Male	Hex Head	**F4PNM-H†**	44SEW-12	Solder	Self-Flare	SG	2.1 (53.3)	0.91 (23.1)
N Male	Hex Head	**F4PNM-HC**		Captivated	Self-Flare	SG	2.1 (53.3)	0.92 (23.4)
N Male	Right Angle	**F4PNR†**	49593	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Male	Rt Angle, Hex Hd	**F4PNR-H**	49588	Solder	Tab-Flare	SG	3.3/1.5 (84/38)	0.86 (21.8)
N Female		**F4NF†**	44ASN	Solder	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4NF-C**		Captivated	Self-Flare	BS	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF†**	44SPN	Solder	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female		**F4PNF-C**		Captivated	Self-Flare	SG	2.3 (53.3)	0.88 (22.4)
N Female	Bulkhead	**F4PNF-BH**	44BSPN-BH	Solder	Self-Flare	SG	2.3 (58)	0.95 (24.1)
4.1/9.5 DIN Male	Indoor Use	**F4PKM-IC**	44KM	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Outdoor Use	**F4PKM-C**	44KME	Captivated	Self-Flare	SS	2.0 (50)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Indoor use	**F4PKR-IC**	44KM-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
4.1/9.5 DIN Male	Rt Angle, Outdoor Use	**F4PKR-C**	44KME-RA	Captivated	Self-Flare	SS	2.3/1.5 (57/38)	0.95 (24.1)
7-16 DIN Male		**F4PDM-C†**	44SDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male		**F4PDM†**	44ASDM	Captivated	Self-Flare	SS	2.0 (50)	1.4 (35.6)
7-16 DIN Male		**F4PDR**		Solder	Self-Flare	SS	2.4/1.8 (61/46)	1.4 (35.6)
7-16 DIN Male	Right Angle	**F4PDR-C**	44SDM-RA	Captivated	Self-Flare	SS	2.1/2.0 (53/50)	1.4 (35.6)
7-16 DIN Female		**F4PDF-C**	44SDF	Captivated	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female		**F4PDF**	44ASDF	Solder	Self-Flare	SS	2.0 (50)	1.1 (27.9)
7-16 DIN Female	Bulkhead	**F4PDF-BH**		Solder	Self-Flare	SS	2.01 (51.1)	1.50 (38)
7-16 DIN Female	Panel Mount	**F4PDF-PM**		Solder	Self-Flare	SS	2.01 (51.1)	1.26 (32)
7-16 DIN Female	Bulkhead	**F4PDF-BHC**		Captivated	Self-Flare	SS	2.0 (50)	1.8 (45.7)
7-16 DIN Female	Panel Mount	**F4PDF-PMC**		Captivated	Self-Flare	SS	2.0 (50)	1.3 (33)
7/8" EIA Flange		**44ASR**		Solder	Tab Flare	BS	3.3 (84)	1.4 (35.6)
UHF Male		**44ASP**		Solder	Tab Flare	BS	2.1 (53)	0.84 (21.3)
UHF Female		**44ASU**		Solder	Tab Flare	BS	2.3 (58)	0.84 (21.3)
HN Male		**44ASJ**		Solder	Tab Flare	BB	2.4 (61)	0.84 (21.3)
SC Male		**44SPCW**		Solder	Tab Flare	SG	2.7 (69)	0.88 (22.4)

† See page 570 for bulk packs.

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin

Connector Accessories

	Type Number
Connector Pin-Paks, five replacement pins	
For F4NM, F4NM-H	**241455-3**
For F4PNM, F4PNM-H	**241455-4**
For F4PDM	**14417-2**
Connector Reattachment Kit	**34767A-39**
Bulkhead Adapter, for N or UHF Females	**26016-2**



Accessories – Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**

Description	Type No.
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters - please refer to page 554-555.	
Hoisting Grip	**43094**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
Crimping Tool to field attach lug to Grounding Kit	207270
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-5**	**48939-6**
Three Hole:	**204679-7**	**48939-8**

Tools - for more tools see page 569.

EASIAX® Cutting Tool	**207865**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

HELIAX®
Coaxial Cables

50-ohm
5/8" Air Dielectric, HJ Series

HJ4.5-50

Cable Ordering Information

Description	Type No.
Standard Cable	
5/8" Standard Cable, Standard Jacket	**HJ4.5-50**
Fire Retardant Cable	
5/8" Fire Retardant Jacket (CATVR)	**HJ4.5RN-50**
Low VSWR and Specialized Cables	
5/8" Low VSWR, specify operating band	**HJ4.5P-50-(**)**
Cable for Cellular, standard jacket	
824-960 MHz, 1.20 VSWR, max.	**HJ4.5P-50-1**
880-960 MHz, 1.10 VSWR, max.	**HJ4.5P-50-2**

** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Mechanical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	6.6
Velocity, percent	92
Peak Power Rating, kW	40
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.41 (1.35)
Outer	0.23 (0.75)
dc Breakdown, volts	4000
Jacket Spark, volts RMS	5500
Capacitance, pF/ft (m)	22.3 (73.2)
Inductance, µH/ft (m)	0.056 (0.182)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	0.875 (22.2)
Diameter over Copper Outer Conductor, in (mm)	0.775 (19.7)
Diameter Inner Conductor, in (mm)	0.272 (6.9)
Nominal Inside Transverse Dimensions (cm)	1.51
Minimum Bending Radius, in (mm)	7 (180)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	16 (21.7)
Cable Weight, lb/ft (kg/m)	0.40 (0.59)
Tensile Strength, lb (kg)	750 (340)
Flat Plate Crush Strength, lb/in (kg/mm)	250 (4.5)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.034	0.110	40.0
1	0.048	0.156	40.0
1.5	0.058	0.192	40.0
2	0.067	0.221	35.30
10	0.152	0.497	15.64
20	0.215	0.706	10.98
30	0.264	0.867	8.94
50	0.343	1.12	6.90
100	0.488	1.60	4.84
150	0.602	1.98	3.92
200	0.699	2.29	3.38
300	0.864	2.83	2.73
400	1.00	3.29	2.35
450	1.07	3.51	2.20
500	1.13	3.71	2.09
600	1.25	4.09	1.89
700	1.35	4.43	1.74
800	1.45	4.76	1.62
824	1.48	4.85	1.59
894	1.54	5.05	1.52
960	1.60	5.25	1.47
1000	1.64	5.37	1.43
1250	1.85	6.07	1.27
1500	2.04	6.70	1.16
2000	2.40	7.86	0.986
3000	3.02	9.89	0.784
4000*	3.55	11.6	0.665
5000	4.04	13.3	0.585
6000	4.50	14.8	0.525
6600	4.76	15.6	0.496

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power. VSWR 1.0, Inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.
* Operation of this cable in the 4250-4400 MHz band is not recommended because of VSWR spikes produced by the dielectric spacing.

N Male
H4.5PNM

7-16 DIN Male
H4.5PDM

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male		**H4.5PNM**	85PW	Spring Finger	Self Flare	SG	2.6 (66)	1.3 (33)
7-16 DIN Male		**H4.5PDM**	85DM	Spring Finger	Self Flare	SS	2.8 (71)	1.3 (33)
Splice		**85Z**		Self-tapping	Self Flare	BB	3.1 (79)	1.6 (41)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 428 for further information.

Connector Accessories

	Type Number
Bulkhead Adapter, for N or UHF Females	**26016-2**

Low VSWR Specifications, Type HJ4.5P-50-( )

Frequency Band, GHz	Type No.	Using Connector Type*	Assembly VSWR, Maximum (R.L., dB) 1-25ft (0.3-8 m)	25-100 ft (8-30 m)	100-200 ft (30-60 m)	200-500 ft (60-150 m)	Above 500 ft (150 m)
0.824-0.960	**HJ4.5P-50-1**	N Plug: **H4.5PNM**	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
		7-16 DIN male: **H4.5PDM**	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)	1.20 (20.8)
0.880-0.960	**HJ4.5P-50-2**	N Plug: **H4.5PNM**	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
		7-16 DIN male: **H4.5PDM**	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)	1.10 (26.4)
0.940-2.7	**HJ4.5P-50-3**	N Plug: **H4.5PNM**	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)
		7-16 DIN male: **H4.5PDM**	1.20 (20.8)	1.20 (20.8)	1.25 (19.1)	1.25 (19.1)	1.25 (19.1)
0.010-0.806	**HJ4.5P-50-4**	N Plug: **H4.5PNM**	1.25 (19.1)	1.25 (19.1)	1.30 (17.6)	1.30 (17.6)	1.30 (17.6)
		7-16 DIN male: **H4.5PDM**	1.25 (19.1)	1.25 (19.1)	1.30 (17.6)	1.30 (17.6)	1.30 (17.6)
0.010-2.7	**HJ4.5P-50-5**	N Plug: **H4.5PNM**	1.25 (19.1)	1.25 (19.1.)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
		7-16 DIN male: **H4.5PDM**	1.25 (19.1)	1.25 (19.1.)	1.35 (16.5)	1.35 (16.5)	1.35 (16.5)
0.010-4.2	**HJ4.5P-50-6**	N Plug: **H4.5PNM**	1.30 (17.6)	1.35 (16.5)	1.40 (15.6)	1.50 (19.9)	1.50 (19.9)
		7-16 DIN male: **H4.5PDM**	1.30 (17.6)	1.35 (16.5)	1.40 (15.6)	1.50 (19.9)	1.50 (19.9)
4.6-6.6	**HJ4.5P-50-7**	N Plug: **H4.5PNM**	1.30 (17.6)	1.35 (16.5)	1.40 (15.6)	1.50 (19.9)	1.50 (19.9)
		7-16 DIN male: **H4.5PDM**	1.30 (17.6)	1.35 (16.5)	1.40 (15.6)	1.50 (19.9)	1.50 (19.9)

* Connectors ordered separately.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

HELIAX®
Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-9**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**

Description	Type No.
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Hoisting Grip	**29958**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-7**

Feed-Thru Plates and Boots. Order separately.

Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole	**204679-13**	**48939-14**
Three Hole	**204679-14**	**48939-15**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

50-ohm
7/8" Air Dielectric, HJ Series

HELIAX®
Coaxial Cables

HJ5-50

Cable Ordering Information

Description	Type No.
Standard Cable	
7/8" Standard Cable, Standard Jacket	**HJ5-50***
Fire Retardant Cables	
7/8" Fire Retardant Jacket (CATVP)	**HJ5RP-50***
7/8" Fire Retardant Jacket (CATVR)	**HJ5RN-50***
Low VSWR and Specialized Cables	
7/8" Low VSWR, specify operating band	**HJ5P-50-(**)**
Cable for Cellular, standard jacket	
824-894 MHz, 1.20 VSWR, max.	**25831-3**
880-960 MHz, 1.20 VSWR, max.	**25831-6**
880-960 MHz, 1.10 VSWR, max.	**25831-7**
Cable for Cellular, fire retardant jacket (CATVR)	
824-894 MHz, 1.20 VSWR, max.	**41690-78**

* For broadcast applications, specify channel or frequency.
** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

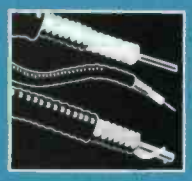
Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	5.2
Velocity, percent	91.6
Peak Power Rating, kW	90
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.25 (0.82)
Outer	0.20 (0.66)
dc Breakdown, volts	6000
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	22.2 (72.8)
Inductance µH/ft (m)	0.055 (0.180)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.11 (28.2)
Diameter over Copper Out Conductor, in (mm)	1.01 (25.7)
Diameter Inner Conductor, in (mm)	0.359 (9.1)
Nominal Inside Transverse Dimensions (cm)	2.02
Minimum Bending Radius, in (mm)	10 (250)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	25 (34)
Cable Weight, lb/ft (kg/m)	0.54 (0.80)
Tensile Strength, lb (kg)	800 (360)
Flat Plate Crush Strength, lb/in (kg/mm)	250 (4.5)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0245	0.0804	90.0
1	0.0350	0.115	79.0
1.5	0.0431	0.141	64.1
2	0.0500	0.164	55.2
10	0.114	0.374	24.8
20	0.163	0.533	17.1
30	0.200	0.656	13.8
50	0.260	0.853	10.5
88	0.347	1.14	7.86
100	0.370	1.21	7.36
108	0.386	1.27	7.05
150	0.460	1.51	5.86
174	0.500	1.64	5.44
200	0.540	1.77	5.06
300	0.665	2.18	4.07
400	0.772	2.53	3.49
450	0.822	2.70	3.27
500	0.870	2.85	3.09
512	0.881	2.89	3.06
600	0.959	3.15	2.80
700	1.04	3.42	2.58
800	1.12	3.68	2.40
824	1.14	3.74	2.37
894	1.19	3.92	2.26
960	1.24	4.07	2.17
1000	1.27	4.17	2.12
1250	1.43	4.68	1.89
1500	1.57	5.15	1.72
1700	1.69	5.53	1.62
2000	1.85	6.07	1.49
2300	2.03	6.65	1.36
3000†	2.41	7.90	1.15
4000	2.90	9.51	0.954
5000	3.30	10.8	0.828
5200	3.40	11.1	0.807

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For average Power. VSWR 1.0 inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.
† Contact Andrew for information on operation in the 3050-3200 MHz band.



HELIAX®
Coaxial Cables

N Female
H5PNF

N Female
H5NF-T

7/8" EIA Flange
75AR

7-16 DIN Male
H5PDM

7-16 DIN Female
H5PDF

N Male
H5PNM

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male		**H5PNM**	75PW	Self-tapping	Tab Flare	SG	3.5 (89)	1.4 (36)
N Male	Tunable	**H5NM-T**	75WT	Self-tapping	Tab Flare	BB	8.5 (216)	1.4 (36)
N Female		**H5PNF**	75PN	Self-tapping	Tab Flare	SG	3.4 (86)	1.4 (36)
N Female	Tunable	**H5NF-T**	75NT	Self-tapping	Tab Flare	BB	8.2 (208)	1.4 (36)
7-16 DIN Male		**H5PDM**	75ADM	Spring Finger	Tab Flare	SS	2.8 (71)	1.4 (36)
7-16 DIN Female		**H5PDF**	75ADF	Spring Finger	Tab Flare	SS	2.8 (71)	1.4 (36)
7/8" EIA Flange	Gas Pass	**75AR**	–	Self-tapping	Tab Flare	BB	3.7 (94)	2.25 (57)
7/8" EIA Flange	Gas Pass, Tunable	**75ART**	–	Self-tapping	Tab Flare	BB	5.9 (150)	2.25 (57)
7/8" EIA Flange	Gas Barrier	**75AG**	–	Self-tapping	Tab Flare	BB	3.7 (94)	2.25 (57)
7/8" EIA Flange	Gas Barrier, Tunable	**75AGT**	–	Self-tapping	Tab Flare	BB	5.9 (150)	2.25 (57)
UHF Female		**75AU**	–	Self-tapping	Tab Flare	BS	3.4 (86)	1.4 (36)
LC Male		**75AM**	–	Self-tapping	Tab Flare	BB	5.0 (127)	1.4 (36)
End Terminal		**75AT**	–	Self-tapping	Tab Flare	BB	5.1 (130)	1.4 (36)
Splice		**75AZ**	–	Self-tapping	Tab Flare	BB	4.2 (107)	1.4 (36)

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 428 for further information.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For H5PNF, H5PNM, 75AR, 75PN, 75PW	**34767A-3**
For 75AG, 75AU	**34767A-5**
For 75ART, 75AGT	**34767A-44**
For H5NF-T, 75NT	**34767A-18**
Bulkhead Adapter, for N or UHF Females	**26016-2**
90°, 7/8" EIA Miter Elbow, includes one inner connector	**1060A**

Terrestrial Microwave – Low VSWR Specifications

Frequency Band, GHz	Type No.	Recommended Connectors 7/8" EIA No Gas Barrier	7/8" EIA Gas Barrier	Type N Plug	Type N Jack	VSWR, max. (R.L.)
1.7-1.9	**HJ5P-50-17L**	75ART	75AGT	H5NM-T	H5NF-T	1.08 (28.3)
1.85-1.99	**HJ5P-50-18**	75AR*	75AG*	H5NM-T	H5NF-T	1.08 (28.3)
2.11-2.2	**HJ5P-50-21**	75AR*	75AG*	H5NM-T	H5NF-T	1.08 (28.3)
1.7-2.11	**HJ5P-50-17**	75ART	75AGT	H5NM-T	H5NF-T	1.08 (28.3)
1.9-2.3	**HJ5P-50-19**	75ART	75AGT	H5NM-T	H5NF-T	1.08 (28.3)
2.3-2.7	**HJ5P-50-23W**	75ART	75AGT	H5NM-T	H5NF-T	1.08 (28.3)
3.625-4.2	**HJ5P-50-36**	–	–	H5PNM	H5PNF	1.20 (20.8)

* Tunable connector may be used.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.

Accessories –

Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-2**

Description	Type No.
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	**206930**
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	**207030**
Kit of ten	**207030-2**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-2**
Angle Adapter for insulated hanger	**40430-1**
Stainless Steel Wraplock (Round Tower Members)	**12395-1**
Hoisting Grip	**19256B**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

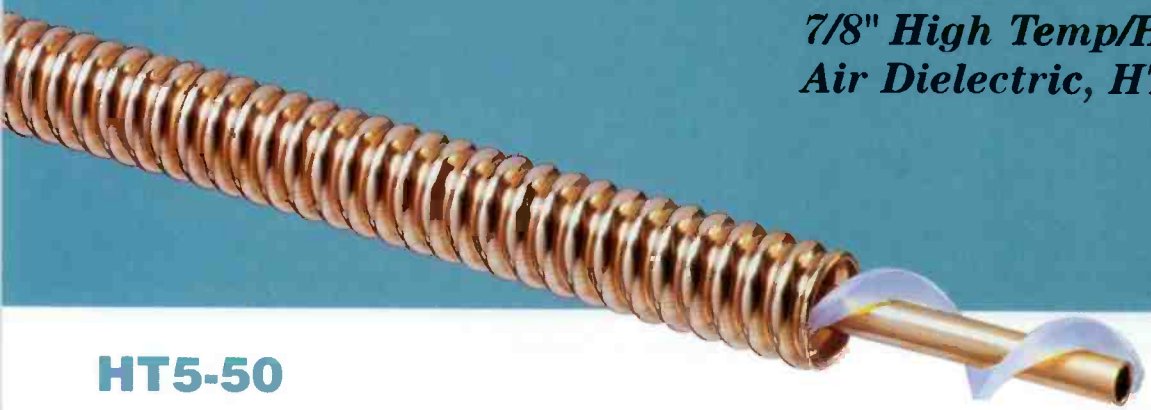
Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole	**204679-2**	**48939-1**
Three Hole		**48939-2**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

HELIAX®
Coaxial Cables

50-ohm
7/8" High Temp/High Power Air Dielectric, HT Series



HT5-50

Cable Ordering Information

Description	Type No.
Standard Cable	
7/8" Standard Cable, Unjacketed	HT5-50

Characteristics

Electrical	
Impedance, ohms	50 ± 1
Maximum Frequency, GHz	5.2
Velocity, percent	92.5
Peak Power Rating, kW	90
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.25 (0.82)
Outer	0.20 (0.66)
dc Breakdown, volts	6000
Capacitance, pF/ft (m)	21.7 (71.2)
Inductance, µH/ft (m)	0.055 (0.182)
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper Tube
Diameter over Copper Outer Conductor, in (mm)	1.01 (25.5)
Minimum Bending Radius, in (mm)	10 (250)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	29 (39.3)
Cable Weight, lb/ft (kg/m)	0.45 (0.67)
Tensile Strength, lb (kg)	800 (360)
Flat Plate Crush Strength, lb/in (kg/mm)	240 (4.3)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0253	0.0829	90.0
1	0.0360	0.118	90.0
1.5	0.0442	0.145	90.0
2	0.0512	0.168	90.0
10	0.118	0.387	59.2
20	0.171	0.561	40.8
30	0.213	0.698	32.7
50	0.282	0.925	24.7
88	0.389	1.28	17.9
100	0.419	1.38	16.6
108	0.438	1.44	15.9
150	0.532	1.75	13.1
174	0.581	1.91	11.9
200	0.632	2.07	11.0
300	0.813	2.67	8.59
400	0.972	3.19	7.18
450	1.05	3.44	6.65
500	1.12	3.69	6.21
512	1.14	3.74	6.11
600	1.26	4.15	5.52
700	1.40	4.59	4.99
800	1.53	5.03	4.55
824	1.56	5.13	4.47
894	1.65	5.42	4.23
960	1.73	5.69	4.03
1000	1.78	5.85	3.92
1250	2.08	6.84	3.34
1500	2.37	7.77	2.94
1700	2.59	8.50	2.20
2000	2.91	9.56	1.51
2300	3.24	10.6	1.49
3000†	3.95	13.0	1.46
4000	4.91	16.1	1.42
5000	5.84	19.2	1.19
5200	6.02	19.8	1.16

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For average power, VSWR 1.0 inner temperature 200°C (392°F), ambient temperature 40°C (104°F) atmospheric pressure, dry air, no solar loading.
† Operation of this cable in the 3550-3700 MHz band is not recommended because of VSWR spikes produced by the dielectric section spacing.

HELIAX®
Coaxial Cables

N Female
H5PNF

7-16 DIN Male
H5PDM

7-16 DIN Female
H5PDF

7/8" EIA Flange
75AR

N Male
H5PNM

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male		**H5PNM**	75PW	Self-tapping	Tab Flare	SG	3.5 (89)	1.4 (36)
N Female		**H5PNF**	75PN	Self-tapping	Tab Flare	SG	3.4 (86)	1.4 (36)
7-16 DIN Male		**H5PDM**	75ADM	Spring Finger	Tab Flare	SS	2.8 (71)	1.4 (36)
7-16 DIN Female		**H5PDF**	75ADF	Spring Finger	Tab Flare	SS	2.8 (71)	1.4 (36)
7/8" EIA Flange	Gas Pass	**75AR**	–	Self-tapping	Tab Flare	BB	3.7 (94)	2.25 (57)
7/8" EIA Flange	Gas Barrier	**75AG**	–	Self-tapping	Tab Flare	BB	3.7 (94)	2.25 (57)
UHF Female		**75AU**	–	Self-tapping	Tab Flare	BS	3.4 (86)	1.4 (36)
LC Male		**75AM**	–	Self-tapping	Tab Flare	BB	5.0 (127)	1.4 (36)
End Terminal		**75AT**	–	Self-tapping	Tab Flare	BB	5.1 (130)	1.4 (36)
Splice		**75AZ**	–	Self-tapping	Tab Flare	BB	4.2 (107)	1.4 (36)

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 428 for further information.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For H5PNF, H5PNM, 75AR, 75PN, 75PW	**34767A-3**
For 75AG, 75AU	**34767A-5**
For 75ART, 75AGT	**34767A-44**
For H5NF-T, 75NT	**34767A-18**
Bulkhead Adapter, for N or UHF Females	**26016-2**
90°, 7/8" EIA Mitre Elbow, includes one inner connector	**1060A**

HELIAX® Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-2**

Description	Type No.
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	**206930**
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	**207030**
Kit of ten	**207030-2**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-2**
Angle Adapter for insulated hanger	**40430-1**
Stainless Steel Wraplock (Round Tower Members)	**12395-1**
Hoisting Grip	**19256B**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

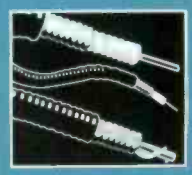
	4 in Boots	5 in Boots
One Hole	**204679-2**	**48939-1**
Three Hole		**48939-2**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

50-ohm

1-5/8" Air Dielectric, HJ Series

HELIAX® Coaxial Cables



HJ7-50A

Cable Ordering Information

Description	Type No.
Standard Cable	
1-5/8" Standard Cable, Standard Jacket	HJ7-50A
Enhanced Power Cable	
1-5/8" Cable with Polyolefin Dielectric for 25% increase in power ratings	27591-101
Fire Retardant Cables	
1-5/8" Fire Retardant Jacket (CATVP)	HJ7RP-50A
1-5/8" Fire Retardant Jacket (CATVR)	HJ7RN-50A
Low VSWR and Specialized Cables	
1-5/8" Low VSWR, specify operating band	HJ7P-50A-(**)
1-5/8" Low VSWR, specify operating band	HJ7SP-50A-(**)
Cable for Cellular, standard jacket	
824-894 MHz, 1.20 VSWR, max.	25816A-31
880-960 MHz, 1.20 VSWR, max.	25816A-32
880-960 MHz, 1.10 VSWR, max.	25816A-33
Cable for Cellular, fire retardant jacket (CATVR)	
824-894 MHz, 1.20 VSWR, max.	41690-79
Broadcast, Low VSWR	42140*
54-216 MHz, 1.05 VSWR, max. over broadcast channel	
470-740 MHz, 1.08 VSWR, max. over broadcast channel	
806-856 MHz, 1.10 VSWR, max. over broadcast channel	

* For broadcast applications, specify channel or frequency.
** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	2.7
Velocity, percent	92.1
Peak Power Rating, kW	305
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.22 (0.72)
Outer	0.10 (0.33)
dc Breakdown, volts	11000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	22.1 (72.4)
Inductance, µH/ft (m)	0.055 (0.181)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.98 (50.3)
Diameter over Copper Outer Conductor, in (mm)	1.83 (46.5)
Diameter Inner Conductor, in (mm)	0.713 (18.1)
Nominal Inside Transverse Dimensions (cm)	3.99
Minimum Bending Radius, in (mm)	20 (510)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	30 (40.7)
Cable Weight, lb/ft (kg/m)	1.04 (1.55)
Tensile Strength, lb (kg)	750 (340)
Flat Plate Crush Strength, lb/in (kg/mm)	175 (3.1)

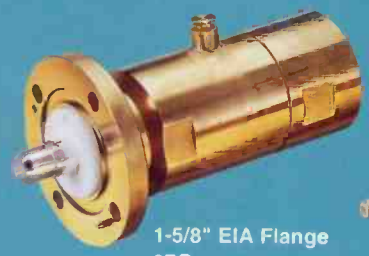
Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0143	0.0469	217
1	0.0200	0.0656	178.2
1.5	0.0244	0.0799	147.2
2	0.0280	0.0919	126.5
10	0.0640	0.210	55.2
20	0.0911	0.299	38.4
30	0.112	0.367	31.0
50	0.145	0.476	23.8
88	0.194	0.636	17.7
100	0.207	0.679	16.5
108	0.215	0.705	15.8
150	0.252	0.827	13.4
174	0.271	0.889	12.4
200	0.290	0.951	11.5
300	0.361	1.18	9.34
400	0.422	1.38	8.06
450	0.451	1.48	7.55
500	0.478	1.57	7.14
512	0.484	1.59	7.04
600	0.528	1.73	6.46
700	0.576	1.89	5.94
800	0.619	2.03	5.54
824	0.629	2.07	5.46
894	0.658	2.16	5.24
960	0.684	2.25	5.05
1000	0.700	2.30	4.94
1250	0.794	2.61	4.35
1500	0.880	2.89	3.91
1700	0.950	3.12	3.64
2000	1.05	3.44	3.33
2300	1.15	3.76	3.01
2700	1.27	4.17	2.69

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power, VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

N Female
H7PNF

7-16 DIN Male
H7PDM



1-5/8" EIA Flange
87G

7/8" EIA Flange
87S

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male	Tunable	**H7NM-T**	87WT	Tab Flare	Tab Flare	BB	11.6 (295)	2.4 (61)
N Female		**H7PNF**	87PN	Tab Flare	Tab Flare	SG	4.1 (104)	2.4 (61)
N Female	Tunable	**H7NF-T**	87NT	Tab Flare	Tab Flare	BB	11.4 (290)	2.4 (61)
7-16 DIN Male		**H7PDM**	87ADM	Tab Flare	Tab Flare	SS	4.2 (107)	2.7 (69)
7-16 DIN Female		**H7PDF**	–	Tab Flare	Tab Flare	SS	4.2 (107)	2.7 (69)
1-5/8" EIA Flange	Gas Pass†	**87R**	–	Tab Flare	Tab Flare	BB	4.8 (122)	3.5 (89)
1-5/8" EIA Flange	Gas Block†	**87G**	–	Tab Flare	Tab Flare	BB	5.7 (145)	3.5 (89)
7/8" EIA Flange	Gas Pass†	**87S**	–	Tab Flare	Tab Flare	BB	5.6 (142)	2.4 (61)
7/8" EIA Flange	Gas Pass, Tunable†	**87ST**	–	Tab Flare	Tab Flare	BB	11.8 (300)	2.4 (61)
7/8" EIA Flange	Gas Block†	**87SG**	–	Tab Flare	Tab Flare	BB	5.6 (142)	2.4 (61)
7/8" EIA Flange	Gas Block, Tunable†	**87SGT**	–	Tab Flare	Tab Flare	BB	12.2 (310)	2.4 (61)
LC Female		**87L**	–	Tab Flare	Tab Flare	BB	4.9 (124)	2.4 (61)
End Terminal		**87T**	–	Tab Flare	Tab Flare	BB	7.0 (178)	2.4 (61)
Splice		**87Z**	–	Tab Flare	Tab Flare	BB	5.9 (150)	2.4 (61)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 362 for further information. † Includes inner.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For 87G, 87R	**34767A-6**
For H7PNF, 87PN, 87S, 87SG	**34767A-7**
For 87SGT, 87ST	**34767A-20**
For H7NF-T, H7NM-T, 87NT, 87WT	**34767A-19**
For 87Z	**34767A-13**
7/8" EIA Gas Barrier	**1260A**

Connector Accessories

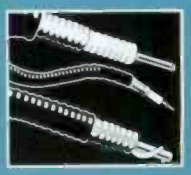
	Type Number
1-5/8" EIA Gas Barrier	**1261B**
1-5/8" EIA End Terminal, for strap connection to center conductor, includes inner connector. Use with 87R	**2061**
1-5/8" Inner Connector, with anchor bead	**34660**
1-5/8" EIA 90° Miter Elbow, includes one inner connector	**1061A**

Terrestrial Microwave, Low VSWR Specifications

Frequency Band, GHz	Type No.	Recommended Connectors: No Gas Barrier	Recommended Connectors: 7/8" EIA Gas Barrier	Recommended Connectors: 7/8" EIA Type N Plug	Recommended Connectors: Type N Jack	VSWR, max. (R.L.)
P Series						
1.7-1.9	**HJ7P-50A-17L**	87ST	87SGT	H7NM-T	H7NF-T	1.15 (23.1)
1.85-1.99	**HJ7P-50A-18**	87S*	87SG*	H7NM-T	H7NF-T	1.15 (23.1)
2.11-2.2	**HJ7P-50A-21**	87S*	87SG*	H7NM-T	H7NF-T	1.15 (23.1)
1.7-2.11	**HJ7P-50A-17**	87ST	87SGT	H7NM-T	H7NF-T	1.15 (23.1)
1.9-2.3	**HJ7P-50A-19**	87ST	87SGT	H7NM-T	H7NF-T	1.15 (23.1)
2.3-2.7	**HJ7P-50A-23W**	87ST	87SGT	H7NM-T	H7NF-T	1.15 (23.1)
SP Series						
1.7-1.9	**HJ7SP-50A-17L**	87ST	87SGT	–	–	1.10 (26.4)
		–	–	H7NM-T	H7NF-T	1.12 (24.8)
1.85-1.99	**HJ7SP-50A-18**	87ST	87SGT	–	–	1.10 (26.4)
		–	–	H7NM-T	H7NF-T	1.12 (24.8)
2.11-2.2	**HJ7SP-50A-21**	87ST	87SGT	–	–	1.10 (26.4)
		–	–	H7NM-T	H7NF-T	1.12 (24.8)
1.7-2.11	**HJ7SP-50A-17**	87ST	87SGT	–	–	1.10 (26.4)
		–	–	H7NM-T	H7NF-T	1.12 (24.8)
1.9-2.3	**HJ7SP-50A-19**	87ST	87SGT	–	–	1.10 (26.4)
		–	–	H7NM-T	H7NF-T	1.12 (24.8)

* Tunable connector may be used.

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.



Accessories –

Photos and descriptions on pages 544-572.

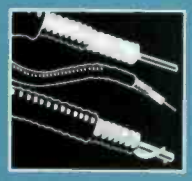
Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	42396A-2
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	31769-5
1" (25) mm long	31769-1
Angle Adapter, kit of 10.	
Stainless Steel	31768A
Galvanized	242774
Galvanized, metric hardware	242774-M
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	31670-1
2-3 (50-75)	31670-2
3-4 (75-100)	31670-3
4-5 (100-125)	31670-4
5-6 (125-150)	31670-5
6-8 (150-200)	31670-6
Threaded Rod Support 3/8" rod, nuts, washers, celling bracket	
12 In (305 mm) long, kit of 1	31771
12 in (305 mm) long, kit of 5	31771-4
24 in (610 mm) long, kit of 1	31771-9
24 in (610 mm) long, kit of 5	31771-6
36 in (915 mm) long, kit of 5	31771-10
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	30848-5
1.5-3.0 (40-50)	30848-4
3-4 (75-100)	30848-1
4-5 (100-125)	30848-2
5-6 (125-150)	30848-3
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	41108A-1
4-5 (100-125)	41108A-2
5-6 (125-150)	41108A-3
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 4 ft (1.22 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	206706-4

Description	Type No.
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	206929-1
4 cable runs, 2 connections required	206929-4
8 cable runs, 3 connections required	206929-8
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	206930
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	207030
Kit of 10	207030-2
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	33948-3
Angle Adapter for insulated hanger	13555A
Round Member Adapter for insulated hanger fits member diameters 1-3 in (25-75 mm)	13550
Hoisting Grip	24312A
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	204989-4
factory attached, two-hole lug, 24 in (610 mm) lead	241088-4
field attachable crimp-on, one-hole lug, 36 In (915 mm) lead	204989-24
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	241088-9
field attachable screw-on lug, 36 in (915 mm lead)	204989-34
Crimping Tool to field attach lug to Grounding Kit	207270
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	221213
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	40656A-2

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	204673-1	48940-1
1	204673-2	
2		48940-2
3		48940-3
4	204673-4	48940-4
6		48940-6
8	204673-8	
12	204673-12	
	4 in Boots	5 in Boots
One Hole	204679-4	48939-4

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.



HELIAX®
Coaxial Cables

50-ohm
2-1/4" Air Dielectric, HJ Series

HJ12-50

Cable Ordering Information

Description	Type No.
Standard Cable	
2-1/4" Standard Cable, Standard Jacket	HJ12-50
Fire Retardant Cable	
2-1/4" Fire Retardant Jacket (CATVR)	HJ12RN-50
Low VSWR and Specialized Cables	
2-1/4" Low VSWR, specify operating band	HJ12P-50-(**)
Cable for Cellular, standard jacket	
824-894 MHz, 1.20 VSWR, max.	207760
880-960 MHz, 1.20 VSWR, max.	207760-2
880-960 MHz, 1.10 VSWR, max.	207760-3
Broadcast, Low VSWR	207761*
54-216 MHz, 1.05 VSWR, max. over broadcast channel	
470-740 MHz, 1.08 VSWR, max. over broadcast channel	
740-856 MHz, 1.10 VSWR, max. over broadcast channel	

* For broadcast applications, specify channel or frequency.
** Insert suffix number from "Low VSWR Specifications" table.

Characteristics

Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	2.3
Velocity, percent	93.1
Peak Power Rating, kW	425
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.17 (0.56)
Outer	0.075 (0.25)
dc Breakdown, volts	13000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	21.8 (71.5)
Inductance, µH/ft (m)	0.055 (0.180)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	2.38 (60.4)
Diameter over Copper Outer Conductor, in (mm)	2.23 (56.6)
Diameter Inner Conductor, in (mm)	0.890 (22.6)
Nominal Inside Transverse Dimension (cm)	4.96
Minimum Bending Radius, in (mm)	22 (560)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	55 (75)
Cable Weight, lb/ft (kg/m)	1.16 (1.73)
Tensile Strength, lb (kg)	980 (445)
Flat Plate Crush Strength, lb/in (kg/mm)	145 (2.6)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0113	0.0371	345
1	0.0161	0.0528	240.3
1.5	0.0198	0.0650	204.7
2	0.0229	0.0752	170.2
10	0.0517	0.170	75.3
20	0.0737	0.241	53.0
30	0.0906	0.297	43.0
50	0.118	0.387	33.1
88	0.158	0.519	25.1
100	0.169	0.554	23.1
108	0.176	0.577	22.6
150	0.209	0.686	18.6
174	0.226	0.743	17.2
200	0.244	0.800	15.9
300	0.303	0.994	12.8
400	0.354	1.16	11.0
450	0.378	1.24	10.3
500	0.400	1.31	9.74
512	0.406	1.33	9.61
600	0.442	1.45	8.81
700	0.482	1.58	8.08
800	0.519	1.70	7.50
824	0.528	1.73	7.38
894	0.553	1.81	7.04
960	0.576	1.89	6.77
1000	0.589	1.93	6.61
1250	0.669	2.20	5.83
1500	0.744	2.44	5.24
1700	0.800	2.63	4.87
2000	0.880	2.89	4.42
2300	0.956	3.14	4.08

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power. VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

HELIAX® Coaxial Cables

N Female
H12PNF

3-1/8" EIA Flange
82GF

1-5/8" EIA Flange
82R

7/8" EIA Flange
82S

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Female		**H12PNF**	82PN	Tab Flare	Tab Flare	SG	4.4 (112)	2.8 (71)
7-16 DIN Male		**H12PDM**	82ADM	Tab Flare	Tab Flare	SS	4.5 (114)	3.1 (79)
3-1/8" EIA Flange	Gas Pass, Female	**82RF**	–	Tab Flare	Tab Flare	BB	6.9 (175)	5.2
3-1/8" EIA Flange	Gas Barrier, Female	**82GF**	–	Tab Flare	Tab Flare	BB	6.9 (175)	5.2
1-5/8" EIA Flange	Gas Pass, Male	**82R**	–	Tab Flare	Tab Flare	BB	4.8 (122)	3.5 (89)
7/8" EIA Flange	Gas Pass, Male	**82S**	–	Tab Flare	Tab Flare	BB	5.7 (145)	2.8 (71)
Splice		**82Z**	–	Tab Flare	Tab Flare	BB	5.9 (150)	3.4 (86)

Plating Codes: BB - Brass Body and Pin, SG - Silver Plated Body and Gold Plated Pin, SS - Silver Plated Body and Pin
* Previous Type Number. See page 428 for further information.

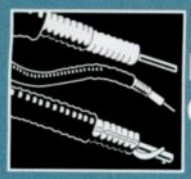
Connector Accessories

	Type Number
Connector Reattachment Kit	
For H12PNF, 82PN	**34767A-46**
For 82R	**34767A-47**
1-5/8" EIA Gas Barrier	**1261B**
1-5/8" EIA End Terminal, for strap connection to center conductor, includes inner connector. Use with 82R	**2061**
1-5/8" Inner Connector, with anchor bead	**34660**
3-1/8" Inner Connector, with anchor bead	**ACX350-20**
3-1/8" EIA 90° Miter Elbow, includes inner conductor	**STD350-10**
1-5/8" EIA 90° Miter Elbow	**1061A**
7/8" EIA 90° Miter Elbow	**1060A**

Terrestrial Microwave – Low VSWR Specifications

Frequency Band, GHz	Type No.	Recommended Connectors: 7/8" EIA No Gas Barrier	Recommended Connectors: Type N Jack	Recommended Connectors: VSWR, max. (R.L.)	Frequency Band, Ghz	Type No.	Recommended Connectors: 7/8" EIA No Gas Barrier	Recommended Connectors: Type N Jack	Recommended Connectors: VSWR, max. (R.L.)
1.7-1.9	**HJ12P-50-17L**	82S	H12PNF	1.15 (23.1)	1.7-2.11	**HJ12P-50-17**	82S	H12PNF	1.15 (23.1)
1.85-1.99	**HJ12P-50-18**	82S	H12PNF	1.15 (23.1)	1.9-2.3	**HJ12P-50-19**	82S	H12PNF	1.15 (23.1)
2.11-2.2	**HJ12P-50-21**	82S	H12PNF	1.15 (23.1)					

VSWR values are guaranteed for factory fit assemblies and are typical for field cut lengths. If two different connector interfaces are selected, the higher VSWR value is guaranteed.



HELIAX® Coaxial Cables

Accessories –

Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-4**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33948-6**
Angle Adapter for insulated hanger	**13555A**
Round Member Adapter for insulated hanger fits member diameters 1-3 in (25-75 mm)	**13550**
Hoisting Grip	**31535**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-5**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-5**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-25**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-10**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-35**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see pages 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-6**

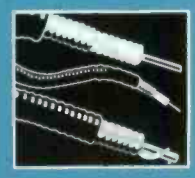
Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole	**204679-8**	**48939-9**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

HELIAX®
Coaxial Cables



50-ohm
3" Air Dielectric, HJ Series

HJ8-50B

Cable Ordering Information

Description	Type No.
Standard Cable	
3" Standard Cable, Standard Jacket	**HJ8-50B**
Low VSWR and Specialized Cables	
Cable for Cellular, standard jacket 824-894 MHz, 1.20 VSWR, max.	**209227**
Broadcast, Low VSWR	**42141***
54-216 MHz, 1.05 VSWR, max. over broadcast channel	
470-740 MHz, 1.08 VSWR, max. over broadcast channel	
740-856 MHz, 1.10 VSWR, max. over broadcast channel	
Cable with Polyethylene Dielectric (12% lower attenuation at 800 MHz)	**27591-6**

* For broadcast applications, specify channel or frequency.

Characteristics

Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	1.64
Velocity, percent	93.3
Peak Power Rating, kW	640
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.15 (0.49)
Outer	0.07 (0.23)
dc Breakdown, volts	16000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	21.7 (71.2)
Inductance, µH/ft (m)	0.055 (0.18)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	3.01 (76.6)
Diameter over Copper Outer Conductor, in (mm)	2.85 (72.4)
Diameter Inner Conductor, in (mm)	1.14 (29.0)
Nominal Inside Transverse Dimensions, (cm)	6.35
Minimum Bending Radius, in (mm)	30 (760)
Number of Bends, minimum (typical)	15 (25)
Bending Moment, lb-ft (N•m)	30 (41)
Cable Weight, lb/ft (kg/m)	1.78 (2.6)
Tensile Strength, lb (kg)	750 (340)
Flat Plate Crush Strength, lb/in (kg/mm)	175 (3.1)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0089	0.0292	640
1	0.0130	0.0427	473
1.5	0.0162	0.0533	379
2	0.0190	0.0623	325
10	0.0430	0.141	142
20	0.0611	0.200	99.3
30	0.0750	0.246	80.5
50	0.0980	0.322	62.1
88	0.131	0.430	45.6
100	0.140 (0.136)	0.459 (0.448)	42.5 (33.4)
108	0.147	0.481	40.7
150	0.178	0.584	33.9
174	0.193	0.633	31.2
200	0.208	0.682	28.7
300	0.266	0.872	22.7
400	0.317	1.04	19.3
450	0.341 (0.309)	1.12 (1.01)	19.9 (14.7)
500	0.364	1.20	16.8
512	0.370	1.21	16.5
600	0.409	1.34	14.9
700	0.450	1.48	13.5
800	0.488 (0.429)	1.60 (1.41)	12.4 (10.6)
824	0.497	1.63	12.2
894	0.523	1.72	11.5
960	0.546	1.79	11.0
1000	0.560	1.84	10.69
1250	0.658	2.18	9.14
1500	0.750	2.48	8.05
1640	0.792	2.60	7.58

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power. VSWR 1.0, inner temperature 121°C (250°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

3-1/8" EIA Flange
H8MP-302

1-5/8" EIA Flange
78AS

Connectors

Interface	Description	Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
3-1/8" EIA Flange	Gas pass, captivated inner connector	**H8MP-302**	Tab Flare	Tab Flare	BB	8.06 (204.7)	5.19 (131.7)
3-1/8" EIA Flange	Gas block, captivated inner connector**	**H8MB-302**	Tab Flare	Tab Flare	BB	8.06 (204.7)	5.19 (131.7)
3-1/8" EIA Flange	Gas pass, no inner connector	**H8FP-302**	Tab Flare	Tab Flare	BB	6.0 (152.4)	5.19 (131.7)
3-1/8" EIA Flange	Gas block, no inner connector	**H8FB-302**	Tab Flare	Tab Flare	BB	6.0 (152.4)	5.19 (131.7)
1-5/8" EIA Flange	Gas Pass, Inner connector	**78AS**	Tab Flare	Tab Flare	BB	3.9 (99)	3.6 (91)
Splice		**78BZ**	Tab Flare	Tab Flare	BB	6.1 (155)	5.3 (135)

* **Plating Codes:** BB - Brass Body and Pin ** Universal application - designed so that all connector variations of same flange size can be accommodated by modifying this connector, using instructions provided.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For H8MP-302, H8MB-302, H8FP-302, H8FB-302	**34767A-60**
For 78AGF, 78ARM, 78ARF, 78AGM, 78AS	**34767A-10**
For 78BZ	**34767A-30**
3-1/8" EIA End Terminal, for strap connection to center conductor, includes inner connector. Use with H8FP-302.	**2062**
3-1/8" Inner Connector, with anchor bead	**ACX350-20**
1-5/8" Inner Conductor, with anchor bead	**34660**
3-1/8" EIA 90° Miter Elbow, Includes one inner connector	**STD350-10**
1-5/8" EIA 90° Miter Elbow	**1061A**

Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**31766A-11**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 In (305 mm) long, kit of 5	**31771-4**
24 In (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**

Accessories – Continued

Description	Type No.
Tower Standoff Kit of 10. 1 In (25 mm) standoff. Member Diameter, In (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33948-2**
Angle Adapter for insulated hanger	**13555A**
Round Member Adapter for insulated hanger fits memberdiameters 1-3 in (25-75 mm)	**13550**
Hoisting Grip	**26985A**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-5**
field attachable crimp-on, one-hole lug, 36 In (915 mm) lead	**204989-25**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-35**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40394-2**

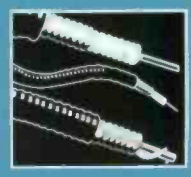
Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	
	4 In Boots	5 In Boots
One Hole	**204679-9**	**48939-10**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.

50-ohm
4" Air Dielectric, HJ Series

HELIAX®
Coaxial Cables



HJ11-50

Cable Ordering Information

Description	Type No.
Standard Cable	
4" Standard Cable, Standard Jacket	**HJ11-50**
Low VSWR and Specialized Cables	
Broadcast, Low VSWR 54-216 MHz, 1.05 VSWR, max. over broadcast channel 470-740 MHz, 1.08 VSWR, max. over broadcast channel 740-856 MHz, 1.10 VSWR, max. over broadcast channel	**42144***

* For broadcast applications, specify channel or frequency.

Characteristics

Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	1.22
Velocity, percent	92
Peak Power Rating, kW	1100
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.11 (0.36)
Outer	0.04 (0.13)
dc Breakdown, volts	21000
Jacket Spark, volts RMS	10000
Capacitance, pF/ft (m)	22.0 (72.2)
Inductance, µH/ft (m)	0.055 (0.18)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	4.00 (102)
Diameter over Copper Outer Conductor, in (mm)	3.84 (97)
Diameter Inner Conductor, in (mm)	1.55 (39.4)
Nominal Inside Transverse Dimensions, (cm)	8.55
Minimum Bending Radius, in (mm)	40 (1015)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	191 (259)
Cable Weight, lb/ft (kg/m)	2.50 (3.72)
Tensile Strength, lb (kg)	900 (408)
Flat Plate Crush Strength, lb/in (kg/mm)	280 (5.0)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0071	0.0234	1026
1	0.0100	0.0328	729
1.5	0.0122	0.0399	598
2	0.0140	0.0459	517
10	0.0330	0.108	220
20	0.0481	0.158	151
30	0.0600	0.197	123
50	0.0780	0.256	94.3
88	0.106	0.346	69.1
100	0.113	0.371	64.4
108	0.118	0.387	61.7
150	0.141	0.464	51.7
174	0.154	0.504	47.8
200	0.166	0.545	44.5
300	0.212	0.695	35.1
400	0.252	0.825	29.5
450	0.270	0.885	27.6
500	0.287	0.943	26.0
512	0.291	0.956	25.6
600	0.320	1.05	23.3
700	0.351	1.15	21.7
800	0.379	1.24	19.6
824	0.385	1.26	19.3
894	0.403	1.32	18.4
960	0.420	1.38	17.7
1000	0.430	1.41	17.2

Standard Conditions:
For Attenuation, VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power, VSWR 1.0, inner temperature 121°C (250°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

6-1/8" EIA Flange
H11FP-602

3-1/8" EIA Flange
H11FB-302

Connectors

Interface	Description	Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code*	Maximum Length in (mm)	Maximum Diameter in (mm)
6-1/8" EIA Flange	Gas pass, includes inner connector	**H11MP-602**	Tab Flare	Tab Flare	BB	11.3 (288)	8.13 (207)
6-1/8" EIA Flange	Gas block, includes inner connector**	**H11MB-602**	Tab Flare	Tab Flare	BB	11.3 (288)	8.13 (207)
6-1/8" EIA Flange	Gas pass, no inner connector	**H11FP-602**	Tab Flare	Tab Flare	BB	8.5 (216)	8.13 (207)
6-1/8" EIA Flange	Gas block, no Inner connector	**H11FB-602**	Tab Flare	Tab Flare	BB	8.5 (216)	8.13 (207)
4-1/2" IEC Flange	Gas pass, includes inner connector	**H11MP-M408**	Tab Flare	Tab Flare	BB	9.4 (240)	6.36 (162)
4-1/2" IEC Flange	Gas block, includes inner connector**	**H11MB-M408**	Tab Flare	Tab Flare	BB	9.4 (240)	6.36 (162)
4-1/2" IEC Flange	Gas pass, no Inner connector	**H11FP-M408**	Tab Flare	Tab Flare	BB	7.0 (178)	6.36 (162)
4-1/2" IEC Flange	Gas block, no inner connector	**H11FB-M408**	Tab Flare	Tab Flare	BB	7.0 (178)	6.36 (162)
3-1/8" EIA Flange	Gas pass, includes Inner connector	**H11MP-302**	Tab Flare	Tab Flare	BB	9.1 (230)	5.2 (132)
3-1/8" EIA Flange	Gas block, Includes inner connector**	**H11MB-302**	Tab Flare	Tab Flare	BB	9.1 (230)	5.2 (132)
3-1/8" EIA Flange	Gas pass, no inner connector	**H11FP-302**	Tab Flare	Tab Flare	BB	7.0 (178)	5.2 (132)
3-1/8" EIA Flange	Gas block, no Inner connector	**H11FB-302**	Tab Flare	Tab Flare	BB	7.0 (178)	5.2 (132)
Splice		**81Z**	Tab Flare	Tab Flare	BB	7.0 (178)	6.0 (152)

* **Plating Codes:** BB - Brass Body and Pin ** Universal application - designed so that all connector variations of same flange size can be accommodated by modifying this connector, using instructions provided.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For H11( )-602	**34767A-57**
For H11( )-M408	**34767A-58**
For H11( )-302	**34767A-59**
For 81RF	**34767A-15**
For 81GF	**34767A-16**
For 42826	**34767A-40**
For 42896	**34767A-41**
For 81Z	**34767A-17**
3-1/8" End Terminal, for strap connection to center conductor, includes inner connector. Use with H11FP-302.	**2062**
6-1/8" EIA Inner Connector, with anchor bead	**STD650-20**
3-1/8" EIA Inner Connector, with anchor bead	**ACX350-20**
4-1/2" IEC Inner Connector, with anchor bead	**241252**
3-1/8" EIA 90° Mitre Elbow, includes one Inner connector	**STD350-10**
Reducer, 3-1/8" to 1-5/8", captivated 3-1/8" inner connector	**1861**
6-1/8" EIA 90° Miter Elbow, includes one inner connector	**STD650-10**

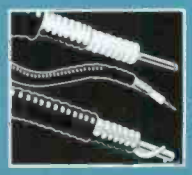
Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**31766A-10**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanizedl	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**

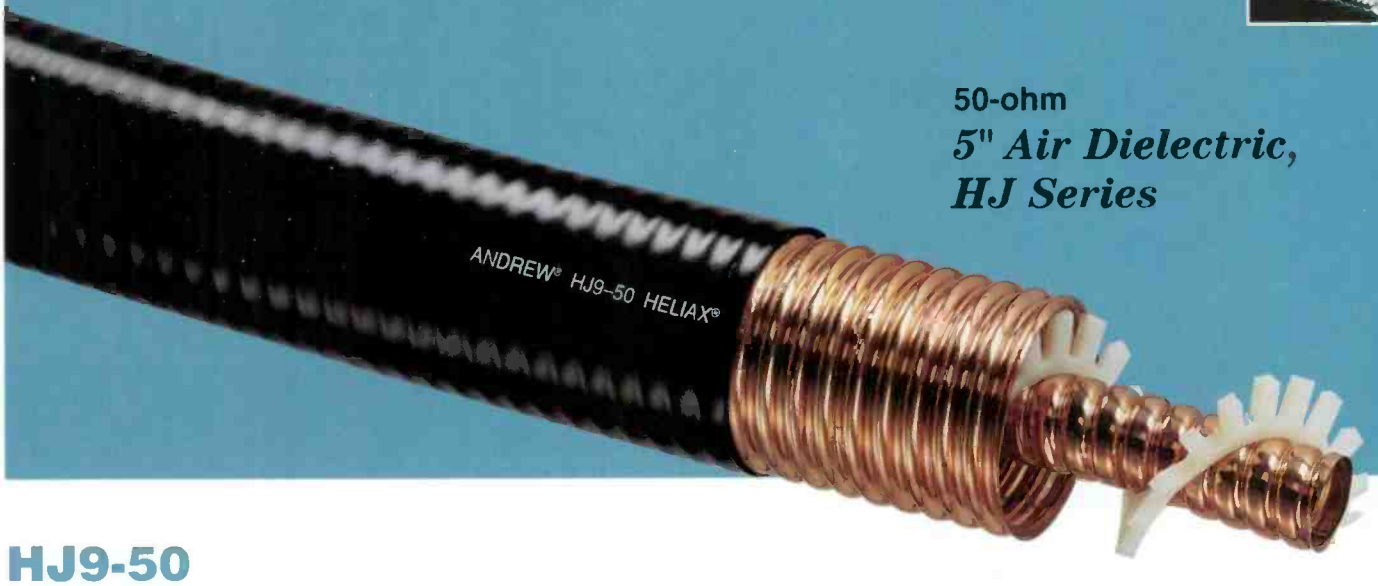
Accessories – Continued

Description	Type No.
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 In (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 In (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 In (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33948-4**
Angle Adapter for insulated hanger	**13555A**
Round Member Adapter for insulated hanger fits memberdiameters 1-3 In (25-75 mm)	**13550**
Hoisting Grip	**34759**
Grounding - for more Information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-6**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-26**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-36**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40394-1**
Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.	

HELIAX® Coaxial Cables



50-ohm
5" Air Dielectric, HJ Series



HJ9-50

Cable Ordering Information

Description	Type No.
Standard Cable	
5" Standard Cable, Standard Jacket	HJ9-50
Low VSWR and Specialized Cables	
Broadcast, Low VSWR	42142*
54-216 MHz, 1.05 VSWR, max. over broadcast channel	
470-740 MHz, 1.08 VSWR, max. over broadcast channel	
740-856 MHz, 1.10 VSWR, max. over broadcast channel	

* For broadcast applications, specify channel or frequency.

Characteristics

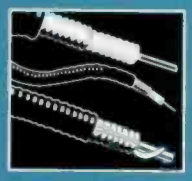
Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	0.96
Velocity, percent	93.1
Peak Power Rating, kW	1890
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.1 (0.3)
Outer	0.04 (0.13)
dc Breakdown, volts	27500
Jacket Spark, volts RMS	12000
Capacitance, pF/ft (m)	21.7 (71.2)
Inductance, μH/ft (m)	0.055 (0.18)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	5.20 (133)
Diameter over Copper Outer Conductor, in (mm)	5.00 (127)
Diameter Inner Conductor, in (mm)	1.72 (43.7)
Nominal Inside Transverse Dimensions, (cm)	11.3
Minimum Bending Radius, in (mm)	50 (1270)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	200 (271)
Cable Weight, lb/ft (kg/m)	3.3 (4.9)
Tensile Strength, lb (kg)	1000 (454)
Flat Plate Crush Strength, lb/in (kg/mm)	275 (4.9)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0053	0.0173	1253
1	0.0074	0.0243	900
1.5	0.0090	0.0296	745
2	0.0104	0.0341	644
10	0.0233	0.0764	284
20	0.0333	0.109	198
30	0.0410	0.135	162
50	0.0540	0.177	123
88	0.0736	0.242	90.0
100	0.0790	0.259	83.9
108	0.0823	0.270	80.6
150	0.0980	0.322	67.8
174	0.106	0.349	62.9
200	0.115	0.377	58.6
300	0.143	0.471	47.1
400	0.168	0.551	40.5
450	0.180	0.589	37.6
500	0.191	0.626	35.3
512	0.193	0.634	34.8
600	0.212	0.695	31.6
700	0.231	0.759	28.7
800	0.250	0.820	26.4
824	0.254	0.833	26.0
894	0.267	0.876	24.7
960	0.278	0.912	23.5

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power. VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.



HELIAX®
Coaxial Cables

6-1/8" EIA Flange
H9FP-602

Connectors

Interface	Description	Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter In (mm)
6-1/8" EIA Flange	Gas pass, includes inner connector	**H9MP-602**	Tab Flare	Tab Flare	BB	12.3 (313)	8.13 (207)
6-1/8" EIA Flange	Gas block, includes inner connector**	**H9MB-602**	Tab Flare	Tab Flare	BB	12.3 (313)	8.13 (207)
6-1/8" EIA Flange	Gas pass, no inner connector	**H9FP-602**	Tab Flare	Tab Flare	BB	9.5 (241)	8.13 (207)
6-1/8" EIA Flange	Gas block, no inner connector	**H9FB-602**	Tab Flare	Tab Flare	BB	9.5 (241)	8.13 (207)
4-1/2" IEC Flange	Gas pass, includes inner connector	**H9MP-M408**	Tab Flare	Tab Flare	BB	10.7 (272)	6.6 (168)
4-1/2" IEC Flange	Gas block, includes inner connector**	**H9MB-M408**	Tab Flare	Tab Flare	BB	10.7 (272)	6.6 (168)
4-1/2" IEC Flange	Gas pass, no inner connector	**H9FP-M408**	Tab Flare	Tab Flare	BB	8.3 (211)	6.6 (168)
4-1/2" IEC Flange	Gas block, no inner connector	**H9FB-M408**	Tab Flare	Tab Flare	BB	8.3 (211)	6.6 (168)
Splice		**79AZ**	Tab Flare	Tab Flare	BB	6.2 (157)	7.6 (193)

* **Plating Codes:** BB - Brass Body and Pin ** Universal application - designed so that all connector variations of same flange size can be accommodated by modifying this connector, using Instructions provided.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For 79AG, 79AR	**34767A-45**
For H9( )-602	**34767A-55**
For H9( )-M408	**34767A-56**
For 79AZ	**34767A-31**
6-1/8" EIA Inner Connector with anchor bead	**STD650-20**
4-1/2" IEC Inner Connector with anchor bead	**241252**
Reducer, 6-1/8" to 3-1/8", includes two inner connectors	**1872**
6-1/8" EIA 90° Miter Elbow, includes inner connector	**STD650-10**

Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33598-5**
Hardware Kit of 10, 1/2" x 1-1/4" bolts, lockwashers, nuts	**31769-4**
Angle Adapter, kit of 10. Stainless Steel	**33981A-1**
Round Member Adapter/Tower Kit of 10 2.5 in (60 mm) Standoff	**33981A-1**
Member Diameter, in (mm)	
3-4 (75-100)	**43130-1**
4-5 (100-125)	**43130-2**
5-6 (125-150)	**43130-3**

Accessories – Continued

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33948-1**
Angle Adapter for insulated hanger	**13555A**
Round Member Adapter for insulated hanger fits memberdiameters 1-3 in (25-75 mm)	**13550**
Hoisting Grip	**31031-1**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-7**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-27**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-37**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**33938-5**
Installer Pax™ - Bulk packs are available for some grounding kits. See page 570	

50-ohm

5" Air Dielectric, High Power HJ( )HP Series

HELIAX®
Coaxial Cables

HJ9HP-50

Cable Ordering Information

Description	Type No.
High Power Cable	
5" Standard High Power Cable	**HJ9HP-50**
45 – 70 MHz, 1.06 VSWR, max.	
87 – 108 MHz, 1.06 VSWR, max. over broadcast channel	
170 – 230 MHz, 1.08 VSWR, max. over broadcast channel	
470 – 860 MHz, 1.10 VSWR, max. over broadcast channel	

* For broadcast applications, specify channel or frequency.

Characteristics

Electrical	
Impedance, ohms	50 ± 0.5
Maximum Frequency, GHz	0.96
Velocity, percent	96.4
Peak Power Rating, kW	1690
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.1 (0.33)
Outer	0.04 (0.13)
dc Breakdown, volts	26000
Jacket Spark, volts RMS	12000
Capacitance, pF/ft (m)	20.8 (68.1)
Inductance, µH/ft (m)	0.054 (0.176)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	5.20 (132)
Diameter over Outer Conductor, in (mm)	5.00 (127)
Diameter Inner Conductor, in (mm)	2.07 (52.7)
Nominal Inside Transverse Dimensions, (cm)	11.3
Minimum Bending Radius, in (mm)	50 (1270)
Number of Bends, minimum (typical)	15 (30)
Bending Moment, lb-ft (N•m)	200 (271)
Cable Weight, lb/ft (kg/m)	3.4 (4.9)
Tensile Strength, lb (kg)	1000 (454)
Flate Plate Crush Strength, lb/in (kg/mm)	240 (4.29)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0045	0.0148	1690
1	0.0064	0.0211	1690
1.6	0.0081	0.0267	1540
2	0.0092	0.0300	1375
10	0.0211	0.0693	599
20	0.0306	0.100	416
30	0.0381	0.125	335
50	0.0505	0.166	254
88	0.0695	0.228	185
100	0.0748	0.245	172
108	0.0782	0.257	165
150	0.0948	0.311	137
174	0.104	0.340	125
200	0.113	0.369	116
300	0.144	0.474	90.8
400	0.173	0.568	76.2
450	0.186	0.612	70.8
500	0.200	0.655	66.3
512	0.203	0.665	65.3
600	0.225	0.737	59.1
700	0.249	0.816	53.6
800	0.272	0.893	49.1
824	0.278	0.910	48.2
860	0.286	0.937	48.9
894	0.293	0.962	45.7
960	0.308	1.010	43.6

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power. VSWR 1.0, inner temperature 150°C (302°F) ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.

HELIAX®
Coaxial Cables

6-1/8" EIA Flange
H9FP-602

Connectors

Interface	Description	Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
6-1/8" EIA Flange	Gas pass, includes inner connector	**H9HPMP-602**	Tab Flare	Tab Flare	BB	12.4 (315)	8.13 (207)
6-1/8" EIA Flange	Gas block, includes inner connector**	**H9HPMB-602**	Tab Flare	Tab Flare	BB	12.4 (315)	8.13 (207)
6-1/8" EIA Flange	Gas pass, no inner connector	**H9HPFP-602**	Tab Flare	Tab Flare	BB	9.5 (242)	8.13 (207)
6-1/8" EIA Flange	Gas block, no inner connector	**H9HPFB-602**	Tab Flare	Tab Flare	BB	9.5 (242)	8.13 (207)
Splice		**H9HPZ**	Tab Flare	Tab Flare	BB	6.19 (158)	7.57 (193)

* **Plating Codes:** BB - Brass Body and Pin ** Universal application - designed so that all connector variations of same flange size can be accommodated by modifying this connector, using instructions provided.

Connector Accessories

	Type Number
Connector Reattachment Kit	
For H9 ( ) HP-602	**34767A-55**
For H9HPZ	**34767A-31**
6-1/8" EIA Inner Connector with anchor bead	**STD650-20**
4-1/2" IEC Inner Connector with anchor bead	**241252**
Reducer, 6-1/8" to 3-1/8", includes two inner connectors	**1872**
6-1/8" EIA 90° Miter Elbow, includes inner connector	**STD650-10**

Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33598-5**
Hardware Kit of 10, 1/2" x 1-1/4" bolts, lockwashers, nuts	**31769-4**
Angle Adapter, kit of 10. Stainless Steel	**33981A-1**
Round Member Adapter/Tower Kit of 10 2.5 in (60 mm) Standoff	**33981A-1**
Member Diameter, in (mm)	
3-4 (75-100)	**43130-1**
4-5 (100-125)	**43130-2**
5-6 (125-150)	**43130-3**

Accessories – Continued

Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 4.5 ft (1.37 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**33948-1**
Angle Adapter for insulated hanger	**13555A**
Round Member Adapter for insulated hanger fits memberdiameters 1-3 in (25-75 mm)	**13550**
Hoisting Grip	**31031-1**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-7**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-27**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-37**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**33938-5**
Installer Pax™ - Bulk packs are available for some grounding kits. See page 570.	

75-ohm
1/4" Superflexible Foam Dielectric, FSJ Series

FSJ1-75

Cable Ordering Information

Description	Type No.
Standard Cable	
1/4" Standard superflexible	**FSJ1-75**
Fire Retardant Cables	
1/4" Fire Retardant Jacket (CATVX)	**FSJ1RN-75**
1/4" Fire Retardant Jacket (CATVR)	**FSJ1RN-75**

Characteristics

Electrical	
Impedance, ohms	75 ± 4
Maximum Frequency, GHz	22.0
Velocity, percent	78
Peak Power Rating, kW	6.7
dc Resistance, ohms/1000 ft (1000 m)	
Inner	15 (49.2)
Outer	1.8 (5.9)
dc Breakdown, volts	2000
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	17.4 (57.0)
Inductance, µH/ft (m)	0.098 (0.321)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Steel
Diameter over Jacket, in (mm)	0.29 (7.4)
Diameter over Copper Outer Conductor, in (mm)	0.25 (6.4)
Minimum Bending Radius, in (mm)	1 (25)
Number of Bends, minimum (typical)	15 (50)
Bending Moment, lb-ft (N•m)	0.5 (0.68)
Cable Weight, lb/ft. (kg/m)	0.046 (0.068)
Tensile Strength, lb (kg)	150 (68)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.129	0.425	6.70
1	0.182	0.597	5.86
1.5	0.222	0.729	4.81
2	0.256	0.840	4.16
10	0.574	1.88	1.86
20	0.815	2.67	1.30
30	1.00	3.28	1.06
50	1.30	4.27	0.806
88	1.75	5.74	0.601
100	1.87	6.14	0.564
108	1.95	6.39	0.543
150	2.31	7.58	0.462
174	2.49	8.18	0.429
200	2.68	8.79	0.399
300	3.34	11.0	0.320
400	3.91	12.8	0.274
450	4.17	13.7	0.256
500	4.41	14.5	0.242
512	4.47	14.7	0.238
600	4.87	16.0	0.219
700	5.30	17.4	0.200
800	5.72	18.8	0.185
824	5.82	19.1	0.183
894	6.10	20.0	0.174
960	6.35	20.8	0.167
1000	6.50	21.3	0.163
1250	7.40	24.3	0.144
1500	8.23	27.0	0.130
1700	8.84	29.0	0.121
2000	9.70	31.8	0.109
2300	10.6	34.7	0.100
3000	12.4	40.8	0.0852
4000	14.9	48.7	0.0714
5000	17.0	55.8	0.0623
6000	19.2	62.9	0.0553
8000	23.2	76.1	0.0458
10000	26.9	88.3	0.0396

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

HELIAX® Coaxial

N Male
F1NM-7550

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Dimensions, In (mm) Maximum Length	Maximum Diameter
N Male	50 Ohm Mating Pin	**F1NM-7550**	41SW-75	Solder	Tab Flare	NS	1.5 (38)	0.83 (21.1)
N Male	50 Ohm Mating Pin	**F1NM-7550-H**	–	Solder	Collet	SG	1.85 (47)	0.92 (23.4)
N Male	70 Ohm Mating Pin	**F1NM-7570**	41SW-70	Solder	Tab Flare	NS	2.2 (56)	0.79 (20.1)
N Female	70 Ohm Mating Pin	**F1NF-7570**	41SN-70	Solder	Tab Flare	BS	1.9 (48)	0.70 (17.8)
BNC Male	50 Ohm Mating Pin	**49651**	–	Solder	Tab Flare	BS	1.2 (30)	0.56 (14.2)
UHF Male	50 Ohm Mating Pin	**41SP**	–	Solder	Tab Flare	BB	1.5 (38)	0.72 (18.3)
TNC Male	50 Ohm Mating Pin	**41SWT-75**	–	Solder	Tab Flare	SS	1.1 (28)	0.63 (16.0)
CATV Type F		**F1FM-75**	41ASCM	Spring Finger	Crimp	BB	1.42 (36)	0.56 (14.2)

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin, NS - Nickel Plated Body and Silver Plated Pin, SS - Silver Plated Body and Pin, SG - Silver Plated Body and Gold Plated Pin

Accessories –

Photos and descriptions on pages 544-572.

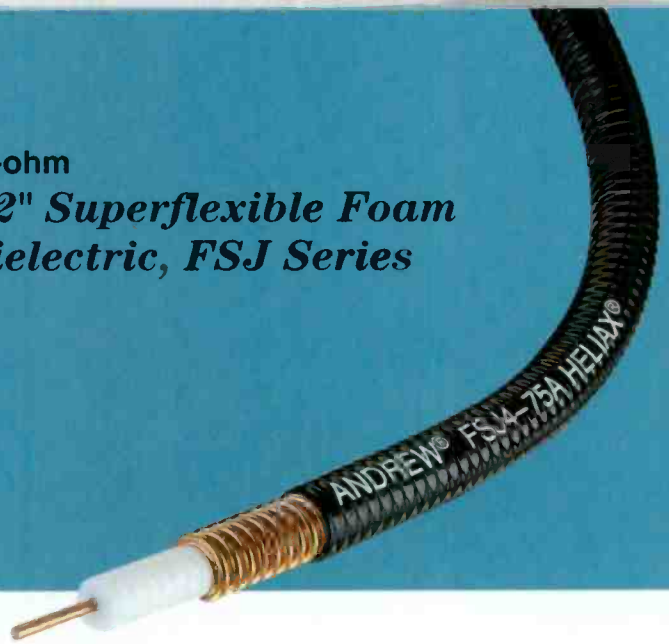
Description	Type No.
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-3**
Angle Adapter, for insulated hanger	**40430-1**
Stainless Steel Wraplock, for round tower members	**12395-1**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 1 ft (0.3 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 1 ft (0.3 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit factory attached, one-hole lug, 24 in (610 mm) lead	**223158**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Tools - for more tools see page 569.	
Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.	

75-ohm

1/2" Superflexible Foam Dielectric, FSJ Series

HELIAX®
Coaxial Cables



FSJ4-75A

Cable Ordering Information

Description	Type No.
Standard Cable	
1/2" Standard superflexible	**FSJ4-75A**
Fire Retardant Cables	
1/2" Fire Retardant Jacket (CATVX)	**FSJ4RN-75A**
1/2" Fire Retardant Jacket (CATVR)	**FSJ4RN-75A**

Characteristics

Electrical	
Impedance, ohms	75 ± 2
Maximum Frequency, GHz	11.5
Velocity, percent	81
Peak Power Rating, kW	10.0
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.50 (4.9)
Outer	1.00 (3.28)
dc Breakdown, volts	2500
Jacket Spark, volts RMS	5000
Capacitance, pF/ft (m)	16.7 (54.9)
Inductance, µH/ft (m)	0.094 (0.309)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	0.52 (13.2)
Diameter over Copper Outer Conductor in (mm)	0.48 (12.2)
Diameter Inner Conductor, in (mm)	0.118 (3.0)
Minimum Bending Radius, in (mm)	1.25 (32)
Number of Bends, minimum (typical)	20 (50)
Bending Moment, lb-ft (N•m)	2.0 (2.7)
Cable Weight, lb/ft (kg/m)	0.14 (0.21)
Tensile Strength, lb (kg)	140 (63.5)
Flat Plate Crush Strength, lb/in (kg/mm)	105 (1.9)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0651	0.214	10.00
1	0.0924	0.303	10.00
1.5	0.113	0.372	10.00
2	0.131	0.430	10.00
10	0.295	0.968	5.81
20	0.420	1.38	4.07
30	0.517	1.70	3.31
50	0.673	2.21	2.54
88	0.903	2.96	1.90
100	0.965	3.17	1.77
108	1.00	3.29	1.70
150	1.19	3.90	1.44
174	1.29	4.23	1.32
200	1.39	4.56	1.23
300	1.73	5.68	0.989
400	2.02	6.63	0.848
450	2.16	7.07	0.795
500	2.28	7.49	0.750
512	2.31	7.59	0.739
600	2.53	8.29	0.667
700	2.75	9.02	0.622
800	2.96	9.73	0.577
824	3.01	9.89	0.568
894	3.16	10.4	0.543
960	3.28	10.8	0.521
1000	3.36	11.0	0.509
1250	3.82	12.5	0.449
1500	4.24	13.9	0.407
1700	4.56	15.0	0.375
2000	5.02	16.5	0.342
2300	5.46	17.9	0.314
3000	6.41	21.0	0.267
4000	7.62	25.0	0.224
5000	8.76	28.7	0.196
6000	9.85	32.3	0.177
8000	11.9	38.9	0.145
10000	13.7	44.9	0.125
11500	15.1	49.5	0.114

Standard Conditions:
For Attenuation. VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

HELIAX®
Coaxial Cables

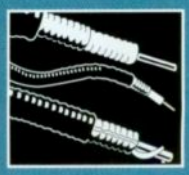
N Male
F4NM-7570

N Female
F4NF-7570

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
Male	50 Ohm Mating Pin	**F4NM-7550**	44ASW-75	Solder	Tab Flare	BB	2.3 (58)	0.84 (21.3)
N Male	70 Ohm Mating Pin	**F4NM-7570**	44ASW-70	Solder	Tab Flare	BB	2.2 (56)	0.84 (21.3)
N Male	50 Ohm Mating Pin, Right Angle	**F4NR-7550**	49600-75	Solder	Tab Flare	BB	3.3/1.5 (84/38)	0.84 (21.3)
N Female	50 Ohm Mating Pin	**F4NF-7550**	44ASN-75	Solder	Tab Flare	BS	2.2 (56)	0.84 (21.3)
N Female	70 Ohm Mating Pin	**F4NF-7570**	44ASN-70	Solder	Tab Flare	BS	2.1 (53)	0.84 (21.3)
UHF Male	50 Ohm Mating Pin	**44ASP-75**	–	Solder	Tab Flare	BS	2.3 (58)	0.84 (21.3)
UHF Female	50 Ohm Mating Pin	**44ASU-75**	–	Solder	Tab Flare	BS	2.3 (58)	0.84 (21.3)
CATV Type F		**44ASCM**	–	Solder	Tab Flare	BB	2.5 (64)	0.84 (21.3)

Plating Codes: BB - Brass Body and Pin, BS - Brass Body and Silver Plated Pin



Accessories – Photos and descriptions on pages 544-572.

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 2.5 ft (0.76 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Hanger Blox™ and Insulated Hangers - please refer to pages 554-557.	
Hoisting Grip	**43094**
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**

Description	Type No.
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
1/2" Coax-Type N to 1/2" Coax-Type N	**241474-4**
7/8" Coax-Type N to1/2" Coax-Type N	**241475-1**
1-1/4" or 1-5/8" Coax-Type N to 1/2" Coax-Type N	**241475-2**
7/8" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	**241475-6**
1-1/4" or 1-5/8" Coax-7-16 DIN to FSJ4 -7-16 DIN	**241475-7**
1/2" Coax -Type N to Antenna Output	**241548-4**
1/2" FSJ4 -7-16 DIN to Antenna Output	**241548-7**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately, see pages 566-567.

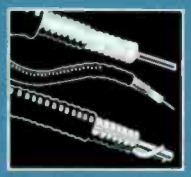
Plates Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-5**	**48939-6**
Three Hole:	**204679-7**	**48939-8**

Tools - for more tools see page 569.

EASIAX® Cutting Tool, FSJ4/FSJ1	**207865**
EASIAX Cutting Tool, FSJ4/FSJ2	**241372**
Cutoff Guide, 7/32" (5.5 mm)	**224361**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.



HELIAX®
Coaxial Cables

75-ohm
1/2" Foam Dielectric, LDF Series

LDF4-75A

Cable Ordering Information

Description	Type No.
Standard Cable	
1/2" Standard cable	**LDF4-75A**
Fire Retardant Cables	
1/2" Fire Retardant Jacket (CATVX)	**LDF4RN-75A**
1/2" Fire Retardant Jacket (CATVR)	**LDF4RN-75A**

Characteristics

Electrical	
Impedance, ohms	75 ± 3
Maximum Frequency, GHz	10
Velocity, percent	88
Peak Power Rating, kW	26
dc Resistance, ohms/1000 ft (1000 m)	
Inner	1.15 (3.77)
Outer	0.58 (1.90)
dc Breakdown, volts	4000
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	15.4 (50.5)
Inductance, µH/ft (m)	0.087 (0.284)

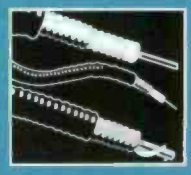
Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-Clad Aluminum
Diameter over Jacket, in (mm)	0.63 (16)
Diameter over Copper Outer Conductor, in (mm)	0.55 (14)
Minimum Bending Radius, in (mm)	5 (125)
Number of Bends, minimum (typical)	15 (40)
Bending Moment, lb-ft (N•m)	2.8 (3.8)
Cable Weight, lb/ft (kg/m)	0.14 (0.21)
Tensile Strength, lb (kg)	200 (90.7)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (2.0)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.042	0.139	24.6
1	0.060	0.197	17.3
1.5	0.074	0.241	14.0
2	0.085	0.279	12.2
10	0.192	0.630	5.39
20	0.273	0.895	3.80
30	0.335	1.10	3.09
50	0.435	1.43	2.38
88	0.583	1.91	1.77
100	0.623	2.04	1.67
108	0.649	2.13	1.60
150	0.770	2.53	1.35
174	0.833	2.73	1.24
200	0.896	2.94	1.15
300	1.11	3.65	0.932
400	1.30	4.25	0.799
450	1.38	4.53	0.751
500	1.46	4.80	0.707
512	1.48	4.86	0.699
600	1.62	5.30	0.641
700	1.76	5.76	0.590
800	1.89	6.20	0.546
824	1.92	6.31	0.538
894	2.01	6.60	0.515
960	2.09	6.86	0.495
1000	2.14	7.02	0.484
1250	2.43	7.96	0.427
1500	2.69	8.82	0.385
1700	2.89	9.48	0.359
2000	3.17	10.4	0.327
2300	3.44	11.3	0.300
3000	4.03	13.2	0.256
4000	4.77	15.7	0.217
5000	5.47	17.9	0.190
6000	6.14	20.1	0.169
8000	7.35	24.1	0.140
10000	8.46	27.8	0.122

Standard Conditions:
For Attenuation, VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

HELIAX®
Coaxial Cables



N Male
L4NM-7570

N Female
L4NF-7570

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Male	50 Ohm Mating Pin	**L4NM-7550**	L44W-75	Solder	Self Flare	BB	2.5 (64)	0.91 (23.1)
N Male	50 Ohm Mating Pin	**L4NM-7550-H**	–	Solder	Self Flare	BB	2.5 (64)	0.94 (23.8)
N Male	70 Ohm Mating Pin	**L4NM-7570**	L44W-70	Solder	Self Flare	BB	2.5 (64)	0.91 (23.1)
N Male	70 Ohm Mating Pin	**L4NM-7570-H**	–	Solder	Self Flare	BB	2.5 (64)	0.94 (23.8)
N Male	50 Ohm Mating Pin, Right Angle	**L4NR-7550**	206161	Solder	Self Flare	NB	3.2/1.5 (81/38)	0.95 (24.1)
N Female	50 Ohm Mating Pin	**L4NF-7550**	L44N-75	Solder	Self Flare	BB	2.5 (64)	0.91 (23.1)
N Female	70 Ohm Mating Pin	**L4NF-7570**	L44N-70	Solder	Self Flare	BB	2.3 (58)	0.91 (23.1)
UHF Male		**L44P-75**	–	Solder	Self Flare	BB	2.3 (58)	0.91 (23.1)
UHF Female		**L44U-75**	–	Solder	Self Flare	BB	2.3 (58)	0.91 (23.1)
CATV Equipment Housing		**48070**	–	–	Self Flare	BB	2.0 (50)	0.91 (23.1)
Splice		**L44Z-75**	–	Solder	Self Flare	BB	3.2 (81)	1.1 (27.9)

Plating Codes: BB - Brass Body and Pin, NB - Nickel Plated Body and Brass Pin

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557.	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 3 ft (0.91 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**43211A**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-1**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Hanger Blox™ kit of 3. Injection molded plastic, stackable. 6 runs per unit; 18 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 3 ft (0.91 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**HB-4**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-456**
Extender Kit	**HBEH-456**
Nylon Cable Tie Kit of 50. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**40417**
Nylon Cable Tie Kit in Plastic Box. 100 each, 4, 5.5, and 7.5 inch (101,140, and 190 mm) ties. Recommended maximum spacing for outdoor installations is 3 ft (1 m)	**CT-K350**
Velcro Cable Ties. Black, 8 inch. For indoor use only	
Kit of 10	**VCT8-10**
Kit of 50	**VCT8-50**
Insulated Hangers and Adapters - please refer to page 554-555.	
Hoisting Grip	**43094**

Description	Type No.
Grounding and Surge Protection - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-1**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-1**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-21**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-6**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Cold Shrink Weatherproofing Kit	
1/2" Coax-Type N to 1/2" Coax-Type N	**241474-4**
7/8" Coax-Type N to1/2" Coax-Type N	**241475-1**
1-1/4" or 1-5/8" Coax-Type N to 1/2" Coax-Type N	**241475-2**
7/8" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-4**
1-1/4" or 1-5/8" Coax-7-16 DIN to LDF4 -7-16 DIN	**241475-5**
2-1/4" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-8**
1/2" Coax -Type N to Antenna Output	**241548-4**
1/2" LDF4 -7-16 DIN to Antenna Output	**241548-6**
Connector/Splice Weatherproofing Kit, covers twelve splices	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

	4 in Boots	5 in Boots
One Hole:	**204679-5**	**48939-6**
Three Hole:	**204679-7**	**48939-8**

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. **APPORT-(*)-(**)**
Use with Arrestor Plus surge protector series.
Available in many configurations see page 562 for available options and ordering information.
** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

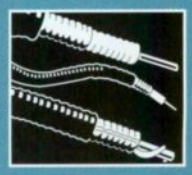
Tools - for more tools see page 569.

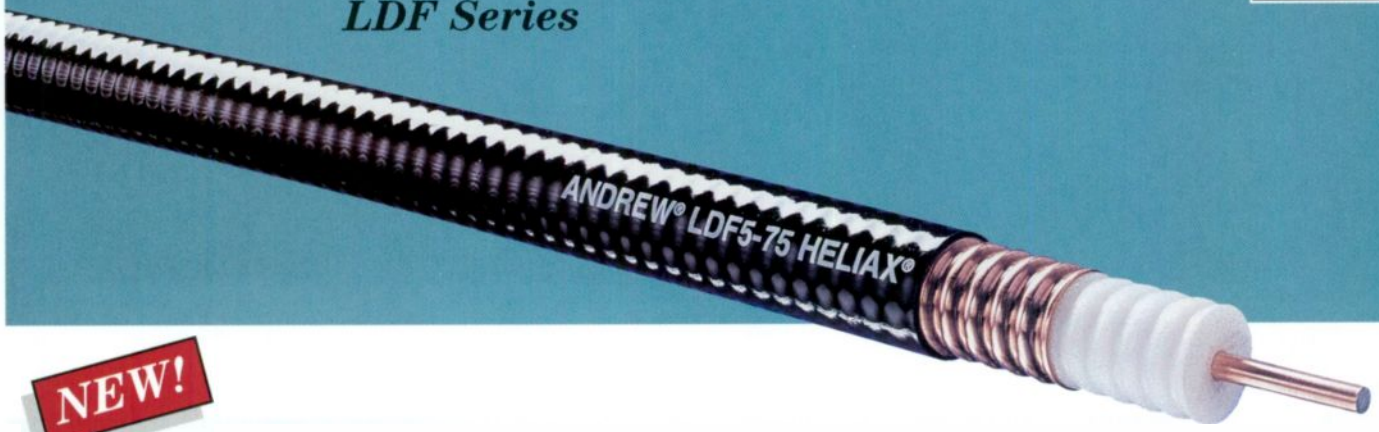
EASIAX® Cutting Tool	**207866**
Cable Flare Tool	**224363**
Cutoff Guide, 7/32" (5.5 mm)	**224361**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.

75-ohm
7/8" Foam Dielectric, LDF Series

HELIAX®
Coaxial Cables





NEW!

LDF5-75

Cable Ordering Information

Description	Type No.
7/8" Standard Cable	LDF5-75

Characteristics

Electrical	
Impedance, ohms	75 ± 3
Maximum Frequency, GHz	5.3
Velocity, percent	89
Peak Power Rating, kW70	
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.34 (1.11)
Outer	0.32 (1.05)
dc Breakdown, volts	6500
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	15.1 (49.5)
Inductance, µH/ft (m)	0.087 (0.284)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper-clad aluminum
Diameter over Jacket, in (mm)	1.082 (27.48)
Diameter over Copper Outer Conductor, in (mm)	0.980 (24.89)
Minimum Bending Radius, in (mm)	10 (250)
Number of Bends, minimum (typical)	15 (40)
Bending Moment, lb-ft (Nïm)	12 (16.3)
Cable Weight, lb/ft (kg/m)	0.30 (0.45)
Tensile Strength, lb (kg)	325 (147)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.042	0.139	24.6
1	0.060	0.197	17.3
1.5	0.074	0.241	14.0
2	0.085	0.279	12.2
10	0.192	0.630	5.39
20	0.273	0.895	3.80
30	0.335	1.10	3.09
50	0.435	1.43	2.38
88	0.583	1.91	1.77
100	0.623	2.04	1.67
108	0.649	2.13	1.60
150	0.770	2.53	1.35
174	0.833	2.73	1.24
200	0.896	2.94	1.15
300	1.11	3.65	0.932
400	1.30	4.25	0.799
450	1.38	4.53	0.751
500	1.46	4.80	0.707
512	1.48	4.86	0.699
600	1.62	5.30	0.641
700	1.76	5.76	0.590
800	1.89	6.20	0.546
824	1.92	6.31	0.538
894	2.01	6.60	0.515
960	2.09	6.86	0.495
1000	2.14	7.02	0.484
1250	2.43	7.96	0.427
1500	2.69	8.82	0.385
1700	2.89	9.48	0.359
2000	3.17	10.4	0.327
2300	3.44	11.3	0.300
3000	4.03	13.2	0.256
4000	4.77	15.7	0.217
5000	5.47	17.9	0.190
6000	6.14	20.1	0.169
8000	7.35	24.1	0.140
10000	8.46	27.8	0.122

Standard Conditions:
For Attenuation, VSWR 1.0, ambient temperature 24°C (75°F).
For average power, VSWR 1.0 ambient temperature 40°C (104°F), inner conductor temperature 100°C (212°F), no solar loading.

HELIAX®
Coaxial Cables

N Female
L5PNF-7570-BH

Connectors

Interface	Description	Type Number	Previous Type Number	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Maximum Length in (mm)	Maximum Diameter in (mm)
N Female	70 Ohm Mating Pin Bulkhead	**L5PNF-7570-BH**	–	Solder	Self Flare	BB	3.1 (78.7)	1.36 (34.5)

Description	Type No.
Hangers and Adapters - for more hangers and adapters see pages 547-557	
Standard Hangers and Adapters Standard Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 5.5 ft (1.68 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Stainless steel Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Snap-In Hangers and Adapters **Snap-In Hanger Kit** of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-2**
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Adapter	**206930**
Hanger Blox kit of 3. Injection molded plastic, stackable. 4 runs per unit; 12 runs per bundle. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice, bolted to tower. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547	**HB-5**
See page 557 for supporting accessories.	
Hanger Blox Hardware Kit.	
Starter Kit	**HBSH-456**
Extender Kit	**HBEH-456**
Insulated Hangers and Adapters - please refer to pages 554-555.	
Support/Hoisting Grip. Use at 200 ft (60 m) intervals.	
Grip with one clamp	**L5SGRIP**
Support clamp kit of 10	**L5SGRIP-51K**
Installation tool with 10 support clamps	**L5SGRIP-51KT**
Hoisting Grip	**19256B**
Grounding and Surge Protection - for more information, see pages 559-564.	
SureGround™ Grounding Kit, with tape weatherproofing kit.	
factory attached, one-hole lug, 600 mm lead	**SGL5-06B1**
factory attached, two-hole lug, 600 mm lead	**SGL5-06B2**
field attachable crimp-on, one-hole lug,1000 mm lead	**SGL5-10B3**
field attachable crimp-on, two-hole lug,1000 mm lead	**SGL5-10B4**

Description	Type No.
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
Crimping Tool to field attach lug to Grounding Kit	207270
Weatherproofing - for more information, see page 565.	
Cold-Shrink Weatherproofing Kit	
7/8" Coax-Type N to 1/2" Coax-Type N	**241475-1**
7/8" Coax-Type N to 7/8" Coax-Type N	**241474-5**
1-1/4" or 1-5/8" Coax-Type N to 7/8" Coax-Type N	**241475-3**
7/8" Coax-7-16 DIN to 1/2" LDF4 - 7-16 DIN	**241475-4**
7/8" Coax-7-16 DIN to 1/2" FSJ4 - 7-16 DIN	**241475-6**
AAPL5 to 7/8" LDF5-50A	**241474-5**
7/8" Coax-Type N to Antenna Output	**241548-5**
FSJ2-LDF5	**241475-10**
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-1**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	

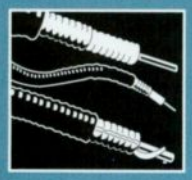
	4 in Boots	5 in Boots
One Hole:	**204679-2**	**48939-1**
Three Hole:	**204679-15**	**48939-2**

ArrestorPort Plus™. Wall entry plate and integrated ground bar assembly. **APPORT-(*)-(**)**
Use with Arrestor Plus surge protector series. Available in many configurations see page 562. for available options and ordering information.
** Number of surge arrestor openings in the plate.*
*** Number of cable feed thru ports at the top.*

Tools - for more tools see page 569.

Cable Flare Tool **224368**

Installer Pax™. Bulk packs are available for some hangers, adapters, grounding kits and cold shrink weatherproofing kits. See page 570.



HELIAX®
Coaxial Cables

75-ohm
7/8" Air Dielectric, HJ Series

HJ5-75

Cable Ordering Information

Description	Type No
Standard Cable	
7/8" Standard Cable, Standard Jacket	**HJ5-75**
Fire Retardant Cable	
7/8" Fire Retardant Jacket (CATVR)	**HJ5RN-75**

Characteristics

Electrical	
Impedance, ohms	75 ± 1
Maximum Frequency, GHz	5.6
Velocity, percent	90
Peak Power Rating, kW	60
dc Resistance, ohms/1000 ft (1000 m)	
Inner	0.25 (0.82)
Outer	0.20 (0.66)
dc Breakdown, volts	6000
Jacket Spark, volts RMS	8000
Capacitance, pF/ft (m)	15.1 (49.4)
Inductance, µH/ft (m)	0.085 (0.278)

Mechanical	
Outer Conductor	Copper
Inner Conductor	Copper
Diameter over Jacket, in (mm)	1.11 (28.2)
Diameter over Copper Outer Conductor, in (mm)	1.01 (25.7)
Minimum Bending Radius, in (mm)	10 (250)
Number of Bends, minimum (typical)	15 (20)
Bending Moment, lb-ft (N•m)	25 (34)
Cable Weight, lb/ft (kg/m)	0.52 (0.79)
Tensile Strength, lb (kg)	800 (360)
Flat Plate Crush Strength, lb/in (kg/mm)	250 (4.5)

Attenuation and Average Power

Frequency MHz	Attenuation dB/100 ft	Attenuation dB/100m	Average Power kW
0.5	0.0250	0.0819	60.0
1	0.0355	0.116	54.7
1.5	0.0436	0.143	44.6
2	0.0505	0.166	38.5
10	0.116	0.381	16.4
20	0.168	0.552	11.4
30	0.209	0.686	9.31
50	0.272	0.892	7.13
88	0.363	1.19	5.34
100	0.388	1.27	5.01
108	0.404	1.33	4.80
150	0.480	1.58	4.02
174	0.517	1.70	3.71
200	0.555	1.82	3.45
300	0.687	2.26	2.79
400	0.800	2.63	2.40
450	0.850	2.79	2.25
500	0.898	2.95	2.14
512	0.909	2.98	2.10
600	0.988	3.24	1.93
700	1.07	3.51	1.78
800	1.15	3.77	1.66
824	1.17	3.82	1.64
894	1.22	3.99	1.57
960	1.26	4.14	1.52
1000	1.29	4.23	1.49
1250	1.46	4.78	1.31
1500	1.61	5.28	1.17
1700	1.74	5.70	1.08
2000	1.92	6.30	0.977
2300	2.10	6.89	0.898
3000†	2.49	8.18	0.763
4000	3.00	9.84	0.640
5000	3.40	11.2	0.565
5600	3.65	12.0	0.526

Standard Conditions:
For Attenuation. VSWR 1.0 ambient temperature 24°C (75°F), atmospheric pressure, dry air.
For Average Power, VSWR 1.0, inner temperature 100°C (212°F), ambient temperature 40°C (104°F), atmospheric pressure, dry air, no solar loading.
† Operation of this cable in the 3500-3650 MHz band is not recommended because of VSWR spikes produced by the dielectric section spacing.

Connectors

Interface	Description	Type Number	Reference*	Inner Contact Attachment	Outer Contact Attachment	Plating Code	Dimensions, in (mm) Maximum Length	Maximum Diameter
N Male	50 Ohm Mating Pin	**H5NM-7550**	75AW-75	Self-tapping	Tab Flare	BB	3.5 (89)	1.4 (36)
N Female	50 Ohm Mating Pin	**H5NF-7550**	75AN-75	Self-tapping	Tab Flare	BB	3.9 (99)	1.4 (36)
7/8" EIA Flange	Gas Pass	**75AR-75**	–	Self-tapping	Tab Flare	BB	4.3 (109)	2.25 (57)
UHF Female	50 Ohm Mating Pin	**75AU-75**	–	Self-tapping	Tab Flare	BB	4.3 (109)	1.4 (36)
LC Male	50 Ohm Mating Pin	**75AM-75**	–	Self-tapping	Tab Flare	BB	5.0 (127)	1.4 (36)
End Terminal		**75AT-75**	–	Self-tapping	Tab Flare	BB	5.8 (147)	1.4 (36)
Splice		**75AZ-75**	–	Self-tapping	Tab Flare	BB	4.2 (107)	1.4 (36)

Plating Codes: BB - Brass Body and Pin * Previous Type Number. See page 428 for further information.

Accessories – Photos and descriptions on pages 544-572.

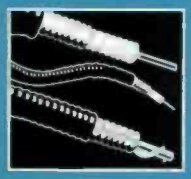
Description	Type No.
Hangers and Adapters - for more information, see pages 547-557.	
Standard Hangers and Adapters	
Hanger Kit of 10. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**42396A-5**
Hardware Kit of 10, 3/8" bolts, lock washers, nuts	
3/4" (19 mm) long	**31769-5**
1" (25) mm long	**31769-1**
Angle Adapter, kit of 10.	
Stainless Steel	**31768A**
Galvanized	**242774**
Galvanized, metric hardware	**242774-M**
Round Member Adapter Kit of 10. Two kits needed for each hanger kit. Stainless steel. Member Diameter, in (mm)	
1-2 (25-50)	**31670-1**
2-3 (50-75)	**31670-2**
3-4 (75-100)	**31670-3**
4-5 (100-125)	**31670-4**
5-6 (125-150)	**31670-5**
6-8 (150-200)	**31670-6**
Threaded Rod Support 3/8" rod, nuts, washers, ceiling bracket	
12 in (305 mm) long, kit of 1	**31771**
12 in (305 mm) long, kit of 5	**31771-4**
24 in (610 mm) long, kit of 1	**31771-9**
24 in (610 mm) long, kit of 5	**31771-6**
36 in (915 mm) long, kit of 5	**31771-10**
Tower Standoff Kit of 10. 1 in (25 mm) standoff. Member Diameter, in (mm)	
0.75-1.5 (20-40)	**30848-5**
1.5-3.0 (40-50)	**30848-4**
3-4 (75-100)	**30848-1**
4-5 (100-125)	**30848-2**
5-6 (125-150)	**30848-3**
Tower Standoff Kit of 10. 2.5 in (60 mm) standoff. Member Diameter, in (mm)	
3-4 (75-100)	**41108A-1**
4-5 (100-125)	**41108A-2**
5-6 (125-150)	**41108A-3**
Snap-In Hangers and Adapters	
Snap-In Hanger Kit of 10. For prepunched 3/4 in (19 mm) holes on tower members or adapters below. Standard tower configuration spacing is 3-4 feet (1-1.2 m). Recommended maximum spacing for outdoor installation is 1.5 ft (0.46 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**206706-2**

Description	Type No.
Tower Hanger/Adapter, attaches to existing angle tower members	
1 cable run, 1 connection required	**206929-1**
4 cable runs, 2 connections required	**206929-4**
8 cable runs, 3 connections required	**206929-8**
J-Bolt Hardware Kit of 10 for use with Tower/Hanger Tower/Hanger Adapter	**206930**
Cluster Mount, octagonal, attaches to 1.9 in (48 mm) member	
Kit of one	**207030**
Kit of 10	**207030-2**
Insulated Hangers and Adapters	
Insulated Hanger, single, for insulated towers. *Standard tower configuration spacing is 3-4 feet (1-1.2 m).* Recommended maximum spacing for outdoor installation is 6 ft (1.83 m) at 125 mph (200 km/h) wind, 1/2" (13 mm) radial ice. For different wind and ice loading spacing recommendations, refer to Cable Hanger Spacing, page 547.	**11662-2**
Angle Adapter for insulated hanger	**40430-1**
Stainless Steel Wraplock (Round Tower Members)	**12395-1**
Hoisting Grip	**19256B**
Grounding - for more information, see pages 559-564.	
Grounding Kit	
factory attached, one-hole lug, 24 in (610 mm) lead	**204989-2**
factory attached, two-hole lug, 24 in (610 mm) lead	**241088-2**
field attachable crimp-on, one-hole lug, 36 in (915 mm) lead	**204989-22**
field attachable crimp-on, two-hole lug, 36 in (915 mm) lead	**241088-7**
field attachable screw-on lug, 36 in (915 mm lead)	**204989-32**
Crimping Tool to field attach lug to Grounding Kit	**207270**
Weatherproofing - for more information, see page 565.	
Connector/Splice Weatherproofing Kit	**221213**
Entry Systems - for more information, see pages 566-567.	
Wall/Roof Feed-Thru	**40656A-3**

Feed-Thru Plates and Boots. Order separately.

Openings	Plates For 4 in Boots	Plates For 5 in Boots
1	**204673-1**	**48940-1**
1	**204673-2**	
2		**48940-2**
3		**48940-3**
4	**204673-4**	**48940-4**
6		**48940-6**
8	**204673-8**	
12	**204673-12**	
	4 in Boots	5 in Boots
One Hole	**204679-2**	**48939-1**
Three Hole		**48939-2**

Installer Pax™ - Bulk packs are available for some hangers, adapters, and grounding kits. See page 570.



HELIAX® Coaxial Cables

VALUFLEX assemblies

Standard assemblies

Factory Made Cable Assemblies

Andrew manufacturers cable assemblies all over the world to provide you with the fastest service and the highest quality you expect from Andrew. Check out the benefits of the Andrew cable assembly program:

- ***Competitive pricing*** *- New lower attachment charges*
- ***Guaranteed quality*** *- Assemblies are 100% tested prior to shipment*
- ***Fast Delivery*** *- Local manufacturing and inventory*
- ***Complete product offering*** *- Any cable, any length, any connector*
- ***Low VSWR assemblies*** *- For high performance applications*
- ***VALUFLEX™ assemblies*** *- Value priced for indoor applications*

For easy ordering, our most popular jumpers are listed in the tables. However, you are not limited to these jumpers. To order custom assemblies, specify the cable, cable length and connectors.

VALUFLEX™ Cable Assemblies - Ordering Information

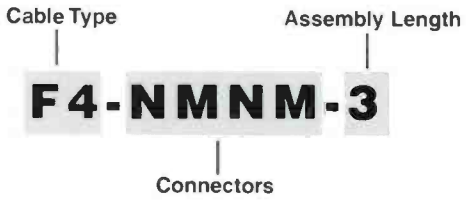
Connectors	Lengths, feet	Type No.
FSJ1-50A Cable		
N Male/N Male	3, 6, 8, 10 or variable	VFX1-NMNM-(*)
N Male/N Male, silver plated	3, 6, 8, 10 or variable	VFX1-PNMNM-(*)
N Male/N Female	3, 6, 8, 10 or variable	VFX1-NMNF-(*)
N Male/N Female, silver plated	3, 6, 8, 10 or variable	VFX1-PNMNF-(*)
N Male/UHF Male	3, 6, 8, 10 or variable	VFX1-NMUM-(*)
N Male/BNC Male	3, 6, 8, 10 or variable	VFX1-NMBM-(*)
UHF Male/BNC Male	3, 6, 8, 10 or variable	VFX1-UMBM-(*)
UHF Male/UHF Male	3, 6, 8, 10 or variable	VFX1-UMUM-(*)
BNC Male/BNC Male	3, 6, 8, 10 or variable	VFX1-BMBM-(*)
FSJ2-50 Cable		
N Male/N Male	3, 6, 8, 10 or variable	VFX2-NMNM-(*)
N Male/N Male, silver plated	3, 6, 8, 10 or variable	VFX2-PNMNM-(*)
N Male/N Female	3, 6, 8, 10 or variable	VFX2-NMNF-(*)
N Male/N Female, silver plated	3, 6, 8, 10 or variable	VFX2-PNMNF-(*)
N Male/UHF Male	3, 6, 8, 10 or variable	VFX2-NMUM-(*)
UHF Male/UHF Male	3, 6, 8, 10 or variable	VFX2-UMUM-(*)
HST1-50 Cable		
N Male/N Male	3 or variable	VFXT1-NMNM-3
N Male/N female	3 or variable	VFXT1-NMNF-3

* Insert length in feet for standard lengths. For other lengths, specify base Type No. and length in feet or meters. e.g., VFX1-NMNM, 15 feet long or VFX1-NMNM, 3 meters long. Maximum length is 50 ft (15 m).

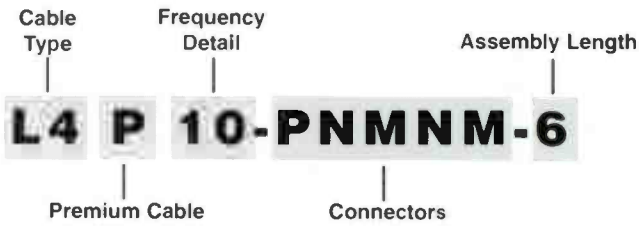
Cable Assembly Numbering System

This catalog features a new, functional, cable assembly numbering system that installation, purchasing and receiving personnel should find easy to understand. This system incorporates the new connector numbering system explained on page 428.

Standard Cable Assemblies



Low VSWR Cable Assemblies



Standard FSJ/LDF/ETS Cable Assemblies - Ordering Information

Connectors	Lengths, feet	Type No.
FSJ1-50A Cable		
N Male/N Male, premium	6, 8 or variable	**F1-PNMNM-(*)**
N Male/Right Angle N Male, premium	6, 8 or variable	**F1-PNMNR-(*)**
N Male/N Female, premium	6, 8 or variable	**F1-PNMNF-(*)**
N Male/UHF Male, premium	6, 8 or variable	**F1-PNMUM-(*)**
N Male/BNC Male, premium	6, 8 or variable	**F1-PNMBM-(*)**
N Male/SMA Male, premium	6, 8 or variable	**F1-PNMSM-(*)**
UHF Male/UHF Male	6, 8 or variable	**F1-UMUM-(*)**
UHF Male/Mini UHF Male	6, 8 or variable	**F1-UMMU-(*)**
BNC Male/BNC Male, premium	6, 8 or variable	**F1-PBMBM-(*)**
BNC Male/SMA Male, premium	6, 8 or variable	**F1-PBMSM-(*)**
SMA Male/SMA Male, premium	6, 8 or variable	**F1-PSMSM-(*)**
SMA Male/SMA Female, premium	6, 8 or variable	**F1-PSMSF-(*)**
SMA Male/Right Angle SMA Male, premium	6, 8 or variable	**F1-PSMSR-(*)**
FSJ2-50 Cable		
N Male/N Male, premium	6, 8 or variable	**F2-PNMNM-(*)**
N Male/7-16 DIN Male	6, 8 or variable	**F2-PNMDM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**F2-PDMDM-(*)**
FSJ4-50B Cable		
N Male/N Male	3, 6, 8 or variable	**F4-NMNM-(*)**
N Male/N Male, premium	6, 8 or variable	**F4-PNMNM-(*)**
N Male/Right Angle N Male	6, 8 or variable	**F4-NMNR-(*)**
N Male/N Female	6, 8 or variable	**F4-NMNF-(*)**
N Male/UHF Male	6, 8 or variable	**F4-NMUM-(*)**
N Male/7-16 DIN Male	6, 8 or variable	**F4-PNMDM-(*)**
UHF Male/UHF Male	6, 8 or variable	**F4-UMUM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**F4-PDMDM-(*)**
FSJ4P-50B-4, Low-VSWR Cable (800 - 960 MHz) - See specifications on page 452.		
N Male/N Male	3, 6, 10, 15, 20, 25, 30 or variable	**F4P4-NMNM-(*)**
N Male/Right Angle N Male	10, 15, 20, 25, 30 or variable	**F4P4-NMNR-(*)**
EFX2-50 Cable		
N Male/N Male, premium	6, 8 or variable	**EFX2-PNMNM-(*)**
N Male/7-16 DIN Male	6, 8 or variab le	**EFX2-PNMDM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**EFX2-PDMDM-(*)**
LDF2-50 Cable		
N Male/N Male	6, 8 or variable	**L2-NMNM-(*)**
N Male/N Female	6, 8 or variable	**L2-NMNF-(*)**
N Male/UHF Male	6, 8 or variable	**L2-NMUM-(*)**
UHF Male/UHF Male	6, 8 or variable	**L2-UMUM-(*)**
N Male/7-16 DIN Male	6, 8 or variable	**L2-PNMDM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**L2-PDMDM-(*)**
LDF4-50A Cable		
N Male/N Male	3, 6, 8 or variable	**L4-NMNM-(*)**
N Male/N Male, premium	6, 8 or variable	**L4-PNMNM-(*)**
N Male/Right Angle N Male	6, 8 or variable	**L4-NMNR-(*)**
N Male/N Female	6, 8 or variable	**L4-NMNF-(*)**
N Male/UHF Male	6, 8 or variable	**L4-NMUM-(*)**
N Male/7-16 DIN Male	6, 8 or variable	**L4-PNMDM-(*)**
UHF Male/N Female	6, 8 or variable	**L4-UMNF-(*)**
UHF Male/UHF Male	6, 8 or variable	**L4-UMUM-(*)**
7-16 DIN Male/7-16 DIN Male	6, 8 or variable	**L4-PDMDM-(*)**
LDF4P-50A-1, Low-VSWR Cable (824 - 960 MHz) - See specifications on page 463.		
N Male/N Male	3, 6, 10 or variable	**L4P1-NMNM-(*)**

* Insert length in feet for the listed standard lengths. For other lengths, specify base Type No. and length in feet or meters. e.g., F1-PNMNM, 15 feet long.
For configurations not listed, contact Andrew.

HELIAX®
Coaxial Cables

GPS Antenna Kit

- **An Industry First!**
- **Simplifies Ordering**
- **Speeds Installation**

Now PCS licensees can obtain a complete GPS antenna system packaged in a single comprehensive kit without coordinating activities with multiple vendors.

Available exclusively from Andrew, the GPS Antenna System Kit includes everything required to establish GPS capabilities for PCS applications.

The system is weatherproof and designed for outdoor use. It has been tested to meet the following specifications:

Test	Test Specification
Thermal shock	MIL-STD-202, method 107, condition A-1, -55°C to +85°C
Moisture resistance:	IEC 529, Class IPX4S

Kit Includes:

- *GPS antenna integrated with a 26 dB low-noise amplifier with a Type N female conector. A 5-volt dc bias is required, via the center conductor, to power the integrated low-noise pre-amplifier.*
- *HELIAX connectors. (1/2" LDF4, 1/2" FSJ4 or 7/8" LDF5 HELIAX cable is ordered separately to length).*
- *HELIAX cable hangers, grounding kit, and 3M™ Cold Shrink™ self-applicating, weatherproofing kit.*
- *Antenna mounting plate and mast shroud.*

GPS-KIT12 and GPS-KITF4 Kit Specifications

Parameter GPS Antenna, N Female	Description
Antenna Mount	Aluminum, 6061-T6
Antenna Gasket	Black Neoprene
8-32 Screws x 0.63", 4 each	18-8 stainless steel
#8 Lockwasher, 4 each	18-8 stainless steel
Connector Shroud	Aluminum, 6061-T6
Galvanized Steel Pipe Mast	3/4" nom. OD, 33 in length
Pipe Clamp, 3 each	18-8 stainless steel
10-32 Screws x 0.50", 2 each	18-8 stainless steel
1/2" Cable Hanger, 2 each	18-8 stainless steel
Cable Hanger Support, 2 each	18-8 stainless steel
1/4"-20 Bolts x 0.75", 2 each	18-8 stainless steel
1/4"-20 Nuts, 2 each	18-8 stainless steel
Round Member Adapter, 2 each	18-8 stainless steel
Cold Shrink Sleeve	Andrew Type 242424
Cold Shrink Spacer	Andrew Type 242416
Grounding Kit, 2 each	Andrew Type 204989-1
L4PNM, 2 each (GPS-KIT12)	N Male LDF4 connector
F4PNM, 2 each (GPS-KITF4)	N Male FSJ4 connector

GPS-KIT78 Antenna Kit Specifications

Parameter GPS Antenna, N Female	Description
Antenna Mount	Aluminum, 6061-T6
Antenna Gasket	Black Neoprene
8-32 Screws x 0.63", 4 each	18-8 stainless steel
#8 Lockwasher, 4 each	18-8 stainless steel
Connector Shroud	Aluminum, 6061-T6
Galvanized Steel Pipe Mast	3/4" nom. OD, 33 in length
Pipe Clamp, 3 each	18-8 stainless steel
10-32 Screws x 0.50", 2 each	18-8 stainless steel
7/8" Cable Hanger, 2 each	18-8 stainless steel
Cable Hanger Support, 2 each	18-8 stainless steel
1/4"-20 Bolts x 1.75", 2 each	18-8 stainless steel
1/4"-20 Nuts, 2 each	18-8 stainless steel
Round Member Adapter, 2 each	18-8 stainless steel
Cold Shrink Sleeve	Andrew Type 242424
Cold Shrink Spacer	Andrew Type 242416
LDF5 grounding Kits, 2 each	Andrew Type 204989-2
L5PNM, 2 each	N Male LDF5 connector

Cable Hanger Spacing

Recommended maximum hanger spacings are tabulated below for various wind speed and ice conditions. The recommendations are based on guidelines stated in EIA Standard RS-222 and new wind tunnel and vibration tests. They supersede those in previous Andrew Catalogs.

These spacing recommendations assume that all hangers are properly installed and tightened.

Installations in Typical Climates. Use the 125 mph (200 km/h), 1/2" ice conditions, highlighted in red in the table.

Severe or Mild Climates. Use the wind speed and ice conditions that most closely approximate the expected worst case conditions for the local climate.

Standard Hangers - Recommended Maximum Hanger Spacing

Nominal Cable Size	Cable Type Number	Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:			85 mph (137 km/h)			100 mph (160 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	FSJ4-50B	43211A	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	FSJ4-75A	43211A	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	LDF4-50A	43211A	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	LDF4-75A	43211A	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	HL4RP-50	43211A	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	HLT4-50	43211A	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	HS4RP-50	43211A	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	HST4-50	43211A	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	HT4-50	43211A	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	4.5 (1.37)
1/2"	HJ4-50	43211A	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	5 (1.52)
5/8"	HJ4.5-50	42396A-9	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
7/8"	LDF5-50A	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
7/8"	HJ5-50	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
7/8"	HJ5-75	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
7/8"	HT5-50	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-1/4"	LDF6-50	42396A-1	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	HJ7-50A	42396A-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	LDF7-50A	42396A-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	HJ12-50	42396A-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	LDF12-50	42395A-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
3"	HJ8-50B	31766A-11	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
4"	HJ11-50	31766A-10	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	HJ9-50	33598-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	HJ9HP-50	33598-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
Wind Speed:			125 mph (200 km/h)			150 mph (240 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	FSJ4-50B	43211A	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	FSJ4-75A	43211A	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	LDF4-50A	43211A	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	LDF4-75A	43211A	4 (1.22)	2.5 (0.76)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HL4RP-50	43211A	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HLT4-50	43211A	4 (1.22)	2.5 (0.76)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HS4RP-50	43211A	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	HST4-50	43211A	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	HT4-50	43211A	6 (1.83)	5 (1.52)	3.5 (1.07)	6 (1.83)	4 (1.22)	3 (0.91)
1/2"	HJ4-50	43211A	6 (1.83)	5 (1.52)	4 (1.22)	6 (1.83)	4 (1.22)	3 (0.91)
5/8"	HJ4.5-50	42396A-9	6 (1.83)	6 (1.83)	5 (1.52)	6 (1.83)	5.5 (1.68)	4.5 (1.37)
7/8"	LDF5-50A	42396A-5	6 (1.83)	5.5 (1.68)	4.5 (1.37)	5 (1.52)	4.5 (1.37)	3.5 (1.07)
7/8"	HJ5-50	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
7/8"	HJ5-75	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
7/8"	HT5-50	42396A-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
1-1/4"	LDF6-50	42396A-1	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	HJ7-50A	42396A-2	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	4.5 (1.37)
1-5/8"	LDF7-50A	42396A-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	HJ12-50	42396A-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	LDF12-50	42395A-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
3"	HJ8-50B	31766A-11	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
4"	HJ11-50	31766A-10	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	HJ9-50	33598-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	HJ9HP-50	33598-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)

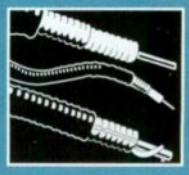
Definitions and Assumptions 1. Per EIA-222 Standard: Coefficient of drag for coaxial cable is 1.2 (cylindrical members). Ice forms completely around member (360 degrees). Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simutaneously. 2. Wind speeds are maximum, which includes gust factors and exposure factors.

HELIAX® Coaxial Cables

Insulated Hangers - Recommended Maximum Hanger Spacing

Nominal Cable Size	Cable Type Number	Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:				**85 mph (137 km/h)**			**100 mph (160 km/h)**	
Radial Ice:			**No Ice**	**1/2 in (13 mm)**	**1 in (25 mm)**	**No Ice**	**1/2 in (13 mm)**	**1 in (25 mm)**
1/4"	**FSJ1-75A**	11662-3	3.5 (1.07)	2 (0.61)	1.5 (0.46)	3 (0.91)	1.5 (0.46)	1 (0.30)
1/4"	**HST1-50**	11662-3	4.5 (1.37)	2.5 (0.76)	2 (0.61)	4 (1.22)	2 (0.61)	1.5 (0.46)
1/4"	**LDF1-50**	11662-3	4.5 (1.37)	2.5 (0.76)	2 (0.61)	4 (1.22)	2.5 (0.76)	1.5 (0.46)
3/8"	**EFX2-50**	11662-3	5.5 (1.68)	3.5 (1.07)	2.5 (0.76)	4.5 (1.37)	3 (0.91)	2 (0.61)
3/8"	**ETS2-50**	11662-3	5.5 (1.68)	3.5 (1.07)	2.5 (0.76)	5 (1.52)	3 (0.91)	2 (0.61)
3/8"	**FSJ2-50**	11662-3	5.5 (1.68)	3.5 (1.07)	2.5 (0.76)	5 (1.52)	3 (0.91)	2 (0.61)
3/8"	**HS2RP-50**	11662-3	5.5 (1.68)	3.5 (1.07)	2.5 (0.76)	5 (1.52)	3 (0.91)	2 (0.61)
3/8"	**HST2-50**	11662-3	5.5 (1.68)	3.5 (1.07)	2.5 (0.76)	5 (1.52)	3 (0.91)	2 (0.61)
3/8"	**LDF2-50**	11662-3	5 (1.52)	3 (0.91)	2.5 (0.76)	4 (1.22)	2.5 (0.76)	2 (0.61)
1/2"	**FSJ4-50B**	11662-3	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	**FSJ4-75A**	11662-3	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	**LDF4-50A**	11662-3	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	**LDF4-75A**	11662-3	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	**HL4RP-50**	11662-3	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	**HLT4-50**	11662-3	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
1/2"	**HS4RP-50**	11662-3	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	**HST4-50**	11662-3	5.5 (1.68)	3.5 (1.07)	3 (0.91)	4.5 (1.37)	3 (0.91)	2.5 (0.76)
1/2"	**HT4-50**	11662-3	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	4.5 (1.37)
1/2"	**HJ4-50**	11662-3	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	5 (1.52)
7/8"	**LDF5-50A**	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
7/8"	**HJ5-50**	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
7/8"	**HJ5-75**	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
7/8"	**HT5-50**	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-1/4"	**LDF6-50**	33948-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	**HJ7-50A**	33948-3	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	**LDF7-50A**	33948-3	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	**HJ12-50**	33948-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	**LDF12-50**	33948-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
3"	**HJ8-50B**	33948-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
4"	**HJ11-50**	33948-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	**HJ9-50**	33948-1	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
5"	**HJ9HP-50**	33948-1	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)

Definitions and Assumptions 1. Per EIA-222 Standard: Coefficient of drag for coaxial cable is 1.2 (cylindrical members). Ice forms completely around member (360 degrees). Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simutanecusly. 2. Wind speeds are maximum, which includes gust factors and exposure factors.



Insulated Hangers - Recommended Maximum Hanger Spacing

Nominal Cable Size	Cable Type Number	Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:			125 mph (200 km/h)			150 mph (240 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/4"	FSJ1-75A	11662-3	2.5 (0.76)	1 (0.30)	1 (0.30)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/4"	HST1-50	11662-3	3 (0.91)	1.5 (0.46)	1 (0.30)	2.5 (0.76)	1.5 (0.46)	1 (0.30)
1/4"	LDF1-50	11662-3	3 (0.91)	2.5 (0.76)	1.5 (0.46)	2.5 (0.76)	1.5 (0.46)	1 (0.30)
3/8"	EFX2-50	11662-3	3.5 (1.07)	2 (0.61)	1.5 (0.46)	3 (0.91)	2 (0.61)	1.5 (0.46)
3/8"	ETS2-50	11662-3	4 (1.22)	2.5 (0.76)	1.5 (0.46)	3 (0.91)	2 (0.61)	1.5 (0.46)
3/8"	FSJ2-50	11662-3	4 (1.22)	2.5 (0.76)	1.5 (0.46)	3 (0.91)	2 (0.61)	1.5 (0.46)
3/8"	HS2RP-50	11662-3	4 (1.22)	2 (0.61)	1.5 (0.46)	3 (0.91)	2 (0.61)	1.5 (0.46)
3/8"	HST2-50	11662-3	4 (1.22)	2 (0.61)	1.5 (0.46)	3 (0.91)	2 (0.61)	1.5 (0.46)
3/8"	LDF2-50	11662-3	3.5 (1.07)	2 (0.61)	1.5 (0.46)	2.5 (0.76)	1.5 (0.46)	1 (0.30)
1/2"	FSJ4-50B	11662-3	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	FSJ4-75A	11662-3	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	LDF4-50A	11662-3	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	LDF4-75A	11662-3	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HL4RP-50	11662-3	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HLT4-50	11662-3	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
1/2"	HS4RP-50	11662-3	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	HST4-50	11662-3	3.5 (1.07)	2.5 (0.76)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	HT4-50	11662-3	6 (1.83)	5 (1.52)	3.5 (1.07)	6 (1.83)	4 (1.22)	3 (0.91)
1/2"	HJ4-50	11662-3	6 (1.83)	6 (1.83)	4 (1.22)	6 (1.83)	6 (1.83)	3 (0.91)
7/8"	LDF5-50A	11662-2	6 (1.83)	5.5 (1.68)	4.5 (1.37)	5 (1.52)	4.5 (1.37)	3.5 (1.07)
7/8"	HJ5-50	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
7/8"	HJ5-75	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
7/8"	HT5-50	11662-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
1-1/4"	LDF6-50	33948-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	HJ7-50A	33948-3	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	6 (1.83)	4.5 (1.37)
1-5/8"	LDF7-50A	33948-3	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	HJ12-50	33948-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	LDF12-50	33948-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
3"	HJ8-50B	33948-2	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
4"	HJ11-50	33948-4	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)	5 (1.52)	4.5 (1.52)
5"	HJ9-50	33948-1	4.5 (1.37)	4.5 (1.37)	4.5 (1.37)	3 (0.91)	3.(0.91)	3 (0.91)
5"	HJ9HP-50	33948-1	4.5 (1.37)	4.5 (1.37)	4.5 (1.37)	3 (0.91)	3.(0.91)	3 (0.91)

Definitions and Assumptions 1. Per EIA-222 Standard: Coefficient of drag for coaxial cable is 1.2 (cylindrical members). Ice forms completely around member (360 degrees). Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simutaneously. 2. Wind speeds are maximum, which includes gust factors and exposure factors.

Snap-In Hangers - Recommended Maximum Hanger Spacing

Nominal Cable Size	Cable Type Number	Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:			85 mph (137 km/h)			100 mph (160 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	FSJ4-50B	206706-1	5.5 (1.68)	3.5 (1.07)	2 (0.61)	4.5 (1.37)	2.5 (0.76)	1.5 (0.46)
1/2"	FSJ4-75A	206706-1	5.5 (1.68)	3.5 (1.07)	2 (0.61)	4.5 (1.37)	2.5 (0.76)	1.5 (0.46)
1/2"	LDF4-50A	206706-1	6 (1.83)	3 (0.91)	2 (0.61)	4.5 (1.37)	2 (0.61)	1.5 (0.46)
1/2"	LDF4-75	206706-1	6 (1.83)	3 (0.91)	2 (0.61)	4.5 (1.37)	2 (0.61)	1.5 (0.46)
1/2"	HL4RP-50	206706-1	6 (1.83)	3 (0.91)	2 (0.61)	4.5 (1.37)	2 (0.61)	1.5 (0.46)
1/2"	HLT4-50	206706-1	6 (1.83)	3 (0.91)	2 (0.61)	4.5 (1.37)	2 (0.61)	1.5 (0.46)
1/2"	HT4-50	206706-1	6 (1.83)	3.5 (1.07)	2 (0.61)	5.5 (1.68)	2.5 (0.76)	2 (0.61)
1/2"	HJ4-50	206706-1	6 (1.83)	3 (0.91)	2 (0.61)	5 (1.52)	2.5 (0.76)	1.5 (0.46)
7/8"	LDF5-50A	206706-2	4.5 (1.37)	3 (0.91)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
7/8"	HJ5-50	206706-2	4.5 (1.37)	3 (0.91)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
7/8"	HJ5-75	206706-2	4.5 (1.37)	3 (0.91)	2 (0.61)	3 (0.91)	2 (0.61)	1.5 (0.46)
1/2"	HS4RP-50	206706-1	5.5 (1.68)	3.5 (1.07)	2 (0.61)	4.5 (1.37)	2.5 (0.76)	1.5 (0.46)
1/2"	HST4-50	206706-1	5.5 (1.68)	3.5 (1.07)	2 (0.61)	4.5 (1.37)	2.5 (0.76)	1.5 (0.46)
7/8"	HT5-50	206706-2	4.5 (1.37)	3 (0.91)	2 (0.61)	3.5 (1.07)	2 (0.61)	1.5 (0.46)
1-1/4"	LDF6-50	206706-3	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	HJ7-50A	206706-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
1-5/8"	LDF7-50A	206706-4	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)
Wind Speed:			125 mph (200 km/h)			150 mph (240 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	FSJ4-50B	206706-1	3.5 (1.07)	1.5 (0.46)	1 (0.30)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	FSJ4-75A	206706-1	3.5 (1.07)	1.5 (0.46)	1 (0.30)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	LDF4-50A	206706-1	3 (0.91)	1.5 (0.46)	0.5 (0.15)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	LDF4-75	206706-1	3 (0.91)	1.5 (0.46)	0.5 (0.15)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	HL4RP-50	206706-1	3 (0.91)	1.5 (0.46)	0.5 (0.15)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	HLT4-50	206706-1	3 (0.91)	1.5 (0.46)	0.5 (0.15)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	HT4-50	206706-1	3.5 (1.07)	1.5 (0.46)	1 (0.30)	2.5 (0.76)	1 (0.30)	0.5 (0.15)
1/2"	HJ4-50	206706-1	3 (0.91)	1.5 (0.46)	0.5 (0.15)	2 (0.61)	1 (0.30)	0.5 (0.15)
7/8"	LDF5-50A	206706-2	2 (0.61)	1.5 (0.46)	1 (0.30)	1 (0.30)	1 (0.30)	0.5 (0.15)
7/8"	HJ5-50	206706-2	2 (0.61)	1.5 (0.46)	1 (0.30)	1 (0.30)	1 (0.30)	0.5 (0.15)
7/8"	HJ5-75	206706-2	2 (0.61)	1.5 (0.46)	1 (0.30)	1 (0.30)	1 (0.30)	0.5 (0.15)
1/2"	HS4RP-50	206706-1	3.5 (1.07)	1.5 (0.46)	1 (0.30)	2 (0.61)	1 (0.30)	0.5 (0.15)
1/2"	HST4-50	206706-1	3.5 (1.07)	1.5 (0.46)	1 (0.30)	2 (0.61)	1 (0.30)	0.5 (0.15)
7/8"	HT5-50	206706-2	2 (0.61)	1.5 (0.46)	1 (0.30)	1.5 (0.46)	1 (0.30)	0.5 (0.15)
1-1/4"	LDF6-50	206706-3	6 (1.83)	6 (1.83)	5.5 (1.68)	6 (1.83)	5 (1.52)	3.5 (1.07)
1-5/8"	HJ7-50A	206706-4	5 (1.52)	4 (1.22)	3 (0.91)	3.5 (1.07)	2.5 (0.76)	2 (0.61)
1-5/8"	LDF7-50A	206706-4	5 (1.52)	4 (1.22)	3 (0.91)	3.5 (1.07)	2.5 (0.76)	2 (0.61)

Nominal Cable Hanger Cable Type Type Size Number Number Recommended Maximum Hanger Spacing, feet (m)
Definitions and Assumptions 1. Per EIA-222-E Standard: Coefficient of drag for coaxial cable is 1.2 (cylindrical members). Ice forms completely around member (360 degrees). Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simutaneously. 2. Wind speeds are maximum, which includes gust factors and exposure factors.
Note: As can be seen from the maximum hanger spacing recommendations, snap-in hangers are not practical for installations subject to high winds and/or thick, radial ice.

Hanger Blox - Recommended Maximum Hanger Spacing

Nominal Cable Size	Cable Type Number	Hanger Type Number	Recommended Maximum Hanger Spacing, feet (m)					
Wind Speed:			85 mph (137 km/h)			100 mph (160 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	LDF4-50A	HB-4	6 (1.83)	4 (1.22)	3.5 (1.07)	5 (1.52)	3.5 (1.07)	2.5 (0.76)
7/8"	LDF5-50A	HB-5	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	5.5 (1.68)
1-1/4"	LDF6-50	HB-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
1-5/8"	LDF7-50A	HB-7	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
2-1/4"	LDF12-50	HB-12	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)
Wind Speed:			125 mph (200 km/h)			150 mph (240 km/h)		
Radial Ice:			No Ice	1/2 in (13 mm)	1 in (25 mm)	No Ice	1/2 in (13 mm)	1 in (25 mm)
1/2"	LDF4-50A	HB-4	4 (1.22)	3 (0.91)	2 (0.61)	3 (0.91)	2.5 (0.76)	1.5 (0.46)
7/8"	LDF5-50A	HB-5	6 (1.83)	6 (1.83)	4.5 (1.37)	5 (1.52)	4.5 (1.37)	3 (0.91)
1-1/4"	LDF6-50	HB-6	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	4.5 (1.37)
1-5/8"	LDF7-50A	HB-7	6 (1.83)	6 (1.83)	6 (1.83)	5 (1.52)	4 (1.22)	6 (1.83)
2-1/4"	LDF12-50	HB-12	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)	6 (1.83)

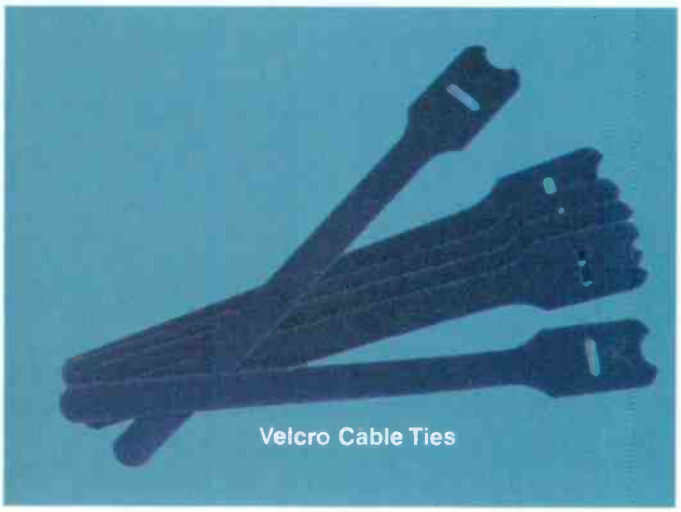
Definitions and Assumptions 1. Per EIA-222-E Standard: Coefficient of drag for coaxial cable is 1.2 (cylindrical members). Ice forms completely around member (360 degrees). Combined wind and ice loading is reduced by 25% to reflect lower probability of wind and ice occuring simutaneously. 2. Wind speeds are maximum, which includes gust factors and exposure factors.

Hangers and Cable Ties

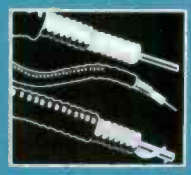
Andrew offers a wide variety of hangers and cable ties for reliable and convenient support of HELIAX® coaxial cables.

- ***Standard Hangers*** *feature great strength and long term reliability. They are ideal for general purpose use.*
- ***Insulated Hangers*** *are for use on insulated towers.*
- ***Snap-In Hangers*** *offer quickest and easiest installation for cable sizes 1/2" to 1-5/8".*
- ***Hanger Blox™*** *are two-piece hangers designed to support multiple runs of cable in a single unit.*
- ***Nylon Cable Ties*** *are lowest cost for cables 1/2" and smaller. They are ideal for 1/4" and 3/8" cable and for temporary installations.*
- ***Velcro* Cable Ties*** *are the easiest way to organize jumpers within and between radio cabinets.*

** Velcro is a registered trademark of Velcro Industries.*


Velcro Cable Ties

HELIAX® Coaxial Cables




Standard Hanger


Insulated Hanger


Snap-In Hanger


Hanger Blox


Nylon Cable Ties

HELIAX®
Coaxial Cables

Standard Hangers and Adapters

Cable Gripping Tabs
Prevent cable slippage without the need for a permanently installed hoisting grip.

Pre-Assembled and Captivated Hardware
Eliminates the need for field assembly.

Springlike Flexibility
Makes it easy to form the hanger around the cable and dampens vibration for long life.

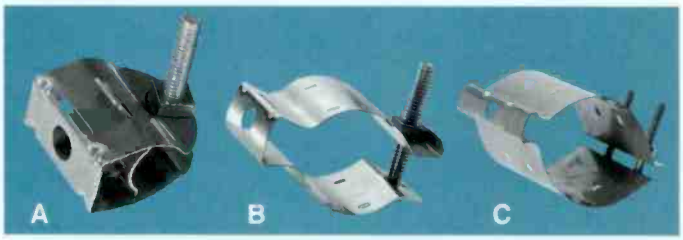
Heavy Gauge Stainless Steel Construction
High strength and excellent corrosion resistance for long-term reliability.

Standard HELIAX hangers are designed for easy installation. The clamp locking bolt and nut are preassembled and captivated to minimize installation labor. Proper tension is easy to determine. The hanger is simply tightened until there is a 5/16" gap between the clamp legs. The pre-drilled hole for 3/8" or 1/2" mounting hardware and slots for round member adapter clamps further simplify installation. Many accessories are available to adapt these hangers to most tower configurations.

Standard Hangers and Adapters for 1/2" to 4" Cables

Hangers for 1/2" to 4" HELIAX cables use 3/8" hardware for attachment to towers or adapters.

Hanger Kit of 10 pieces. Stainless steel. 3/8" mounting hardware not included.



Cable Size	Maximum Spacing	Photo Ref.	Type Number
1/2"	Refer to	A	43211A
5/8"	table	B	42396A-9
7/8"	on	B	42396A-5
1-1/4"	page 547	B	42396A-1
1-5/8"		B	42396A-2
2-1/4"		B	42396A-4
3"		C	31766A-11
4"		C	31766A-10

* See page 570 for bulk packs.

Hardware Kit of 10 sets. 3/8" fillister-head bolts, lock washers and nuts for attachment of hangers to drilled tower members.

3/4" (19 mm) long .....Type **31769-5**
1" (25 mm) long .....Type **31769-1**

Angle Adapter, Stainless Steel, kit of 10 pieces. For mounting cable 1/2" to 4" cable hangers to angle tower members up to 7/8" (22mm) thick. Includes hanger attachment hardware. See page 570 for bulk packs
.....Type **31768A**

Angle Adapter, Galvanized, kit of 10 pieces. For mounting cable 1/2" to 2-1/4" cable hangers to angle tower members up to 3/4" (19 mm) thick. Includes hanger attachment hardware.
3/8" Hardware.....Type **242774**
Metric Hardware .....Type **242774-M**

Round Member Adapter Kit of 10 pieces. Stainless steel clamps to mount 1/2" to 4" cable hangers to round support members. Two each are needed for 3" and 4" cable hangers.

Member Diameter, in (mm)	Type No.
1 - 2 (25 - 50)	31670-1
2 - 3 (50 - 75)	31670-2
3 - 4 (75 - 100)	31670-3
4 - 5 (100 - 125)	31670-4
5 - 6 (125 - 150)	31670-5

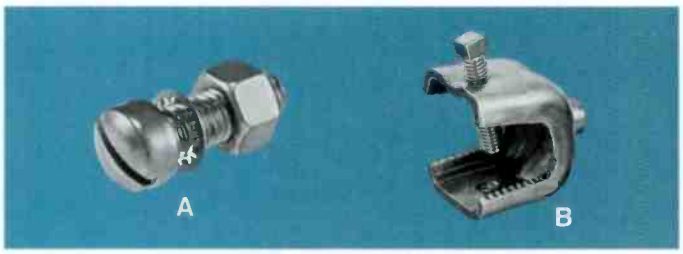
Tower Standoff Kit of 10 pieces. Adapters with round member clamps and hardware for 1/2" to 4" hangers. All parts are stainless steel or galvanized.

Member Diameter in (mm)	1 in (25 mm) Standoff	2.5 in (60 mm) Standoff
0.75 - 1.5 (20 - 40)	30848-5	–
1.5 - 3.0 (40 - 75)	30848-4	–
3 - 4 (75 - 100)	30848-1	41108A-1
4 - 5 (100 - 125)	30848-2	41108A-2
5 - 6 (125 - 150)	30848-3	41108A-3

Threaded Rod Support Kit. Use to mount hangers away from supporting structure, under cable bridge and inside equipment room. Includes 3/8" diameter threaded rod, galvanized ceiling mounting plate, nuts and washers. Attach to angle tower members with 31768A angle adapters. Attach to round tower members with 30848 series tower standoffs. All components are stainless steel, except ceiling mounting plate.

Rod Length in (mm)	Kit of 1	Kit of 5
12 (305)	31771	31771-4
24 (610)	31771-9	31771-6
36 (915)	–	31771-10

Standard Hangers and Adapters for 5" Cables

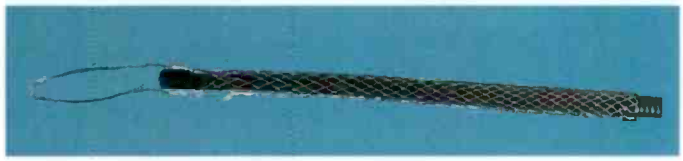


Hangers for 5" HELIAX cables use 1/2" hardware for attachment to towers or adapters.

Hanger, Kit of 10 pieces. Galvanized steel. 1/2" mounting hardware not included. Refer to page 461 for maximum spacing .....Type **33598-5**

A Hardware, Kit of 10 pieces 1/2" x 1-1/4" (32 mm) bolts, lockwashers, and nuts for attachment of 5" hangers to drilled tower members.....Type **31769-4**

B Angle Adapter, Kit of 10 pieces. Stainless steel. For mounting 5" cable hangers to angle tower members up to 7/8" (22 mm) thick .....Type **33981A-1**



Hoisting Grip. Use at 200 ft (60 m) intervals to raise cable on tower.

Cable Size	Type No.
1/2"	43094
5/8"	29958
7/8"	19256B
1-1/4"	29961
1-5/8"	24312A
2-1/4"	31535
3"	26985A
4"	34759
5"	31031-1

Support/Hoisting Grip. Use at 200 ft (60 m) intervals to raise cable and provide permanent cable support. Basic kit includes one grip and one support clamp. Support clamps are also available in kits of 10. Installation tool is required. The tool includes a kit of 10 support clamps.

For Cable Type	Grip with One Clamp	Support Clamp Kit of 10	Installation Tool with Kit of 10 Support Clamps
7/8", LDF5	L5SGRIP	L5SGRIP-5IK	L5SGRIP-5IKT
1-1/4", LDF6	L6SGRIP	L6SGRIP-6IK	L6SGRIP-6IKT
1-5/8", LDF7	L7SGRIP	L7SGRIP-7IK	L7SGRIP-7IKT
2-1/4", LDF12	L12SGRIP	L12SGRIP-12IK	L12SGRIP-12IKT

HELIAX®
Coaxial Cables

Insulated Hangers and Adapters

Insulated Hanger for 1/4" to 7/8" Cables Single. For use on insulated tower. Refer to table on pages 548 and 549 for maximum spacing.

For 1/4", 3/8" and 1/2" cables .....Type **11662-3**
For 7/8" cable .....Type **11662-2**

Insulated Hanger for 1-1/4" - 5" Cables Single. For use on insulated tower.

Cable Size	Max. Spacing	Type No.
1-1/4"	Refer to	33948-5
1-5/8"	table	33948-3
2-1/4"	on	33948-6
3"	page 462	33948-2
4"		33948-4
5"		33948-1

Round Member Adapter/Tower Standoff Kit of 10 pieces. For mounting 5" cable hangers to round support members. HELIAX cable to clear tower leg flanges. Provides 2.5 in (60 mm) standoff. All parts are stainless steel or galvanized.

Member Diameter, in (mm)	
3 - 4 (75 - 100)	43130-1
4 - 5 (100 - 125)	43130-2
5 - 6 (125 - 150)	43130-3

Threaded Rod Support Kit of 5 pieces. 1/2" x 12" (305 mm) threaded rods, ceiling mounting plates, nuts and washers for suspending 5" cable hangers. All parts are stainless steel except galvanized ceiling mounting plate.....Type **31771-5**

Angle Adapter Single. For insulated hangers. Maximum member thickness 7/8 in (22 mm).

A For 1/2" and 7/8" cable .....Type **40430-1**
B For 1-1/4" - 5" cable.....Type **13555A**

Round Member Adapter Single. For use with Type 33948 series (1-1/4"-5" cables) insulated hangers. Fits member diameters 1-3 in (25 - 75 mm). .....Type **13550**

Stainless Steel Wraplock 100 feet complete with fasteners. Use to attach 1/4" - 7/8" insulated hangers to round members. Not to be used to attach cable or waveguide directly to towers.....Type **12395-1**

Snap-In Hangers

Attach Without Hardware
Quick and easy attachment in all types of weather. The hangers snap directly into holes in the tower support members. Installation time and cost are substantially reduced.

Cable Gripping Tabs
Prevent cable slippage without the need for a permanently installed hoisting grip.

Heavy Gauge Stainless Steel Construction
High strength and excellent corrosion resistance for long-term reliability.

Snap-in hangers are ideal for microwave, cellular and land mobile radio systems. They are available for 1/2" to 1-5/8" size HELIAX coaxial cables.

The hanger is designed to be installed into 3/4" holes in support structures 0.120 to 0.150 inch thick. Locking tabs on the hanger's spring fork make the hanger highly resistant to pull-off. The hanger is mounted directly to tower support members by inserting its spring fork into precision pre-punched holes in Andrew cable support systems.

Support systems for all Andrew self-supporting towers are pre-punched to accept both snap-in hangers and standard hangers. Andrew guyed towers have integral cable support systems which are also supplied pre-punched, when specified.

Snap-in hangers can also be used on existing towers by using adapters. Even with the adapters, fewer materials are needed for hanging cable.

Snap-In Hanger Kit of 10 pieces. Mounts to pre-punched 3/4" (19 mm) holes on Andrew self-supporting towers or, when used with adapters, to any tower. Guyed tower transmission support systems can also accommodate snap-in hanger when specified. Made of heavy gauge stainless steel. Refer to table on page 550 for maximum spacing.

Cable Size	Type Number
1/2"	206706-1*
7/8"	206706-2*
1-1/4"	206706-3
1-5/8"	206706-4

* See page 570 for bulk packs.

Tower/Hanger Adapter cable support attaches to existing angle tower members. Includes angle support prepunched with 3/4" and 7/16" holes to accommodate snap-in hanger, and standard hanger.

HELIAX®
Coaxial Cables

Number of Cable Runs	J-Bolt or Angle Adapter Connections Required	Type No.
1	1	206929-1
4	2	206929-4
8	3	206929-8

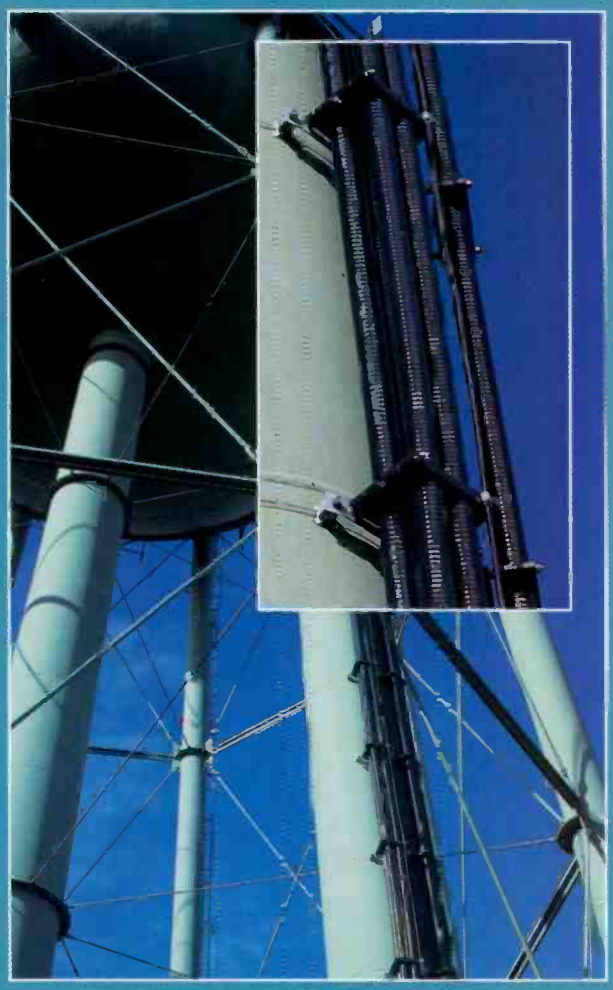
J-Bolt Hardware, Kit of 10 for attaching Tower/Hanger Adapter to 1-1/4" to 2-3/4" (32-70 mm) angle tower members. Includes J-bolt, flat washers, lock washers and nuts .....Type **206930**

Angle Adapter, Kit of 10. For attaching Tower/Hanger Adapter to angle tower members.
Stainless Steel, 3/8" hardware .....Type **31768A**
Galvanized, 3/8" hardware .....Type **242774**
Galvanized, Metric hardware.....Type **242774M**

Cluster Mount**. Octagonal cable support for one to seven cable runs attaches to 1-1/2" nominal steel pipe or 1.90" (48 mm) round tower members. Prepunched with 3/4" and 7/16" holes to accommodate snap-in hanger and standard hanger. Supplied mounting hardware kit includes 3/8" plated bolts, flat washers, lock washers and nuts.
Kit of 1 .....Type **207030**
Kit of 10 .....Type **207030-2**

** Patented United States 4,813,639

HELIAX®
Coaxial Cables



Hanger Blox™ Cable Hangers

Hanger Blox Cable Hangers make the most efficient use of valuable space by arranging cable into compact, orderly units.

Durable
Hanger Blox cable hangers are manufactured from an injection-molded, composite plastic that is UV stable and weather resistant. Gripper tabs, unique to Hanger Blox cable hangers, grab the jacketing to support the cable securely and prevent slippage.

Stackable
Hanger Blox cable hangers are stackable to form a space saving, neat-looking bundle. Installers can stack Hanger Blox up to three high in vertical applications and up to four high horizontally.

Versatile
Hanger Blox cable hangers were designed to support HELIAX coaxial cable. They can be attached directly to a standard tower member or cable ladder by using existing holes, mounted to a wall or roof top, or installed on a cable bridge. Special configurations are easily accommodated. A comprehensive line of unique supporting accessories and hardware is also available, including round member adapters, angle member adapters, and standoffs, which facilitate easy installation even in difficult, non-standard applications.

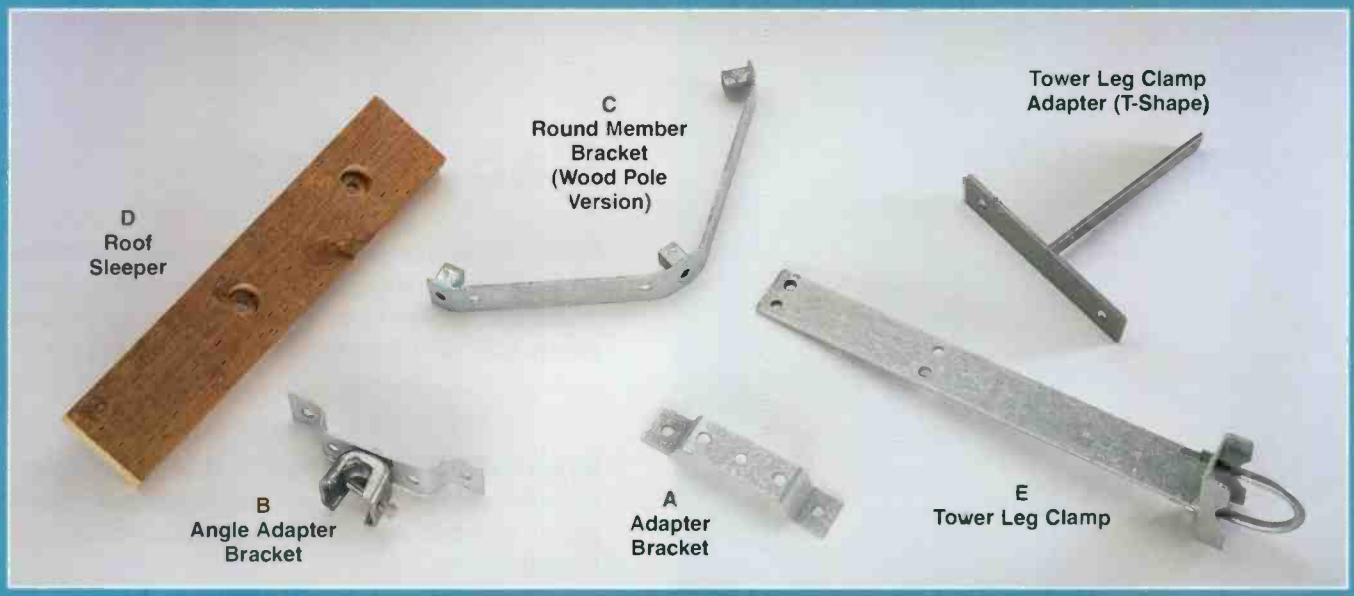
Hanger BLOX

Hanger Blox Cable Hangers Ordering Information

Cable Size	Cable Type	Runs per Unit	Runs per Bundle	Type Number Kit of 10
1/2"	LDF4-50A	6	18	**HB-4**
7/8"	LDF5-50A	4	12	**HB-5**
1-1/4"	LDF6-50	3	9	**HB-6**
1-5/8"	LDF7-50A	2	6	**HB-7**
2-1/4"	LDF12-50	2	6	**HB-12**

Hanger Blox Hardware Kits

For Hanger Blox	Starter Hardware Kit	Extender Hardware Kit
HB-4	**HBSH-456**	**HBEH-456**
HB-5	**HBSH-456**	**HBEH-456**
HB-6	**HBSH-456**	**HBEH-456**
HB-7	**HBSH-7**	**HBEH-7**
HB-12	**HBSH-12**	**HBEH-12**

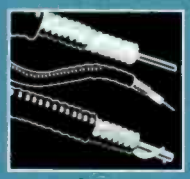


Hanger BLOX

Supporting Accessories

	Description	Type No.
A	Adapter Bracket	242067
B	Angle Adapter Bracket	242067-2
C	Round Member Bracket, wood pole	242070-1
	Round Member Bracket, universal	242070-2
D	Roof Sleeper, 12" (305 mm)	242069-1
	Roof Sleeper, 18" (457 mm)	242069-2

	Description	Type No.
E	Tower Leg Clamp, 2" (51 mm)	242078-1
	Tower Leg Clamp, 2.5" (64 mm)	242078-2
	Tower Leg Clamp, 3" (76 mm)	242078-3
	Tower Leg Clamp, 3.5" (89 mm)	242078-4
	Tower Leg Clamp, 4" (102 mm)	242078-5
	Tower Leg Clamp, 5" (127 mm)	242078-6
	Tower Leg Clamp, 6" (152 mm)	242078-7
	Tower Leg Clamp, 8" (203 mm)	242078-8
	Tower Leg Clamp, 10" (254 mm)	242078-9
	Tower Leg Clamp Adapter (T-Shape)	242079-1
	Strut Hardware	242046

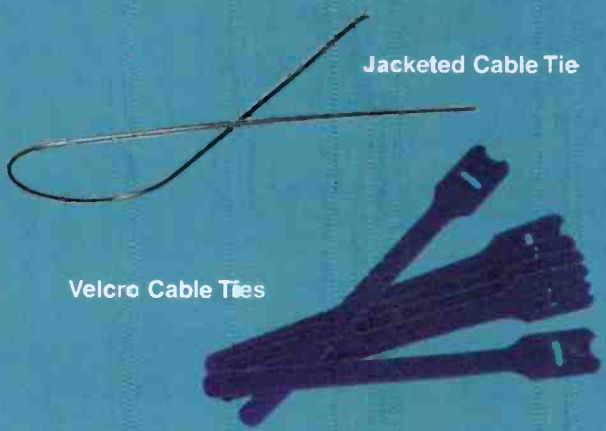


HELIAX®
Coaxial Cables

Nylon Cable Tie

Nylon Cable Tie Kit in Plastic Box

Nylon Cable Tie Installation Tool



Jacketed Cable Tie

Velcro Cable Ties

Cable Ties

Nylon Cable Tie Kit of 50 pieces. Weather-resistant straps for attaching 1/4" to 1/2" cables directly to tower members. Maximum spacing 3 ft (1 m) for HJ and LDF series and 18" (457 mm) for FSJ series cables. .....Type **40417**

Nylon Cable Tie Kit in Plastic Box. Black, weather-resistant cable ties. Kits are packaged in a reusable plastic box and organized for quick selection. Includes:

Quantity 100, 4" (101 mm) cable ties, 18 lb (80 N) tensile strength
Quantity 100, 5.5" (140 mm) cable ties, 40 lb (178 N) tensile strength
Quantity 100, 7.5" (190 mm) cable ties, 50 lb (222 N) tensile strength
50 adhesive-backed black mounts .....Type **CT-K350**

Nylon Cable Tie Installation Tool. For use with Type CT-K350, above. Tightens and trims cable tie in one process with one hand. Cuts ties flush with a simple 1/4 turn downward twist. Top loading for right or left hand users .....Type **CT-IT**

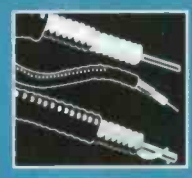
Jacketed Cable Tie Kit of 20 pieces. Weather-resistant ties for attaching FSJ Series cable directly to tower members. Maximum spacing 18" (457 mm) .....Type **27290A**

Velcro* Cable Ties. The easiest way to organize inter-rack cabling. Secure in high-vibration areas. No special tying procedure required. Can be reused to accommodate future expansion. Black, 8" (203 mm) length. Maximum bundle diameter, 2" (51 mm). Minimum bundle diameter, 0.25" (6.4 mm). Tensile strength, 40 lb (178 N). For indoor use only.

Kit of 10 .....Type **VCT8-10**

Kit of 50 .....Type **VCT8-50**

** Velcro is a registered trademark of Velcro Industries.*



SureGround™ Kit

Standard Grounding Kit

Grounding Kits

A well designed system uses grounding kits to provide a bond between the cable and the tower/earth ground system. One grounding kit is recommended at tower top, tower bottom, at 200 ft (60 m) intervals (where applicable), and at the entrance to the equipment shelter.

SureGround™ Series and 204989 and 241088 Series Grounding Kits offer:

- *Solid copper construction for high current handling capability, compatibility with copper cable outer conductors, and long life.*
- *Meet military standards at commercial prices.*
- *Provide certainty of continued operation. Tested at an independent laboratory to withstand 200,000 amps.*

Andrew 204989 and 241088 series solid copper grounding kits have passed United States Air Force lightning simulation tests and meet MIL-STD-188-124A. The non-braided solid copper construction of all Andrew grounding kits eliminates corrosion caused by moisture retention and "wicking." A heat shrink tube protects the cable terminal connection.

Heavy Duty Ground Lead

Andrew grounding kits utilize heavy duty 16 mm^2 ground leads to maximize performance. The IEC 1024-1 compliant copper ground lead reduces dc resistance. The extremely pliable jacket provides protection and makes it easy to maneuver the lead into position for attachment to the down conductor.

Easy Installation

Standard Grounding Kits (204989 and 241088 series) require few steps to install and include easy to follow instructions. Proper tensioning is ensured by an expansion section which provides visual indication that the strap is secured.

SureGround Grounding Kits install in less than half the time required for standard grounding kits. Factory assembled into one component, they feature a pre-formed clip-on grounding strap for easy, snap-on installation.

Kits Include

Standard Grounding Kits for 1/2" and Larger Cables. Series 204989 and 241088 kits include a solid copper strap riveted to the grounding wire, a coiling tool for proper tightening, tower attachment hardware, and a two-part tape weatherproofing system. Field-attachable, crimp-on grounding lugs require the use of a crimping tool (not included, described below).

Standard Grounding Kit for 1/4" and 3/8" Cables. Includes a solid copper strap, connection hardware, tower atachment hardware, and a two-part tape weatherproofing system .....Type **223158**

SureGround Grounding Kit is a one-piece factory assembled ground strap which includes a two-part tape weatherproofing system.

HELIAX® Coaxial Cables

Lug and Wire Length Options for Grounding Kits

Kits are available with either factory attached lugs or field attachable lugs. Standard grounding kits feature field attachable lugs that are either crimp-on or screw-on. SureGround™ grounding kits have crimp-on field attachable lugs.

One or two-hole lugs are available as indicated in the table. The hole spacing on the two-hole lug is 0.815 in (20.7 mm). All Andrew bus bars will accept both types of lugs.

Grounding wire is available in a variety of lengths as indicated in the table.

Crimping Tool. Used to attach crimp-on lugs for standard and SureGround series. Not required for kits having factory-attached lugs

.....Type **207270**

Standard Grounding Kits - See page 570 for bulk packs.

Cable Size	With Factory Attached One-Hole Lug Type No.	With Factory Attached Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	Attachable Screw-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.
Grounding Wire Length:							
	24"	24"	36"	36"	36"	36"	48"
1/2"	204989-1	241088-1	241234-2	204989-21	241088-6	204989-31	–
3/8"	223158	–	–	–	–	–	–
5/8" and 7/8"	204989-2	241088-2	241234	204989-22	241088-7	204989-32	–
1-1/4"	204989-3	241088-3	241234-3	204989-23	241088-8	204989-33	–
1-5/8"	204989-4	241088-4	–	204989-24	241088-9	204989-34	223700-699
2-1/4" and 3"	204989-5	241088-5	–	204989-25	241088-10	204989-35	–
4"	204989-6	–	–	204989-26	–	204989-36	–
5"	204989-7	–	–	204989-27	–	204989-37	–

Cable Size	With Factory Attached One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.
Grounding Wire Length:						
	60"	60"	72"	72"	72"	96"
1/2"	–	241545	–	–	–	–
5/8" and 7/8"	–	220497	241088-16	223700-477	241088-13	223700-734
1-1/4"	–	–	241088-17	223700-478	241088-14	223700-706
1-5/8"	–	220498	241088-18	223700-479	241088-15	223700-703
2-1/4" and 3"	223700-724	–	–	–	–	–

SureGround™ Grounding Kits - See page 570 for bulk packs.

Cable Type	With Factory Attached One-Hole Lug Type No.	With Factory Attached Two-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Factory Attached Two-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.
Grounding Wire Length:							
	600 mm (23.6")	600 mm (23.6")	600 mm (23.6")	600 mm (23.6")	1000 mm (39.4")	1000 mm (39.4")	1000 mm (39.4")
LDF5	SGL5-06B1	SGL5-06B2	SGL5-06B3	SGL5-06B4	SGL5-10B1	SGL5-10B2	SGL5-10B3
LDF6	SGL6-06B1	SGL6-06B2	SGL6-06B3	SGL6-06B4	SGL6-10B1	SGL6-10B2	SGL6-10B3
LDF7	SGL7-06B1	SGL7-06B2	SGL7-06B3	SGL7-06B4	SGL7-10B1	SGL7-10B2	SGL710B3

Cable Type	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Factory Attached Two-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Factory Attached Twoe-Hole Lug Type No.
Grounding Wire Length:							
	1000 mm (39.4")	1500 mm (59.1")	1500 mm (59.1")	1500 mm (59.1")	1500 mm (59.1")	2000 mm (78.7")	2000 mm (78.7")
LDF5	SGL5-10B4	SGL5-15B1	SGL5-15B2	SGL5-15B3	SGL5-15B4	SGL5-20B1	SGL5-20B2
LDF6	SGL6-10B4	SGL6-15B1	SGL6-15B2	SGL6-15B3	SGL6-15B4	SGL6-20B1	SGL6-20B2
LDF7	SGL7-10B4	SGL7-15B1	SGL7-15B2	SGL7-15B3	SGL7-15B4	SGL7-20B1	SGL7-20B2

Cable Type	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.	With Factory Attached One-Hole Lug Type No.	With Factory Attached Two-Hole Lug Type No.	With Field-Attachable Crimp-On One-Hole Lug Type No.	With Field-Attachable Crimp-On Two-Hole Lug Type No.
Grounding Wire Length:						
	2000 mm (78.7")	2000 mm (78.7")	3000 mm (118")	3000 mm (118")	3000 mm (118")	3000 mm (118")
LDF5	SGL5-20B3	SGL5-20B4	SGL5-30B1	SGL5-30B2	SGL5-30B3	SGL5-30B4
LDF6	SGL6-20B3	SGL6-20B4	SGL6-30B1	SGL6-30B2	SGL6-30B3	SGL6-30B4
LDF7	SGL7-20B3	SGL7-20B4	SGL7-30B1	SGL7-30B2	SGL7-30B3	SGL7-30B4

HELIAX®
Coaxial Cables

Arrestor Plus® Lightning Surge Protectors

The Arrestor Plus† Lightning Surge Protector is a one-piece surge protector/HELIAX connector. It uniquely combines the reliability of quarter wave shorting stub technology with the proven performance of HELIAX connectors to deliver premium lightning protection in a single component.

The integrated design of the Arrestor Plus reduces the number of components resulting in improved system performance and reduced system cost. Silver plating and high contact pressures throughout maintain low intermodulation levels - a definite plus for today's wireless systems.

Arrestor Plus is available for 1/2" superflexible and 1/2", 7/8", 1-1/4", and 1-5/8" LDF cables as specified in the table.

† U.S. and International patents pending.

Integrated Arrestor/Connector Design

- *Insertion loss less than 0.1 dB*
- *Improved system performance*
- *Reduced component costs*
- *Easy installation*
- *Completely weatherproof*
- *Attaches directly to ArrestorPort Plus™*

Quarter-Wave Shorting Stub Technology

- *Provides true "multi-strike" capability. Tests performed by independent laboratories verify that Arrestor Plus withstands in excess of 50 impulse current surges of 50 kA without product degradation.*
- *Reliable equipment protection.*
- *Maintenance free.*

Ordering Information

Interface Type	Type Number
For FSJ4-50B, 1/2" Superflexible Cable	
N Male, Hex.	APPF4-3-(*)
N Female	APPF4-1-(*)
7-16 DIN Male	APPF4-4-(*)
7-16 DIN Female	APPF4-5-(*)
N Male, Right Angle, Hex.	APPF4-7-(*)
For LDF4-50A, 1/2" Foam-Dielectric Cable	
N Male, Hex.	APPL4-3-(*)
N Female	APPL4-1-(*)
7-16 DIN Male	APPL4-4-(*)
7-16 DIN Female	APPL4-5-(*)
N Male, Right Angle, Hex.	APPL4-7-(*)
For LDF5-50A, 7/8" Foam-Dielectric Cable	
N Female	APPL5-1-(*)
7-16 DIN Female	APPL5-5-(*)
For LDF6-50, 1-1/4" Foam-Dielectric Cable	
N Female	APPL6-1-(*)
7-16 DIN Female	APPL6-5-(*)
For LDF7-50A, 1-5/8" Foam-Dielectric Cable	
N Female	APPL7-1-(*)
7-16 DIN Female	APPL7-5-(*)
Arrestor Port Plus™ Mounting Hardware	242435

* Frequency band. Insert Detail Number from Operating Frequencies table. Contact Andrew for other combinations.

Operating Frequencies

Frequency Band, MHz**	Detail Number
450-480	-8
480-512	-7
800-870	-6
824-900	-2
824-960	-1
870-960	-3
1425-1535	-10
1700-1900	-11
1850-1990	-9
2100-2200	-5

** Additional frequencies available on request.

Arrestor Plus® T-Series, Lightning Surge Protectors

- *Compact profile ideal for installation in tight spaces*
- *Reliable equipment protection*
- *Excellent microwave performance. Low VSWR, low insertion loss*
- *Fully weatherproof*
- *Easy installation*
- *Available with Type N or DIN interfaces.*

The new Arrestor Plus T-Series surge arrestor provides excellent lightning protection and outstanding RF performance, in a compact design, that is ideal for confined applications, indoors or outdoors.

Using quarterwave surge protection technology, this T-shaped arrestor offers true multistrike protection. For an applied current impulse at 20 kA (8 x 20 waveform), the throughput energy is less than 1 mJ. Silver plated components and high pressure contacts throughout also ensure low levels of intermodulation and excellent VSWR performance. The slim profile easily fits inside equipment enclosures. It it also fully weatherproof and is suitable for a variety of outdoor applications.

The Arrestor Plus T-Series is supplied with a grounding stud which allows direct attachment to a ground lead or bus bar. Mounting flexibility is further enhanced by the variety of through hole configurations provided in the body of the arrestor.

The T-Series is complemented with a full line of mounting adapters and accessories.

NEW!

Ordering Information

Interface Type	Type Number
N Male/N Male	APT-NMNM-(*)
N Female/N Female	APT-NFNF-(*)
N Female/N Male, Hex	APT-NFNM-(*)
7-16 DIN Female/7-16 DIN Female	APT-DFDF-(*)
7-16 DIN Female/7-16 DIN Male	APT-DFDM-(*)

* Frequency band. Insert Detail Number from Operating Frequencies table.

Operating Frequencies

Frequency Band, MHz**	Insertion Loss, dB	VSWR Max.	Detail Number
824-960	< 0.1	1.10	-1
824-900	< 0.1	1.07	-2
870-960	< 0.1	1.07	-3
800-870	< 0.1	1.07	-6
1850-1990	< 0.1	1.07	-9

** Additional frequencies available. Contact Andrew for availability.

APT Mounting Hardware

Type N ..... Type **243394**
DIN ..... Type **243396**

HELIAX®
Coaxial Cables

NEW!

Gas Tube Surge Arrestors

- *Superior microwave performance, low VSWR, and low insertion loss.*
- *Universal version with Type N connectors.*
- *Easy installation. Interfaces directly with existing connectors.*
- *Superior mechanical design. Provides reliable, long term protection.*

Our new line of surge arrestors uses multi-stage gas tube technology to provide excellent surge protection and the ability to pass direct current. This is important for antenna systems having preamplifiers which are powered via the center conductor of the coaxial cable. The rugged construction withstands multiple lightning strikes without sacrificing microwave performance. The surge arrestors also feature a machined housing for rigidity and strength.

The gas tube surge arrestors are universal versions for easy retrofitting of existing systems. In-line installation is as simple as mating your existing cable connectors with the connector interfaces on the surge arrestor. The arrestors are directional devices and must be installed according to the instructions on the product label. A grounding stud provides fast, easy attachment of an earth ground. Type N male and female interfaces are available.

Ordering Information

Operating Frequency, MHz	Input/Output Connectors	Type Number
800-960	N Female/N Female	**SA-1-CEL**
800-960	N Male/N Female	**SA-12-CEL**
1550-1600	N Female/N Female	**SA-1-GPS**
1550-1600	N Male/N Female	**SA-12-GPS**
1850-1990	N Female/N Female	**SA-1-PCS**
1850-1990	N Male/N Female	**SA-12-PCS**

Weatherproofing

3M™ Cold Shrink™ Weatherproofing Kit

Fast, Effective Connector Weatherproofing in Three Minutes.

Cold Shrink
The new weatherproofing product to seal and protect connectors, splices and jumper-to-antenna interfaces from the environment.

No Tools Required
Tapes or heat guns are not required for sealing or shrinking. Simply place the Cold Shrink kit over the cable, make the cable connection, and unwind the pull-tab applicator. Once it is collapsed, its continuous compression design forms a water tight seal around the cable.

Fits up to 2-1/4" HELIAX Cable
The kits are available for transitions from larger to smaller diameter cable, such as 1-5/8" to 1/2", or for same diameter cable, such as 1/2" to 1/2". See the table for Type Numbers.

Fits Type N and 7-16 DIN Connector Interfaces
Cold Shrink kits are designed to fit over Type N, and some 7-16 DIN connector interfaces. (See table below.)

Available for Antenna-Jumper Interface
The kits are also ideal for weatherproofing the antenna-to-jumper interface, which is typically quite difficult to reach. Cold Shrink eliminates the needs for shrink tubes or weatherproofing tapes.

Connector/Splice Weatherproofing Kit

Includes butyl rubber tape and plastic tape to provide additional moisture protection on exposed and buried connectors and splices. It also prevents vibration caused loosening of connectors at jumper cable interfaces.
.....Type **221213**

Cable Size	Connections Per Kit
For Connector Interface	
1-5/8" to 1/2"	2
For Splices	
3", 4" and 5"	1
1-5/8" and 2-1/4"	2
1-1/4"	6
7/8"	8
1/2"	12

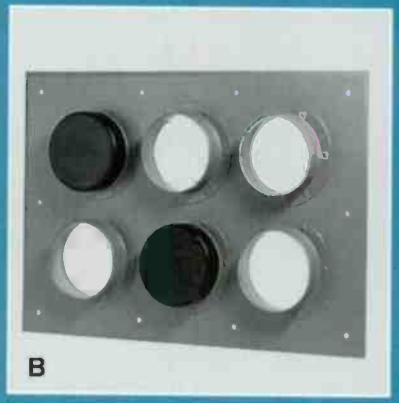
Ordering Information – Cold Shrink

Cable Size	Cable Type, Connector Type		Cable Size	Cable Type/ Connection Type	Type Number*
3/8"	LDF2/FSJ2, Type N	Mated to:	3/8"	LDF2/FSJ2, Type N	241474-3
3/8"	LDF2/FSJ2, Type N	Mated to:		Antenna Output	241548-3
1/2"	LDF4, 7-16 DIN	Mated to:	3/8"	FSJ2	241475-9
1/2"	LDF4/FSJ4, Type N	Mated to:	1/2"	LDF4/FSJ4	241474-4
1/2"	LDF4/FSJ4, Type N	Mated to:	—	Antenna Output	241548-4
1/2"	LDF4, 7-16 DIN	Mated to:	—	Antenna Output	241548-6
1/2"	FSJ4, 7-16 DIN	Mated to:	—	Antenna Output	241548-7
7/8"	LDF5, 7-16 DIN	Mated to:	3/8"	FSJ2	241475-10
7/8"	LDF5	Mated to:	7/8"	LDF5	241474-5
7/8"	LDF5, Type N	Mated to:	1/2"	LDF4/FSJ4	241475-1
7/8"	LDF5, 7-16 DIN	Mated to:	1/2"	LDF4	241475-4
7/8"	LDF5, 7-16 DIN	Mated to:	1/2"	FSJ4	241475-6
7/8"	LDF5	Mated to:	—	Antenna Output	241548-5
7/8"	LDF5, Type N	Mated to:	—	Arrestor Plus	242446-1
7/8"	LDF5	Mated to:	—	APPL5, Integrated Arrestor	241474-5
1-1/4" or 1-5/8"	LDF6/LDF7	Mated to:	1-1/4"	LDF6/LDF7	241474-6
1-1/4" or 1-5/8"	LDF6/LDF7, Type N	Mated to:	1/2"	LDF4/FSJ4	241475-2
1-1/4" or 1-5/8"	LDF6/LDF7	Mated to:	7/8"	LDF5	241475-3
1-1/4" or 1-5/8"	LDF6/LDF7, 7-16 DIN	Mated to:	1/2"	LDF4	241475-5
1-1/4" or 1-5/8"	LDF6/LDF7, 7-16 DIN	Mated to:	1/2"	FSJ4	241475-7
1-1/4" or 1-5/8"	LDF6/LDF7, Type N	Mated to:	—	Arrestor Plus	242446-2
1-5/8"	LDF7	Mated to:	—	APPL7, Integrated Arrestor	241474-6
2-1/4"	LDF7, 7-16 DIN	Mated to:	1/2"	LDF4,7-16 DIN	241475-8

*Kits can be used with Type N or 7-16 DIN interface unless otherwise noted.

HELIAX®
Coaxial Cables


A


B


C


E

NEW!


D

Wall Entry Systems

A Single Entrance Wall/Roof Feed-Thru Assembly. Includes rubber boot, clamp and galvanized steel plate. Order from table.

B Multiple Entrance Wall/Roof Feed Thru Plate. Plate with one or more 4 or 5 inch entry holes. Use with the corresponding size rubber cable boots (sold separately).

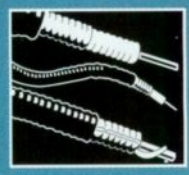
C Rubber Cable Boot. Use with above feed-thru plate, with the corresponding size entry hole.

D ArrestorPort Plus™ Integrated Wall Entry/Grounding System. Wall entry and grounding system in one. Kit consists of a polycarbonate entry panel and a solid copper ground bar assembly with assembly hardware, anti-seize corrosion inhibitor, weatherstripping and weatherproof sealing caps for all entry ports. Use with Arrestor Plus surge arrestors (order separately, see page 562) and cable entry cushions (sold separately, see table on next page).

E Polycarbonate Entry Panel for Conventional Installations. Entry plate fabricated from the same durable polycarbonate material as ArrestorPort Plus for installations where surge protectors are not required. Use with the same cable entry cushions as used with ArrestorPort Plus (sold separately, according to cable size).

Multiple Entrance Wall/Roof Feed-Thru Plate

Number of Openings	Height in (mm)	Width in (mm)	Opening Distance Center to Center in (mm)	Type No.
4" (102 mm) Entry Opening, Multiple Entrance Plate				
1	7 (178)	7 (178)	–	204673-1
1	5 (127)	5 (127)	–	204673-2
4	9.5 (241)	25.5 (648)	5.5 (139)	204673-4
8	17.5 (444)	25.5 (648)	5.5 (139)	204673-8
12	25.5 (648)	25.5 (648)	5.5 (139)	204673-12
5" (127 mm) Entry Opening, Multiple Entrance Plate				
1	9.5 (241)	9.5 (241)	–	48940-1
2	9.5 (241)	17.5 (444)	7 (178)	48940-2
3	9.5 (241)	25.5 (648)	7 (178)	48940-3
4	17.5 (444)	17.5 (444)	7 (178)	48940-4
6	17.5 (444)	25.5 (648)	7 (178)	48940-6



Wall/Roof Feed Thru Assembly, Single Entrance

Cable Size	Type Number
1/2"	40656A-3
5/8"	40656A-7
7/8"	40656A-1
1-1/4"	40656A-5
1-5/8"	40656A-2
2-1/4"	40656A-6
3"	40394-2
4"	40394-1
5"	33938-5

Cable Entry Cushions

Type Number	Cable Size	Number of Holes in Cushions
WC4-3	1/2"	3
WC5-3	7/8"	3
WC6-1	1-1/4"	1
WC7-1	1-5/8"	1
WC12-1	2-1/4"	1

Ground Bar Assembly Only

Used On	Type Number
APPORT-14-2	GBA-14-2
APPORT-22-2	GBA-22-2
APPORT-23-2	GBA-23-2
APPORT-24-3	GBA-24-3
APPORT-26-4	GBA-26-4
APPORT-34-3	GBA-34-3
APPORT-36-4	GBA-36-4
APPORT-38-5	GBA-38-5

Wall/Roof Feed Thru Boots

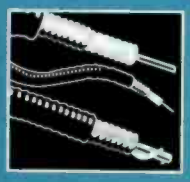
Cable Size	Cable Boot Type No.	Number of Holes in Boots
4" (102 mm) Cable Boots		
1/2" Foam	204679-5	1
1/2" Foam	204679-7	3
1/2" Air	204679-6	1
1/2" Air	204679-1	3
5/8"	204679-13	1
5/8"	204679-14	3
7/8"	204679-2	1
1-1/4"	204679-3	1
1-5/8"	204679-4	1
2-1/4"	204679-8	1
3"	204679-9	1
5" (127 mm) Cable Boots		
1/2" Foam	48939-6	1
1/2" Foam	48939-8	3
1/2" Air	48939-7	1
1/2" Air	48939-5	3
5/8"	48939-14	1
5/8"	48939-15	3
7/8"	48939-1	1
7/8"	48939-2	3
1-1/4"	48939-3	1
1-5/8"	48939-4	1
2-1/4"	48939-9	1
3"	48939-10	1

ArrestorPort-Plus™ Integrated Entry Plate/Ground Systems

Type Number	Surge Arrestor Ports Horizontal Rows	Surge Arrestor Ports Vertical Columns	Cushion Entry Ports	Panel Width in (mm)	Height in (mm)	Wall Opening Width in (mm)	Wall Opening Height in (mm)
APPORT-14-2	1	4	2	20.5 (520)	16 (405)	15.25 (390)	11.25 (285)
APPORT-22-2	2	2	2	15 (380)	22 (560)	9.75 (250)	17.125 (435)
APPORT-23-2	2	3	2	15 (380)	22 (560)	10.75 (275)	16.875 (430)
APPORT-24-3	2	4	3	20 (510)	22 (560)	15.25 (385)	17.125 (435)
APPORT-26-4	2	6	4	26.5 (675)	22 (560)	21.75 (550)	17.25 (440)
APPORT-34-3	3	4	3	20 (510)	28 (710)	15.25 (385)	23.25 (590)
APPORT-36-4	3	6	4	26.5 (675)	28 (710)	21.75 (550)	23.25 (590)
APPORT-38-5	3	8	5	32 (815)	28 (710)	27.25 (690)	23.25 (590)

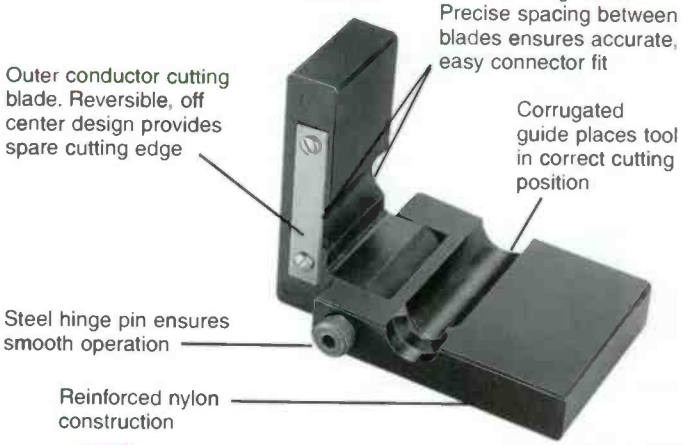
Polycarbonate Entry Panel for Conventional Installations

Type Number	Hole Pattern Horizontal Rows	Hole Pattern Vertical Columns	Panel Width in (mm)	Height in (mm)	Wall Opening Width in (mm)	Wall Opening Height in (mm)
STPORT-14	1	4	26.5 (675)	10.5 (265)	21.75 (550)	5.75 (145)
STPORT-22	2	2	15.5 (395)	16 (405)	10.75 (275)	11.25 (285)
STPORT-23	2	3	20.5 (520)	16 (405)	16.25 (413)	11.25 (285)
STPORT-24	2	4	26.5 (675)	16 (405)	21.75 (550)	11 (280)
STPORT-26	2	6	37.5 (955)	16 (405)	32.75 (830)	11.25 (285)
STPORT-34	3	4	26.5 (675)	21.5 (545)	21.75 (550)	16.75 (425)
STPORT-36	3	6	37.5 (955)	21.5 (545)	32.75 (830)	16.75 (425)
STPORT-46	4	6	37.5 (955)	27 (685)	32.75 (830)	22.25 (565)



HELIAX® Coaxial Cables

Look at the advantages you get with an EASIAX® precision cutting tool from Andrew



NEW!

FSJ2/FSJ4 EASIAX Tool
A new EASIAX tool is now available for FSJ2/ETS2 and FSJ4, 3/8" and 1/2" super-flexible cables. It is designed to cut the jacketing and outer conductor in seconds.

Fast, precision cuts in as little as 15 seconds.

EASIAX®

The cutting tool made exclusively for HELIAX® coaxial cable.

Accurate
Cuts precisely at crest of copper corrugation, at exact distance required for easy connector attachment. Clean cut makes flaring easier than ever. Precise blade depth makes it impossible to cut inner conductor.

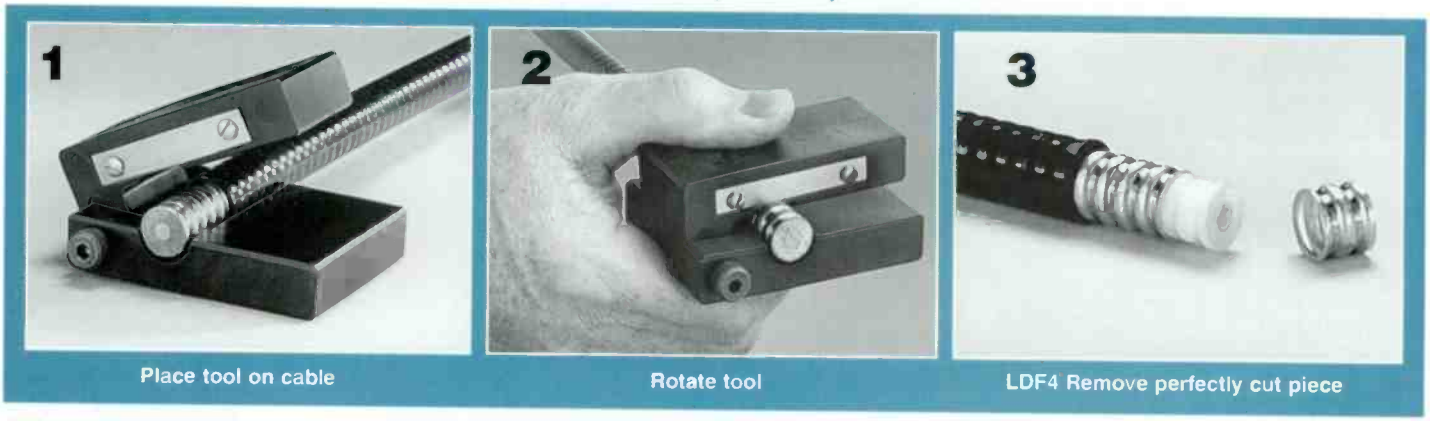
Consistent
Every cut by every technician, on every interface of any cable, will be exactly the same. It's one more way to ensure consistent electrical performance for your cable system.

EASIAX Cutting Tool Ordering Information

For Cable Types	Cutting Tool Type No.	Featuring	Replacement Blades Kit of 5, Type No.
FSJ1†, FSJ4‡, ETS1, RXL1* Series	207865	Cuts jacketing and outer conductor	209874
FSJ2, FSJ4‡, ETS2 Series	241372	Cuts jacketing and outer conductor	209874
LDF4, HL4RP-50, RXL4** Series	207866	Cuts outer conductor and scores jacketing	209874
LDF5, RXL5 Series	222951	Cuts outer conductor and inner conductor and scores jacketing	222954 209874, for jacket cutting

* Except RXL1-1RNT ** Except RXL4-(1, 2 or 3) RNT
† Except FSJ1RN ‡ Except FSJ4RN

Easy as one, two, three...



Cable Flare Tool

Pin Depth Gauge

Pin Alignment Tool

Connector Attachment Tool Kits

One of the most critical factors affecting transmission line operation is the connector interface. Even experienced technicians can make mistakes when equipped with makeshift devices or an inadequate array of simple hand tools, and it only takes a single faulty connection to degrade performance and threaten your operation's revenues.

With the HELIAX connector attachment tool kit, your workmanship is no longer compromised by tools never meant for the job. The kit contains the same specialized tools used by our factory technicians that make connector attachment faster and easier and produces a reliable assembly that matches the quality of the HELIAX cable system serving the operation.

Specialized Tools Included in the Tool Kit

Tools for LDF4, LDF5 and LDF6 cable types are included.

Pin Depth Gauges. Pin depth gauges quickly show the technician whether the contact pin is positioned within tolerance. Gauges for male and female Type N and DIN connectors are available. Dial indicator gauges are available as an option for BNC and SMA male connectors.

Pin Alignment Tool. The tool slides over the contact pin and in the process realigns the pin-to-conductor connection making connector body installation fast and simple.

Order the tools as a complete kit or individually from the table.

Tool Kit Ordering Information

Description	Tool Usage	Type Number
Complete Tool Kit*	General	224350
Tool Box	General	224351
Safety Knife	General	224352
Wire Snips	General	224353
Inch/Millimeter Rule	General	224354
Greasing Brush	General	224355
Point File	General	224356
Leather Buffing Strap	General	224390
Emery Cloth - 1 ft (0.3 m)	General	224391
Flare Hammer	General	224392
Flat Hammer	General	224393
Beveled Hammer Tip	General	224394
LDF5 EASIAX Cable Tool	LDF5	222951
LDF4 EASIAX Cable Tool	LDF4	207866
FSJ1/FSJ4 EASIAX Tool	FSJ1/FSJ4	207865
Tapered Drift Punch 3/4"	General	224358
Pin Alignment Tool	General	224360
Cutoff Guide 7/32" (5.5 mm)	LDF4	224361
Cuttoff Guide 8/32" (6.3 mm)	FSJ4	224362
Cable Flare Tool	LDF4	224363
Cable Flare Tool	LDF5	224368
Cable Flare Tool	LDF6	224373
Soldering Pliers	General	224377
Pin Depth Gauge	N-Male	224380
Pin Depth Gauge	N-Female	224395

* Includes all items listed above.

NEW!

Additional Tools Available (Not included in Kit)		
Pin Depth Gauge	DIN Male	114468
Pin Depth Gauge	DIN Female	114469
Chamfer Tool	FSJ4/LDF4	241953
Chamfer Tool	FSJ2	243398
EASIAX® Tool	FSJ2	241372

HELIAX®
Coaxial Cables

Reel Pax™ Cable Packaging System for HELIAX® Superflexible Cable

Reel Pax cable packaging system makes handling, dispensing, and cutting cable easier and neater. The Reel pax system is a compact, durable carton that comes with one 500 foot or 250 foot (depending on cable size) reel of cable. The tough, compact Reel Pax carton measures only 14 x 12.5 x 15 inches (356 x 3318 x 381 mm).

- ***Fast dispensing*** *- payout slot on box front.*
- ***Precise measuring*** *- foot and meter markings on cable.*
- ***Instant cable tracking*** *- usage record printed on box.*
- ***Damage-free shiping*** *- durable packaging.*
- ***Space saving*** *- compact and stackable box.*
- ***Easy transport*** *- built-in carrying handles.*
- ***Environmentally friendly*** *- carton manufactured from recyclable materials.*

Reel Pax Ordering Information

Cable Type	Cable Length ft (m)	Gross Weight lb (kg)	Reel Pax Type Number
1/4" Superflexible, 50-ohm Cable			
FSJ1-50A	500 (152)	30.7 (13.9)	**FSJ1-50A-RP**
FSJ1RN-50A	500 (152)	30.7 (13.9)	**FSJ1RN-50A-RP**
HS1RP-50A	500 (152)	27.5 (12.5)	**HS1RP-50A-RP**
3/8" Superflexible, 50-ohm Cable			
FSJ2-50	500 (152)	47.2 (21.4)	**FSJ2-50-RP**
FSJ2RN-50	500 (152)	47.2 (21.4)	**FSJ2RN-50-RP**
1/2" Superflexible, 50-ohm Cable			
FSJ4-50B	250 (76)	43.2 (19.6)	**FSJ4-50B-RP**
FSJ4RN-50B	250 (76)	43.2 (19.6)	**FSJ4RN-50B-RP**

Installer Pax™ Bulk Packs

- *Minimize Storage Requirements*
- *Decrease Waste*
- *Reduce Shipping Costs*

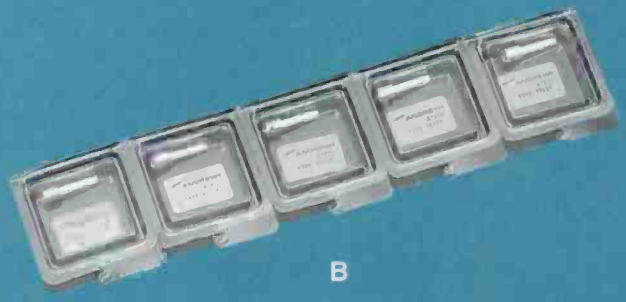
The connectors and accessories listed on the following page are available packed in bulk quantities for your convenience. See the referenced pages for product descriptions.

Installer Pax Ordering Information

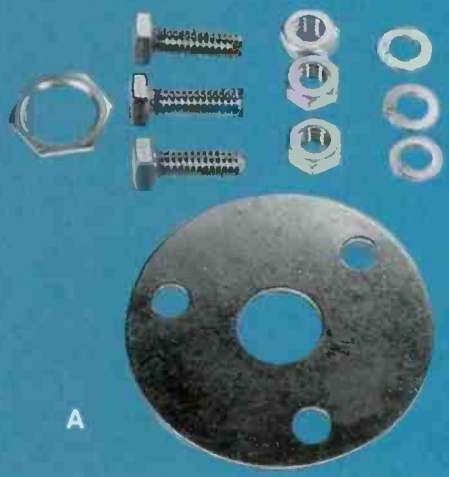
Single Pack Type Number	Page Number	Bulk Pack Quantity	Installer Pax Type Number
F1PNF-BH	440	25	**F1PNF-BH-IP**
F1PNM-H	440	25	**F1PNM-H-IP**
F1PSM	440	25	**F1PSM-IP**
F1PTM	440	25	**F1PTM-IP**
F2PNM	446	25	**F2PNM-IP**
F4NF	451	25	**F4NF-IP**
F4NM-C	451	25	**F4NM-C-IP**
F4NM	451	25	**F4NM-IP**
F4PDM-C	451	25	**F4PDM-C-IP**
F4PDM	451	25	**F4PDM-IP**
F4PNF	451	25	**F4PNF-IP**
F4PNM-C	451	25	**F4PNM-C-IP**
F4PNM-H	451	25	**F4PNM-H-IP**
F4PNM	451	25	**F4PNM-IP**
F4PNR	451	25	**F4PNR-IP**
L1PNM-H	457	25	**L1PNM-H-IP**
L2PNM	459	25	**L2PNM-IP**
L42EWT	459	25	**L42EWT**
L4NF	462	25	**L4NF-IP**
L4NM	462	25	**L4NM-IP**
L4PDF-C	462	25	**L4PDF-C-IP**
L4PDF	462	25	**L4PDF-IP**
L4PDM-C	462	25	**L4PDM-C-IP**
L4PDM	462	25	**L4PDM-IP**
L4PNF	462	25	**L4PNF-IP**
L4PNM-H	462	25	**L4PNM-H-IP**
L4PNM	462	25	**L4PNM-IP**
L5PDF-RC	466	12	**L5PDF-RC-IP**
L5PDF	466	12	**L5PDF-IP**
L5PDM	466	12	**L5PDM-IP**
L5PDR	466	12	**L5PDR-IP**
L5PNF	466	12	**L5PNF-IP**
L5PNM	466	12	**L5PNM-IP**
Hangers and Adapters			
31768A	552	50	**31768A-IP**
206706-1	555	200	**206706-1-IP**
206706-2	555	200	**206706-2-IP**
42396A-1	552	100	**42396A-1-IP**
42396A-2	552	100	**42396A-2-IP**
42396A-3	-	100	**42396A-3-IP**
42396A-4	552	100	**42396A-4-IP**
42396A-5	552	100	**42396A-5-IP**
42396A-7	212	100	**42396A-7-IP**
42396A-8	212	100	**42396A-8-IP**
42396A-9	212	100	**42396A-9-IP**
42396A-11	212	100	**42396A-11-IP**
42396A-15	212	100	**42396A-15-IP**
42396A-16	212	100	**42396A-16-IP**

Single Pack Type Number	Page Number	Bulk Pack Quantity	Installer Pax Type Number
Standard Grounding Kits			
204989-1	560	25	**204989-1-IP**
204989-2	560	25	**204989-2-IP**
204989-3	560	25	**204989-3-IP**
204989-4	560	25	**204989-4-IP**
204989-5	560	25	**204989-5-IP**
204989-6	560	25	**204989-6-IP**
204989-7	560	25	**204989-7-IP**
204989-10	215	25	**204989-10-IP**
204989-21	560	25	**204989-21-IP**
204989-22	560	25	**204989-22-IP**
204989-23	560	25	**204989-23-IP**
204989-24	560	25	**204989-24-IP**
204989-25	560	25	**204989-25-IP**
204989-26	560	25	**204989-26-IP**
204989-27	560	25	**204989-27-IP**
204989-28	215	25	**204989-28-IP**
204989-31	560	25	**204989-31-IP**
204989-32	560	25	**204989-32-IP**
204989-33	560	25	**204989-33-IP**
204989-34	560	25	**204989-34-IP**
204989-35	560	25	**204989-35-IP**
204989-36	560	25	**204989-36-IP**
204989-37	560	25	**204989-37-IP**
223158	559	25	**223158-IP**
241088-1	560	25	**241088-1-IP**
241088-2	560	25	**241088-2-IP**
241088-3	560	25	**241088-3-IP**
241088-4	560	25	**241088-4-IP**
241088-6	560	25	**241088-6-IP**
241088-7	560	25	**241088-7-IP**
241088-8	560	25	**241088-8-IP**
241088-9	560	25	**241088-9-IP**
241088-10	560	25	**241088-10-IP**
241234	560	25	**241234-IP**
241234-2	560	25	**241234-2-IP**
241234-3	560	25	**241234-3-IP**
SureGround™ Kits			
SGL5-06B1	561	25	**SGL5-06B1-IP**
SGL5-06B2	561	25	**SGL5-06B2-IP**
SGL5-10B3	561	25	**SGL5-10B3-IP**
SL5-10B4	561	25	**SGL5-10B4-IP**
SGL5-15B4	561	25	**SGL5-15B4-IP**
SGL6-06B1	561	25	**SGL6-06B1-IP**
SGL6-06B2	561	25	**SGL6-06B2-IP**
SGL6-10B3	561	25	**SGL6-10B3-IP**
SGL6-10B4	561	25	**SGL6-10B4-IP**
SGL7-06B1	561	25	**SGL7-06B1-IP**
SGL7-06B2	561	25	**SGL7-06B2-IP**
SGL7-10B3	561	25	**SGL7-10B3-IP**
SGL7-15B4	561	25	**SGL7-15B4-IP**
Cold Shrink Weatherproofing Kits			
241474-4	565	20	**241474-4-IP**
241474-5	565	20	**241474-5-IP**
241474-6	565	20	**241474-6-IP**
241474-6	565	20	**241474-6-IP**
241475-1	565	20	**241475-1-IP**
241475-2	565	20	**241475-2-IP**
241475-4	565	20	**241475-4-IP**
241475-5	565	20	**241475-5-IP**
241475-6	565	20	**241475-6-IP**
241475-7	565	20	**241475-7-IP**
241475-8	565	20	**241475-8-IP**
241548-3	565	20	**241548-3-IP**
241548-4	565	20	**241548-4-IP**
241548-5	565	20	**241548-5-IP**
241548-6	565	20	**241548-6-IP**
241548-7	565	20	**241548-7-IP**
241475-9	565	20	**241475-9-IP**
241475-10	565	20	**241475-10-IP**

HELIAX® Coaxial Cables



B



A

A Bulkhead Adapter. For use with type N or UHF jacks for 1/4", 3/8", 1/2" or 7/8" HELIAX cable. Includes face-plate and mounting hardware .....Type **26016-2**

B Connector PIN-PAKS. Replacement connector center pins individually packaged in sets (quantities shown below). Each pin can be easily separated from the set. PIN-PAKS for 7/8" cable and smaller include five replacement pins: PIN-PAKS for 1-1/4" and 1-5/8" cable include two replacement pins.

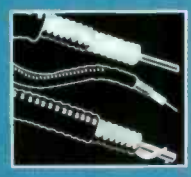
For Connector Type	PIN-PAK Type No.	Quantity Per Kit
For F1PNM-H	**242881**	5
For C41SW	**241051-3**	5
For F2NM, F2NM-H	**242075-3**	5
For F2PNM, F2PNM-H	**242075-4**	5
For F2PDM	**114402-2**	5
For F4NM, F4NM-H	**241455-3**	5
For F4PNM, F4PNM-H	**241455-4**	5
For F4PDM	**114417-2**	5
For L2NM, L2NM-H	**48335-3**	5
For L2PNM, L2PNM-H	**48335-4**	5
For L4NM, L4NM-H	**241730-3**	5
For L4PNM, L4PNM-H	**241730-4**	5
For L4PDM	**222483-2**	5
For L4NF	**242855**	5
For L4PNF	**242855-2**	5
For L5NM	**43158-5**	5
For L5PNM, L5PNM-H	**241495**	5
For L5NF	**43157-2**	5
For L5PNF	**241092**	5
For L5PDM	**114105**	5
For L5PDF, L5PDF-BH	**114105-2**	5
For L6PNF	**241057**	2
For L6PDF, L6PDF-BH	**114105-4**	2
For L6PDM	**114105-3**	2
For L7PNF	**241056**	2
For L7PNM	**243371**	2

Contact Andrew for other replacement pins.

Connector Reattachment Kit includes rubber O ring and gasket parts to replace those which may be damaged during disassembly and subsequent reattachment of connectors. Does not include interface O-rings or gaskets.

Cable Types	For Connector Types	Reattachment Kit Type No.
Foam-Dielectric Cables		
LDF2-50	L2 and L42 Series	**34767A-38**
LDF4-50A	L44 Series, except L4NM, L44PCW, L44PCN,	**34767A-27**
	L4NM, L44PCW, L44PCN	**34767A-51**
FSJ4-50B	F4 and 44AS Series	**34767A-39**
LDF5-50A	L5 and L45 Series	**34767A-28**
LDF6-50	L6 and L46 Series	**34767A-43**
LDF7-50A	L7 and L47 Series	**34767A-35**
Air-Dielectric Cables		
HJ4-50,HT4-50	H4PNM, H4PNF, 74PN, 74PW	**34767A-22**
HJ5-50	H5PNF, H5PNM, 75PN, 75AR, 75PW	**34767A-3**
	75AG, 75AU	**34767A-5**
	75ART, 75AGT	**34767A-44**
	H5NF-T, 75NT	**34767A-18**
HJ7-50A	87G, 87R	**34767A-6**
	H7PNF, 87PN, 87S, 87SG	**34767A-7**
	87SGT, 87ST	**34767A-20**
	H7NF-T, H7NM-T, 87NT, 87WT	**34767A-19**
	87Z	**34767A-13**
HJ12-50	H12PNF, 82PN	**34767A-46**
	82R	**34767A-47**
HJ8-50B	H8( )-302	**34767A-60**
	78AGF, 78ARM, 78ARF, 78AGM, 78AS	**34767A-10**
	78BZ	**34767A-30**
HJ11-50	H11( )-602	**34767A-57**
	H11( )-M408	**34767A-58**
	H11( )-302	**34767A-59**
	81RF	**34767A-15**
	81GF	**34767A-16**
	42826	**34767A-40**
	42896	**34767A-41**
	81Z	**34767A-17**
HJ9-50,	H9( )-602, H9HP( )-602	**34767A-55**
HJ9HP-50	H9( )-M408, H9HP( )-M408	**34767A-56**
	79AG, 79AR	**34767A-45**
	79AZ, H9HPZ	**34767A-31**

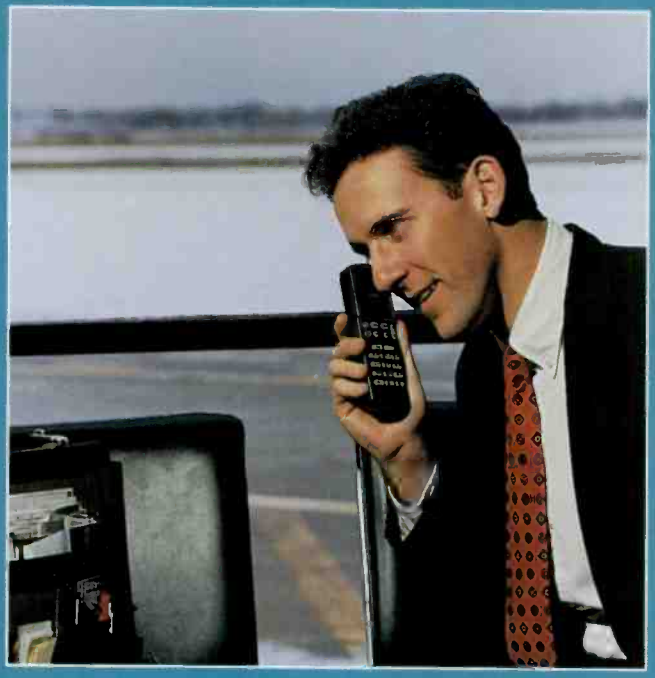
HELIAX® Coaxial Cables

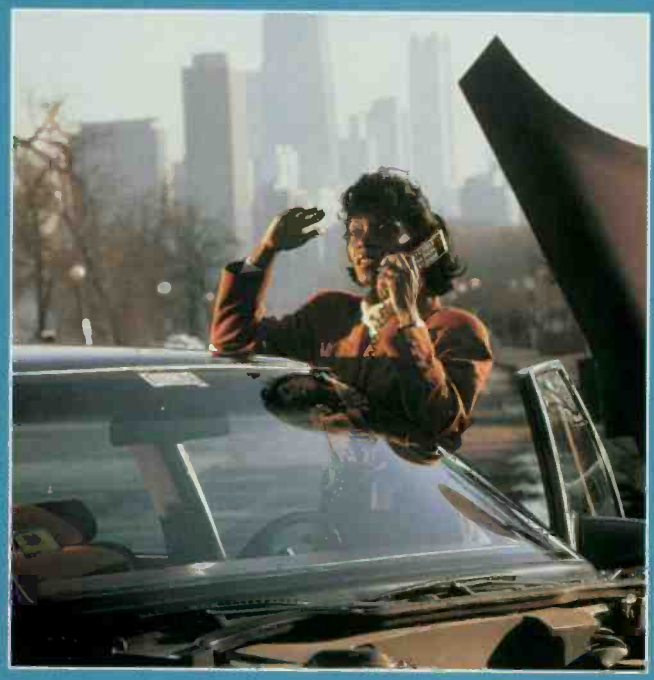


Ordering Information

	Description	Type No.		Description	Type No.	Previous Type No.
A	N Junction, female-female, UG-29B/U	10804-11	M	7-16 DIN male-N female	CA-PNFDM	114113-1
B	N Junction, male-male, UG-57B/U	10804-9		7-16 DIN male-N male	CA-PNMDM	114113-2
C	N Right Angle, male-female, UG-27D/U	10804-66		7-16 DIN female-N female	CA-PNFDF	114113-3
D	N Tee, female-female-female, UG-28A/U	10804-17		7-16 DIN female-N male	CA-PNMDF	114113-4
E	UHF Junction, female-female, PL-258	10805-6	N	90° Miter Elbow, 7/8" EIA, 50 ohm	1060A	
F	UHF Right Angle, male-female, M-359A	10805-5		90° Miter Elbow, 1-5/8" EIA, 50 ohm	1061A	
G	UHF Tee, female-male-female, M-358	10805-4		90° Miter Elbow, 3-1/8" EIA, 50 ohm	1062	
H	N female-UHF male	10805-12	O	N female-7/8" EIA, 50 ohm	2260B	
I	N male-UHF female	10805-11		N female-1-5/8" EIA, 50 ohm	2261A	
J	Flange Adapter, F flange, male-7/8" EIA, 50 ohm	33682		N female-3-1/8" EIA, 50 ohm	2262	
K	F flange, female-N female	104300-2	P	LC female-7/8" EIA, 50 ohm	2360A	
L	F Flange Elbow, F Flange, male-F Flange, female	203361		LC female-1-5/8" EIA, 50 ohm	2361A	

HELIAX®
Coaxial Cables





Wireless Base Station Applications

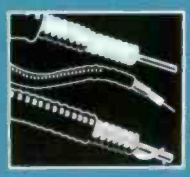
HELIAX® Coaxial Cable is the Answer for Your Wireless Base Station Applications

Cellular	**PCS**
Dispatch	**SMR**
Paging	**Trunking**

Andrew cables, connectors, and other accessories are designed to work together as an integrated system so you achieve maximum system performance and long-service life. The products are supported by an experienced applications engineering staff to help you design the most efficient system for your needs.

HELIAX Coaxial Cable is used on more Main Antenna Feeders because of its

- *Unmatched combination of performance and durability*
- *Lower attenuation which increases system range*
- *Weatherproof design which provides more durability and dependability than braided cables*
- *Wide range of connectors, grounding kits and other Andrew accessories which ensure electrical and mechanical integrity of the transmission line system*



Cable Selection for Wireless Base Station Main Feeder

Frequency	Length-Range ft (m)						
	0-50	50-100 (0-30)	100-200 (30-61)	200-300 (61-91)	300-400 (91-122)	400-500 (122-152)	500 and over (152 and over)
40 MHz	LDF2-50	LDF4-50A	LDF4-50A	LDF4-50A	LDF5-50A	LDF5-50A	LDF5-50A
150 MHz	LDF2-50 —	LDF4-50A —	LDF4-50A or LDF5-50A	LDF5-50A —	LDF6-50 —	LDF7-50A —	HJ7-50A —
450 MHz	LDF2-50 —	LDF4-50A —	LDF5-50A or LDF6-50	LDF6-50 or LDF7-50A	HJ7-50A or HJ12-50	HJ12-50 or 27591-6	275916 — —
850 MHz	LDF2-50 or LDF4-50A	LDF5-50A — —	LDF6-50 or LDF7-50A	HJ7-50A or HJ12-50	HJ12-50 or 27591-6	27591-6 — —	27591-6 — —
1800 MHz	LDF4-50A or LDF5-50A	LDF5-50A or LDF6-50	LDF12-50 or HJ12-50	27591-6 — —	27591-6 — —	— — —	— — —
2100 MHz	LDF4-50A or LDF5-50A	LDF6-50 or LDF7-50	LDF12-50 or HJ12-50	27591-6 — —	27591-6 — —	— — —	— — —

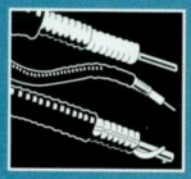
Main Feeder Selection

A rule of thumb is to specify a main feeder with no more than 1.5 dB total attenuation. This is equivalent to 71% efficiency. The following table gives the recommended cable type for commonly used frequencies by length of feeder. Where two choices are given, the larger cable should be selected for applications which are towards the upper end of the range or higher in length or frequency.

At higher frequencies, especially 800 MHz and above, Andrew recommends the use of larger foam and air dielectric cables for best transmission efficiency. The table below shows efficiency calculations for 250 ft and 500 ft feeder runs at 875 MHz, as might commonly be used in SMRs or cellular systems. For a 250 ft run at 875 MHz, 2-1/4" air dielectric cable (HJ12-50) is the smallest cable which will provide less than 1.5 dB (71% efficiency) total attenuation and is therefore, a good choice. For a 500 ft run at 875 MHz, a 5" cable is required to achieve 71% efficiency. Tradeoffs in cost and ease of installation may dictate the use of a 2-1/4" or 3" cable instead. Use of a cable smaller than 2-1/4" will adversely affect system performance.

Main Feeders

Cable Size and Type	Type No.	Attenuation dB/100 ft	250 ft Run Total Attenuation (dB)	250 ft Run Efficiency	500 ft Run Total Attenuation (dB)	500 ft Run Efficiency
875 MHz						
1-1/4" Foam	**LDF6-50**	0.896	2.24	59.7%	4.48	35.7%
1-5/8" Foam	**LDF7-50A**	0.757	1.89	64.7%	3.79	41.8%
2-1/4" Foam	**LDF12-50**	0.628	1.57	69.7%	3.14	48.5%
1-5/8" Air	**HJ7-50A**	0.651	1.63	68.7%	3.25	47.3%
2-1/4" Air	**HJ12-50**	0.546	1.37	72.9%	2.73	53.3%
3" Air (PE dielectric)	**27591-6**	0.452	1.13	77.1%	2.26	59.4%
5" Air (PE dielectric)	**HJ9-50**	0.263	0.68	85.5%	1.32	73.9%
1900 MHz						
1-1/4" Foam	**LDF6-50**	1.41	3.53	44.4%	7.05	19.7%
1-5/8" Foam	**LDF7-50A**	1.21	3.03	49.8%	6.05	24.8%
2-1/4" Foam	**LDF12-50**	1.03	2.58	55.2%	5.15	30.5%
1-5/8" Air	**HJ7-50A**	1.02	2.55	55.6%	5.09	31.0%
2-1/4" Air	**HJ12-50**	0.85	2.13	61.2%	4.27	37.4%



HELIAX® Coaxial Cable is the Ideal Choice for Jumper Applications

Superflexible (FSJ series) and LDF series HELIAX coaxial cables:

- *Offer flexibility and performance.*
- *Reduce the possibility of interference or cross coupling. A solid outer conductor provides for complete shielding.*
- *Excellent intermodulation performance. Solid inner and outer conductors eliminate IM generated by numerous moving contacts in the current path that are found with stranded inner conductors and braided outer conductors.*
- *Offer lower attenuation which optimizes your system performance.*
- *Are available in custom and standard assemblies.*

Jumper Cable Selection

Superflexible cables, with their small bending radii, are ideal for installation in confined spaces such as on combiners or equipment racks. LDF1-50, LDF2-50, LDF4-50A and EFX2-50 are ideal for jumpers between main feeders and antennas, where a very small bending radius is not usually required. Their lower attenuation compared to superflexible cables makes them ideal for longer jumper cables.

HELIAX Connectors

HELIAX connectors are the only connectors completely compatible with HELIAX cable. Used together they provide you with a transmission line system that assures outstanding electrical and mechanical performance.

Excellent electrical matching of the connector to the cable assures low VSWR, and excellent mechanical matching assures weatherproofing.

- *Silver-plated connectors to reduce Intermodulation.*
- *DIN connectors for higher power applications.*

HELIAX Accessories

Andrew offers the industry's widest range of accessories designed to be compatible with HELIAX coaxial cable. Together, HELIAX cable and accessories form a long lasting, cost-effective system.

- *Cold-shrink for weatherproofing.*
- *Snap-in hangers for easier installation.*
- *Surge arrestors for equipment protection.*

The HELIAX Coaxial Cable

HELIAX cable systems are the finest in the industry. When you make a HELIAX cable purchase, you're buying more than just cable. You're buying:

- *Superior electrical performance.*
- *Worldwide availability.*
- *Quality that translates into lower costs over the life of your system investment.*
- *The convenience of one vendor for all of your transmission line needs — Andrew.*

Transmission Line System Components

	LDF Foam							ExtraFlexible		Superflexible			Air	
	1/4"	3/8"	1/2"	7/8"	1-1/4"	1-5/8"	2-1/4"	3/8"	1/4"	3/8"	1/2"	7/8"	1-5/8"	2-1/4"
	HELIAX Coaxial Cable Type Numbers													
	LDF1-50	LDF2-50	LDF4-50A	LDF5-50A	LDF6-50	LDF7-50A	LDF12-50	EFX2-50	FSJ1-50A	FSJ2-50	FSJ4-50B	HJ5-50	HJ7-50A	HJ12-50
Attenuation dB/100 ft (dB/100 m)														
30 MHz	0.672	0.567	0.369	0.197	0.147	0.120	0.095	0.589	0.98	0.65	0.56	0.0245	0.112	0.0906
	(2.20)	(1.86)	(1.21)	(0.646)	(0.481)	(0.394)	(0.31)	(1.93)	(3.22)	(2.14)	(1.84)	(0.0804)	(0.367)	(0.554)
150 MHz	1.53	1.30	0.845	0.458	0.340	0.280	0.226	1.35	2.23	1.49	1.29	0.460	0.252	0.209
	(5.03)	(4.27)	(2.77)	(1.50)	(1.12)	(0.919)	(0.74)	(4.42)	(7.32)	(4.90)	(4.23)	(1.51)	(0.827)	(0.686))
450 MHz	2.73	2.30	1.51	0.834	0.617	0.515	0.422	2.40	3.93	2.66	2.32	0.822	0.451	0.378
	(8.95)	(7.56)	(4.96)	(2.74)	(2.02)	(1.69)	(1.38)	(7.88)	(12.9)	(8.73)	(7.61)	(2.70)	(1.48)	(1.24)
824 MHz	3.77	3.19	2.10	1.17	0.866	0.731	0.605	3.33	5.42	3.68	3.25	1.14	0.629	0.528
	(12.40)	(10.5)	(6.90)	(3.85)	(2.84)	(2.40)	(1.98)	(10.9)	(17.8)	(12.1)	(10.7)	(3.74)	(2.07)	(1.73)
894 MHz	3.94	3.34	2.20	1.23	0.907	0.767	0.640	3.48	5.66	3.85	3.40	1.19	0.658	0.553
	(12.93)	(11.0)	(7.22)	(4.03)	(2.98)	(2.52)	(2.09)	(11.4)	(18.6)	(12.6)	(11.2)	(3.92)	(2.16)	(1.81)
1500 MHz	5.23	4.43	2.93	1.66	1.22	1.05	0.879	4.63	7.47	5.12	4.57	1.57	0.88	0.744
	(17.20)	(14.6)	(9.61)	(5.45)	(4.02)	(3.44)	(2.88)	(15.2)	(24.5)	(16.8)	(15.0)	(5.15)	(2.89)	(2.44)
1700 MHz	5.6	4.75	3.15	1.79	1.32	1.13	0.952	4.97	7.99	5.49	4.92	1.69	0.95	0.800
	(18.38)	(15.6)	(10.3)	(5.87)	(4.31)	(3.72)	(3.12)	(16.3)	(26.2)	(18.0)	(16.1)	(5.53)	(3.12)	(2.63)
2000 MHz	6.14	5.21	3.45	1.97	1.45	1.25	1.06	5.45	8.73	6.01	5.31	1.85	1.05	0.880
	(20.10)	(17.1)	(11.3)	(6.46)	(4.77)	(4.10)	(3.47)	(17.4)	(28.6)	(19.7)	(17.7)	(6.07)	(3.44)	(2.89)
Average Power Rating, kW														
30 MHz	3.32	4.14	6.31	14.0	21.1	28.9	39.5	3.99	2.28	3.97	5.75	13.8	31	43
150 MHz	1.45	1.81	2.75	6.04	9.09	12.3	16.6	1.74	1.00	1.74	2.49	5.86	13.4	18.6
450 MHz	0.818	1.02	1.53	3.32	5.01	6.71	8.91	0.978	0.567	0.975	1.38	3.27	7.55	10.3
824 MHz	0.592	0.736	1.10	2.36	3.57	4.73	6.21	0.706	0.412	0.704	0.991	2.37	5.46	7.38
894 MHz	0.566	0.704	1.05	2.25	3.41	4.51	5.85	0.675	0.395	0.674	0.947	2.26	5.24	7.04
1500 MHz	0.426	0.53	0.793	1.66	2.52	3.30	4.28	0.507	0.299	0.507	0.705	1.72	3.91	5.24
1700 MHz	0.398	0.494	0.738	1.54	2.34	3.06	3.95	0.473	0.279	0.472	0.686	1.62	3.64	4.87
2000 MHz	0.363	0.451	0.673	1.40	2.13	2.76	3.55	0.431	0.256	0.431	0.597	1.49	3.33	4.42
Suggested Cable Length*, ft (m)														
25-50 MHz	115	200	310	580	785	960	1200	195	120	175	200	580	1030	1270
	(36)	(61)	(94)	(177)	(239)	(293)	(365)	(59)	(37)	(53)	(61)	(177)	(315)	(385)
66-88 MHz	88	150	230	430	580	710	885	145	90	130	150	430	770	950
	(27)	(46)	(70)	(131)	(177)	(216)	(270)	(44)	(27)	(39)	(46)	(131)	(235)	(290)
118-174 MHz	62	105	160	300	405	490	610	100	60	91	105	300	550	660
	(19)	(32)	(49)	(91)	(123)	(149)	(185)	(31)	(18)	(27)	(32)	(91)	(165)	(200)
216-400 MHz	40	65	105	190	255	310	380	65	40	58	65	195	355	420
	(12)	(20)	(32)	(58)	(78)	(94)	(115)	(20)	(12)	(17)	(20)	(59)	(105)	(130)
406-512 MHz	35	60	90	165	225	265	325	58	30	51	60	170	310	370
	(10)	(18)	(27)	(50)	(69)	(81)	(100)	(17)	(9)	(15)	(18)	(52)	(95)	(110)
806-960 MHz	25	40	65	115	155	185	225	41	25	36	40	120	220	260
	(7)	(12)	(20)	(35)	(47)	(56)	(68)	(12)	(8)	(11)	(12)	(36)	(65)	(80)
1800 MHz	25	30	46	81	109	128	150	29	18	25	29	83	151	181
	(7)	(9)	(14)	(24)	(33)	(39)	(46)	(8)	(5)	(7)	(9)	(25)	(46)	(55)
2100 MHz	23	28	42	73	100	116	135	26	16	23	27	76	140	165
	(7)	(8)	(12)	(22)	(30)	(35)	(41)	(8)	(5)	(7)	(8)	(23)	(42)	(50)
Connector														
Type N Male	L1PNM-H	L2NM	L4NM	L5NM	L6PNM†	L7PNM	–	E2PNM-H	F1PNM-H	F2PNM	F4NM	H5PNM	H7NM-T	–
Type N Female	L1PNF	L2NF	L4NF	L5NF	L6PNF	L7PNF	L12PNF	E2PNF	F1PNF-BH	F2PNF	F4NF	H5PNF	H7PNF	H12PNF
UHF Male	–	L42P	L44P	L45P	–	–	–	E2UM	41SP	–	44ASP	–	–	–
UHF Female	–	L42U	L44U	L45U	–	–	–	E2UF	41U	–	44ASU	75AU	–	–
Type N Male, Right Angle	–	–	L4PNR	–	–	–	–	–	F1PNR-H	–	F4PNR	–	–	–
7/8 EIA Male Flange	–	–	L44R	L45R	L46S	L47S	–	–	–	44ASR	–	75AR	87S	82S
7-16 DIN Male††	–	L2PDM-C	L4PDM	L5PDM	L6PDM	L7PDM	L12PDM	E2PDM-C	F1PDM	F2PDM-C	F4PDM	H5PDM	H7PDM	H12PDM
7-16 DIN Male, Right Angle††	–	–	L4PDR-C	L5PDR	–	L7PDR	–	–	–	F2PDR-C	F4PDR-C	–	–	–
7-16 DIN Female††	–	L2PDF-C	L4PDF	L5PDF	L6PDF	L7PDF	L12PDF	E2PDF-C	F1PDF	F2PDF	F4PDF	H5PDF	H7PDF	–
Accessories														
Hanger Kit of 10	–	–	43211	42396A-5	42396A-1	42396A-2	42396A-4	–	–	–	43211	42396A-5	42396A-2	42396A-4
Snap-In Hanger Kit of 10	–	–	206706-1	206706-2	206706-3	206706-4	–	–	–	–	–	206706-2	–	–
Hoisting Grip	–	–	43094	L5SGRIP	L6SGRIP	L7SGRIP	L12SGRIP	–	–	–	43094	19256B	24312A	31535
Grounding Kit	–	223158	204989-1	SGL5-06B1	SGL6-06B1	SGL7-06B1	204989-5	–	223158	223158	204989-1	204989-2	204989-4	204989-5
Wall/Roof Feed Thru	–	–	40656-3	40656-1	40656-5	40656-2	40656-6	–	–	40656-3	40652-2	40656-1	40656-6	40394-2
Cable Tie Kit of 50, nylon	40417	40417	40417	–	–	–	–	–	40417	40417	40417	–	–	–
Kit of 20 black jacket wire	27290A	27290A	27290A	–	–	–	–	–	27290A	27290A	27290A	–	–	–

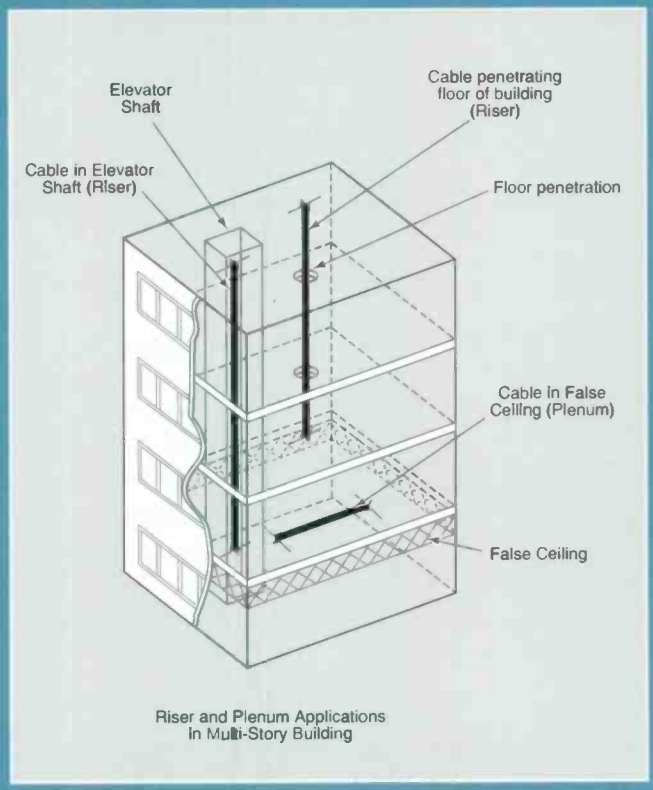
* Each entry is the maximum cable length in feet which will yield a feeder loss of 1.5 dB or less over each frequency band. A power efficiency of 71% is realized at an attenuation level of 1.5 dB. A larger cable will improve power efficiency. For example, a power efficiency of 80%, which corresponds to a feeder loss of 1 dB, will be realized by multiplying any cable length in the table by 0.67. ** Use a 78 AGF connector and 2262 adaptor from 3-1/8" EIA to type N female. † These connectors have silver plated outer bodies and gold-plated inner contacts. †† Silver/Silver

HELIAX® Coaxial Cables

System Equipment

Description	Type Number
Tower	
Guyed	**S36**
Self-Supporting	**LST**
Other tower options and accessories	
Equipment Shelters	**FCS Series**
Engineering, Program Management and Field Services	
System Design Assistance	
Program Management	
Foundations/Civil	
Freight	
Delivery and Assembly	
Installation	
Path Alignment	
System Testing	

Fire Retardant Cables and Waveguides



Riser and Plenum Applications In Multi-Story Building

Fire Retardance Requirements

Cable and waveguide installed inside a building usually must meet fire retardance requirements. In the United States, the National Electrical Code (NEC)[1] sets the standard for coaxial cable used within buildings and normally has the force of law, as most local electrical codes in the U.S. are based on it. In addition, most building codes cover cable, and other local requirements may exist such as the Fire Gas Toxicity Standards of New York State.

Somewhat similar requirements are provided by the Canadian Electrical Code (CEC), issued by the Canadian Standards Association (CSA). Other countries' requirements often reference the International Electrotechnical Commission (IEC) standards.

Definitions

Some terms used in building construction are referred to in fire-retardant cable regulations. They are defined below:

Conduit. A tube or duct for enclosing electrical wires and cable. Conduit may be metallic or nonmetallic.

Duct. A closed channel, tube, or pipe used to transport air, dust, vapors, etc.

Plenum. A compartment or chamber to which one or more air ducts are connected and forms part of the air distribution system of a building.

Raceway. An enclosed channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in the National Electrical Code. Raceway may be metallic or nonmetallic.

Riser. A vertical shaft passing from floor to floor. Risers may or may not be fireproof or have firestops at each floor.

Coaxial Cable Applications Defined by the NEC

In the National Electrical Code, coaxial cable falls under the Community Antenna Television Systems (CATV) category. The NEC provides requirements for coaxial cable installed within buildings in Article 820. These requirements cover all installations except where the cable enters the building from the outside, does not pass through a plenum or riser, and is (a) of any length, but runs throughout in a properly grounded metal conduit (rigid or intermediate) or (b) no longer than 50 feet (15.2 m), within the building, and terminated at a grounding block. The requirements state that these cables shall be listed as being resistant to the spread of fire as specified in the code, listed as being suitable for the purpose, and properly marked.

Four categories of listed coaxial cable are defined (in descending order of fire-resistance rating): Type CATVP, plenum cable; Type CATVR, riser cable; Type CATV, general purpose coaxial cable; and Type CATVX, limited use coaxial cable.

1. National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association.

HELIAX® Coaxial Cables

Wiring In Ducts, Plenums and Other Air-Handling Spaces

Only Type CATVP listed cables, which have extremely high fire resistance coupled with low smoke emission, are permitted by the NEC to be installed in ducts, plenums or other spaces used for environmental air (such as above a false ceiling) without additional protection. All other cables, which must be listed as Type CATVX or higher, must be contained within rigid metal conduit, flexible metallic tubing or similar barrier, depending on the application. (These conditions preclude use of RADIAX cables, so these cables must be CATVP listed to be installed in a plenum or duct.)

Wiring In Vertical Runs

Type CATVR listed cables are required for installation in risers or any other floor penetration connecting more than one floor. Type CATVP cables, which have even higher fire resistance, can be substituted for Type CATVR cables. CATV or CATVX listed cables can also be installed in risers provided that they are encased in noncombustible tubing (not applicable to RADIAX cables) or are located in a fireproof shaft having firestops at each floor.

General Purpose Wiring Within Buildings

All coaxial cables to be installed within buildings in locations other than plenums and risers, as defined above, must be at least Type CATV listed for fire resistance unless one of the following exceptions applies:

1. Type CATVX cable enclosed in raceway.
2. Type CATVX cable in nonconcealed spaces where the exposed length does not exceed 10 ft (3.05 m).
3. Small diameter Type CATVX cables installed in dwellings.

Type CATVR and Type CATVP cables, which have passed more stringent tests, are permitted to be substituted for Type CATV cables.

Acceptable cables are summarized on the chart on page 581.

Model Building Code Requirements for Coaxial Cable

Some model building and mechanical codes also include fire retardance requirements for coaxial cable. Generally, they stipulate that exposed cables in concealed spaces over suspended ceilings, and other spaces used for environmental air handling purposes as defined in the particular code, be listed and labeled as plenum cable per NEC requirements.

Fire Gas Toxicity

Fire-Retardant Jacketing Characteristics. Some coaxial cables use halogenated polymeric jacketing to provide fire retardance. (Halogens are chemically related elements such as fluorine, chlorine, and bromine.) The drawback to such materials is increased levels of smoke and toxic gases under fire.

All **HELIAX** coaxial cables rated Type CATVR achieve fire retardance by using non-halogenated jacketing. While such a jacketing has low toxicity characteristics when burned, it is somewhat less effective at high temperatures than halogenated jacketing. Presently, it is not possible to achieve the highest fire retardance rating, CATVP, without either employing halogenated jacketing or omitting the jacket entirely; consequently, Type CATVP listed HELIAX cables presently use halogenated fire-retardant jacketing. Type CATVX cables have a jacket made of polyvinylchloride, a halogenated material.

New York State Requirements. The New York State Department of State (DOS) Office of Fire Prevention and Control publishes a Fire Gas Toxicity Data File for products covered by Article 15, Part 1120 of the New York State Uniform Fire Prevention and Building Code. Only products listed in this directory are permitted to be used in the construction of some buildings in New York State.

All of Andrew Corporation's cable and waveguide products are listed in the Fire Gas Toxicity Data File, as follows:

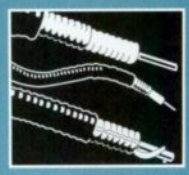
New York State DOS File Number	Listed Manufacturer	Market Name	Listed Cables
16120-880602-2007	Andrew	RADIAX Slotted Coaxial Cable - Foam Dielectric	All Codes
16120-880602-2008	Andrew	HELIAX Coaxial Cable - Foam Dielectric	All Codes
16120-871217-1058	Andrew	HELIAX Coaxial Cable - Air Dielectric	All Codes
16120-880602-2006	Andrew	HELIAX Elliptical Waveguides	All Codes

Caution: Since local requirements may vary, check with your local building inspector to make certain that a proposed installation conforms with all applicable electrical codes, building codes, mechanical codes and fire protection codes.

Andrew Fire Retardant Cables

Andrew offers a full line of fire retardant products for HELIAX coaxial cable, RADIAX® radiating coaxial cable and HELIAX elliptical waveguide. A listing of these products appears on page 582.

Fire retardant cables, which are intended for indoor installation, do not have the UV resistance of standard HELIAX cables and should be covered when stored outdoors for long periods. Refer to the table on page 582 for HELIAX and RADIAX fire retardant cable temperature ratings.



Acceptable Cables and Waveguides by Application - United States

Application Within Building	Type CATVP	Type CATVR	Type CATV	Type CATVX	Unlisted	NEC 1993 Section
Ducts, Plenums and Other Environmental Air Spaces, Exposed	√					820-53(a)
Ducts, Plenums and Other Environmental Air Spaces, in Metal Tubing or Conduit	√	√	√	√		820-53(a), Exception
Vertical Runs Penetrating more than 1 floor, or in a shaft, exposed	√	√				820-53(b), (Non-residental)
Vertical Runs penetrating more than 1 floor, or in a shaft, encased in Metal Raceway or in a Fireproof Shaft having Firestops at each floor	√	√	√	√		820-53 (b), Exception No. 1
All other locations except those given above, exposed for more than 10 ft. (3.05m)	√	√	√			820-53 (c), (Non-residental)
All other locations except those given above, exposed for 10 ft. (3.05m) or less, nonconcealed	√	√	√	√		820-53 (c), Exception No. 2
All other locations except those given above, enclosed in Raceway	√	√	√	√		820-53 (c), Exception No. 1
All other locations except those given above, cable enters from outside, in Grounded Metal Conduit	√	√	√	√	√	820-50, Exception No. 2
All other locations except those given above, cable enters from outside, less than 50 ft. (15.2m) within building, grounded.	√	√	√	√	√	820-50, Exception No. 3

Andrew Fire-Retardant Coaxial Cables and Elliptical Waveguides

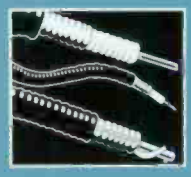
Product	Type CATVP Type No	Type CATVP Refer to Page	Type CATVR Type No.	Type CATVR Refer to Page	Type CATV Type No.	Type CATV Refer to Page	Type CATVX Type No.	Type CATVX Refer to Page
RADIAX® Cable								
1/4"	-	-	RXL1-1RNT	707	-	-	-	-
3/8"	-	-	RXL2-2RNT	708	-	-	-	-
1/2" -3			RXL4-3RNT	709	-	-	-	-
1/2" -2	RXP4-2	713	RXL4-2RNT	709	-	-	-	-
1/2" -1	RXP4-1	713	RXL4-1RNT	709	-	-	-	-
7/8"	-	-	RXL5-1RNT	710	RXL5-1RNT1	710	-	-
1-1/4"	-	-	RXL6-1RNT	711	RXL6-1RNT1	711	-	-
1-5/8"	-	-	RXL7-1RNT	712	RXL7-1RNT1	712	-	-
HELIAX® Cable								
Superflexible								
1/4", 50Ω	ETS1-50T	442	FSJ1RN-50A	439	-	-	FSJ14RN-50A	439
1/4", 75Ω	-	-	FSJ1RN-75	531	-	-	FSJ1RN-75	531
3/8", 50Ω	ETS2-50T	448	FSJ2RN-50	445	-	-	FSJ2RN-50	445
1/2", 50Ω	-	-	FSJ4RN-50B	450	-	-	FSJ4RN-50B	450
1/2", 75Ω	-	-	FSJ4RN-75A	533	-	-	FSJ4RN-75A	533
Foam Dielectric								
1/4", 50Ω	-	-	LDF1RN-50	456	-	-	LDF1RN-50	456
3/8", 50Ω	-	-	LDF2RN-50	458	-	-	LDF2RN-50	458
1/2", 50Ω	-	-	LDF4RN-50A	461	-	-	LDF4RN-50A	461
1/2", 50Ω	-	-	41690-74	461	-	-	-	-
1/2", 75Ω	-	-	LDF4RN-75A	536	-	-	LDF4RN-75A	536
7/8", 50Ω	-	-	LDF5RN-50A	465	-	-	-	-
7/8", 50Ω, Cellular*	-	-	41690-75	465	-	-	-	-
1-1/4", 50Ω	-	-	LDF6RN-50	469	-	-	-	-
1-1/4", 50Ω, Cellular*	-	-	41690-76	469	-	-	-	-
1-5/8", 50Ω	-	-	LDF7RN-50A	474	-	-	-	
1-5/8", 50Ω, Cellular*	-	-	41690-73	474	-	-	-	-
2-1/4", 50Ω	-	-	LDF12RN-50	479	-	-	-	
Air Dielectric								
1/4", 50Ω	HS1RP-50	482	-	-	-	-	-	-
3/8", 50Ω	HS2RP-50	486	-	-	-	-	-	-
1/2", 50Ω	HS4RP-50	502	-	-	-	-	-	-
1/2", 50Ω	HL4RP-50	496	HJ4RN-50	490	-	-	-	-
5/8", 50Ω	-	-	HJ4.5RN-50	508	-	-	-	-
7/8", 50Ω	HJ5RP-50	511	HJ5RN-50	511	-	-	-	-
7/8", 50Ω Cellular*	-	-	41690-78	511	-	-	-	-
7/8", 75Ω	-	-	HJ5RN-75	542	-	-	-	-
1-5/8", 50Ω	HJ7RP-50A	517	HJ7RN-50A	517	-	-	-	-
1-5/8", 50Ω, Cellular*	-	-	41690-79	517	-	-	-	-
2-1/4", 50Ω	-	-	HJ12RN-50	520	-	-	-	-
HELIAX Elliptical Waveguide* **								
Type EWP52	-	-	35409-20	190	-	-	-	-
Type EWP63	-	-	35409-18	192	-	-	-	-
Type EW63	-	-	35409-19	192	-	-	-	-
Type EWP77	-	-	35409-22	196	-	-	-	-
Type EW85	-	-	35409-17	198	-	-	-	-
Type EWP90	-	-	35409-16	200	-	-	-	-
Type EW127A	-	-	35409-15	202	-	-	-	-
Type EW132	-	-	35409-14	204	-	-	-	-
Type EWP180	-	-	35409-21	206	-	-	-	-

* 824-894 MHz, 1.20 max. VSWR.
** High temperature foam dielectric.
*** Type CATVP elliptical waveguides are available on request.
All cables meet standards BS4066 Part 1 and IEC332 Part 1. Type CATVP, CATVR and CATV cables meet BS4066 Part 3 and IEC332 Part 3, Catagory C.

All type CATVP air dielectric cables are also listed by the Canadian Standards Association (CSA) as Communications Cable, Type CXC-FT4, FT6. They carry dual UL/CSA markings.

Temperature Ratings for HELIAX® Fire Retardant Coaxial Cables

	Recommended Temperature Range °C (°F) Storage	Installation and Operation
Fire Retardant, Type CATVX Jacketed Cable, Foam and Air	-30 to 80 (-22 to 176)	-30 to 80 (-22 to 176)
Fire Retardant, Type CATVR Jacketed Cable, Foam and Air	-30 to 80 (-22 to 176)	-30 to 80 (-22 to 176)
Fire Retardant, Type CATVP Jacketed Cable, Foam and Air	-20 to 150 (-4 to 302)	-20 to 150 (-4 to 302)†



Phase Measured Cable Assemblies

HELIAX phase measured cable assemblies are excellent for applications where signals arrive in phase such as phased array radar, or for delay lines cut to precision electrical length. Both phase matched and delay lines are available with precision or standard length tolerances and are referred to collectively as phase measured assemblies.

Phase measured assemblies are manufactured from phase stabilized versions of HELIAX coaxial cables and connectors. HELIAX coaxial cables exhibit excellent phase stability with temperature changes and with bending.

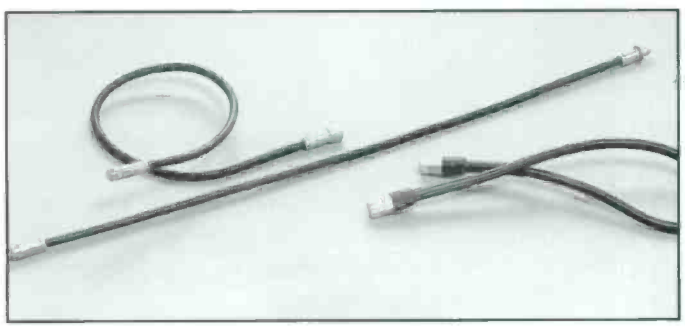
Phase Stability with Temperature Change

As temperature changes, the physical length of the metallic conductors of coaxial cable increase causing an increase in the electrical length and transmission delay time. The dielectric constant of materials, such as the low-loss foam dielectric of HELIAX cable, decreases with increasing temperature. This causes an increase in the velocity of propagation of the cable, which results in a decrease in electrical length and transmission delay time. In HELIAX cable, these two effects are of similar magnitude, causing little change in the overall electrical length of the cable. In cables with solid dielectrics, such as RG-214/U, the decrease in electrical length caused by the dielectric constant change is greater than the increase caused by the conductors. Therefore, these cables exhibit larger changes in electrical length. Figures 1 and 2 display this effect.

Phase Stabilized Cable

When foam cable is subjected to temperature changes, its electrical length undergoes a permanent change which cannot be removed by restoring it to the initial temperature. However, this hysteresis effect can be eliminated by temperature cycling the cable until it returns to the same electrical length after each heating (not the same as the initial electrical length). Temperature cycling is used to produce phase stabilized HELIAX cables.

Figures 3 through 6 show the typical behavior of phase stabilized cable with temperature.



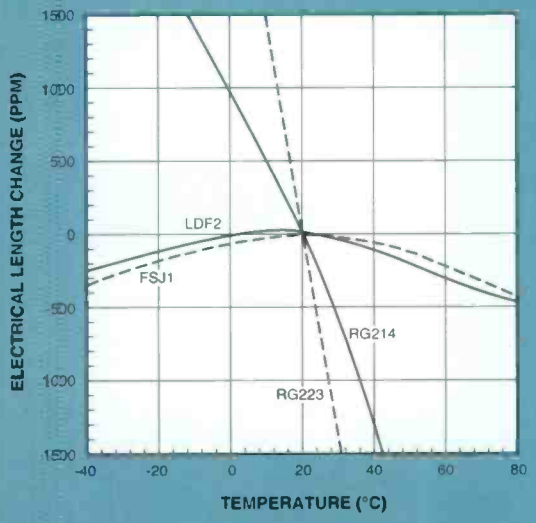


Figure 1

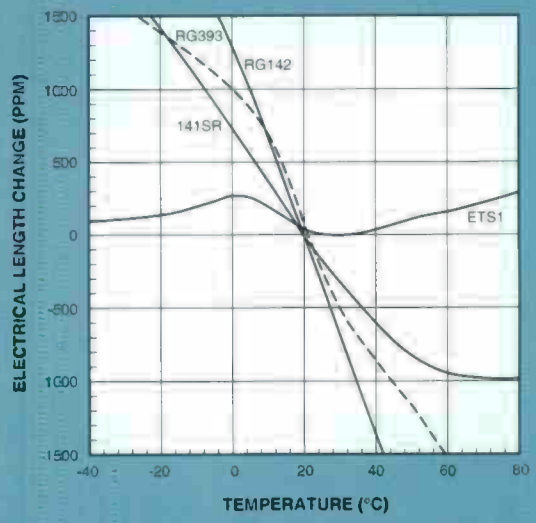


Figure 2

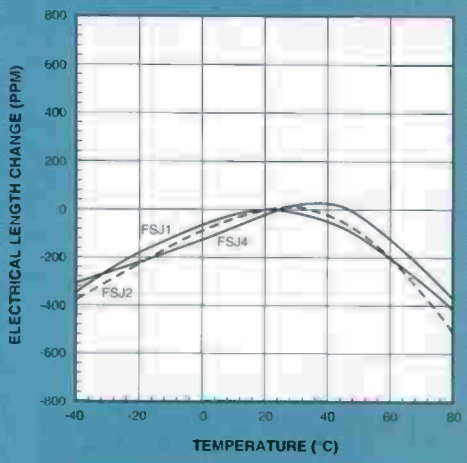


Figure 3 - Electrical Length Change vs. Temperature FSJ1-50A, FSJ2-50, FSJ4-50B

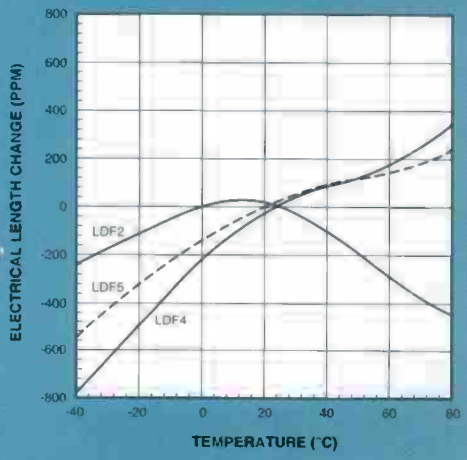


Figure 4 - Electrical Length Change vs. Temperature LDF2-50, LDF4-50A, LDF5-50A

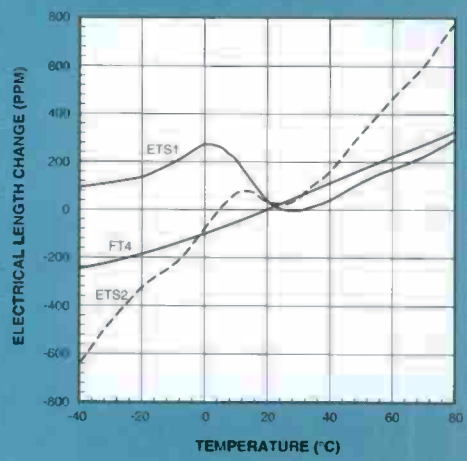


Figure 5 - Electrical Length Change vs. Temperature ETS1-50, ETS2-50, FT4-50

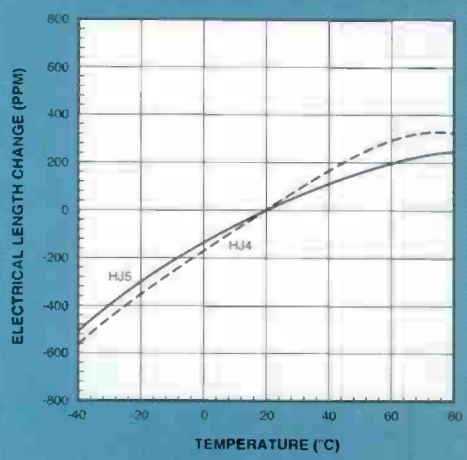


Figure 6 - Electrical Length Change vs. Temperature HJ4-50, HJ5-50

Calculating PPM to Degrees for Specific Applications

Phase Change (Degrees) = 3.66×10^{-7} (ΔPPM) (L•F/V)
Where: ΔPPM = Total Electrical Length Change in PPM Over Temperature Range of Interest (From Figures 3, 4, 5 and 6)

L = Cable Length, Feet
F = Frequency, MHz
V = Cable's Relative Velocity

Sample Calculation

Using the formula above, the change in phase for a system operating at 10 GHz using a 12 ft FSJ4-50B superflexible HELIAX cable over a temperature range of -40 to 80°C (-40 to 176°F) is calculated as follows:

$$\text{Phase Change} = \frac{3.66 \times 10^{-7} (400) \times 12 \times 10^{4}}{0.81}$$

$$= 21.69° \text{ maximum phase change}$$

At 1 GHz this equates to just over 2° maximum phase change.

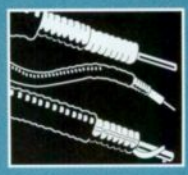
Phase Stability with Bending

When cable is bent during installation, it is important to maintain a constant cable phase length. Stability in bending is enhanced by locking all the cable components together such that the cable bends on its neutral axis. The foam dielectric in HELIAX cables is bonded to the center conductor, while the outer conductor corrugations mechanically lock the outer conductor to the dielectric. This locking results in excellent stability.

Typical phase change with bending data for HELIAX coaxial cables is given below:

Cable	Bending Radius In (mm)	Test Frequency GHz	Typical Phase Change, 360 Bend, Electrical Degrees/GHz
ETS1-50	1.0 (25)	18.0	0.8
FSJ1-50A	1.0 (25)	18.0	0.2
FSJ2-50	1.0 (25)	13.0	0.4
ETS2-50	1.0 (25)	13.0	0.8
FSJ4-50B	1.25 (32)	10.2	0.5
LDF2-50	3.75 (95)	13.0	0.5
LDF4-50A	5.0 (125)	8.0	0.6
LDF5-50A	10.0 (250)	5.0	0.3
HJ4-50	5.0 (125)	10.0	1.0
HJ5-50	10.0 (250)	5.0	0.8

Phase change with bending is not as repeatable or predictable as phase change with temperature. Results obtained will vary depending on exactly how the cable is bent. The above numbers are intended as a guide to the order of magnitude of change to be expected during installation if bending is required.



Phase Measured Assemblies

Two types of phase measured assemblies are available from Andrew:

Delay Lines. These are assemblies cut to a specific electrical length, specified either in nanoseconds or degrees, at a specified frequency. When several are ordered, their physical length can be expected to vary somewhat.

Phase Matched Assemblies. These are assemblies which are matched in electrical length to each other at a specified frequency. When phase matched assemblies are ordered, their minimum acceptable physical length must be specified, as well as an operating frequency. Andrew will supply assemblies matched in electrical length of this physical length and longer.

Two levels of cutting accuracy are available for both delay lines and phase matched assemblies:

Standard Cutting Accuracy. ±0.1 nanoseconds or 36/GHz. This cutting accuracy is not available for some combinations of test frequency and cable assembly lengths.

Precision Cutting Accuracy. Tolerance per table below. This varies by cable type and is based on one half of the corrugation pitch of the cable. This is as close as the cables can be fit on a production basis. This cutting accuracy is not available for some combinations of test frequency and cable assembly lengths.

Phase Measured Cable - Characteristics and Ordering Information

(Larger sizes also available; contact Andrew.)

	1/4" Superflexible FSJ1-50A	3/8" Superflexible FSJ2-50	1/2" Superflexible FSJ4-50B	3/8" LDF LDF2-50	1/2" LDF LDF4-50A	7/8" LDF LDF5-50A
For cable/connector technical information see page:	373	378	382	386	388	394
Type Numbers						
Phase Stabilized Delay Line Cut to Electrical Length ±0.1 ns tolerance (36 /GHz)	**35422-33** **42394-133**	**35422-42** **42394-142**	**35422-24** **42394-124**	**35422-22** **42394-122**	**35422-14** **42394-114**	**35422-15** **42394-115**
Delay Line, Precision Tolerence ±deg/GHz (ns)	**42394-333** 1.906 (0.0053)	**42394-342** 2.021 (0.0056)	**42394-324** 2.222 (0.0062)	**42394-322** 2.946 (0.0082)	**42394-314** 3.466 (0.0096)	**42394-315** 4.627 (0.0129)
Phase Matched ±0.1 ns (36 /GHz)	**42394-33**	**42394-42**	**42394-24**	**42394-22**	**42394-14**	**42394-15**
Precision Phase Matched ±deg/GHz (ns)	**42394-233** 1.906 (0.0053)	**42394-242** 2.021 (0.0056)	**42394-224** 2.222 (0.0062)	**42394-222** 2.946 (0.0082)	**42394-214** 3.466 (0.0096)	**42394-215** 4.627 (0.0129)
Characteristics						
Velocity ±2%	84	83	81	88	88	89
ft/ns (m/ns) ±2%*	0.83 (0.25)	0.82 (0.25)	0.8 (0.24)	0.87 (0.26)	0.87 (0.26)	0.88 (0.27)
Phase/Temp Coefficient over temp. range -22 to + 104 F (-30 to +40 C) PPM/ F (PPM/ C)	-4 to +5 (-7 to +9)	-5 to +5 -9 to +9	-1 to +3 (-2 to +6)	-4 to +3 (-8 to +6)	+4 to +9 (+7 to +16)	+3 to +7 (+5 to +12)

* For delay lines, the approximate length can be determined by multiplying delay in nanoseconds by the ft/ns factor for the appropriate cable type.

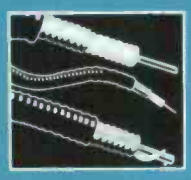
HELIAX®
Coaxial Cables

Phase Measured Cable - Characteristics and Ordering Information -

(Larger sizes also available; contact Andrew.)

	1/4" High Power Superflexible ETS1-50T	3/8" High Power Superflexible ETS2-50T	1/2" Air HJ4-50	7/8" Air HJ5-50
For cable/connector technical information see page:	376	380	408	420
Type Numbers				
Phase Stabilized	**35422-46**	**35422-45**	**35422-8**	**35422-5**
Delay Line Cut to Electrical Length ±0.1 ns tolerance (36 /GHz)	**42394-146**	**42394-145**	**42394-108**	**42394-105**
Delay Line, Precision Tolerence ±deg/GHz (ns)	**42394-346** 1.935 (0.0054)	**42394-345** 2.021 (0.0056)	**42394-308** 4.121 (0.0114)	**42394-305** 4.712 (0.0131)
Phase Matched ±0.1 ns (36 /GHz)	**42394-46**	**42394-45**	**42394-8**	**42394-5**
Precision Phase Matched ±deg/GHz (ns)	**42394-246** 1.935 (0.0054)	**42394-245** 2.021 (0.0056)	**42394-208** 4.121 (0.0114)	**42394-205** 4.712 (0.0131)
Characteristics				
Velocity ±2%	82	83	91.4	91.6
ft/ns (m/ns) ±2%*	0.81 (0.25)	0.82 (0.25	0.9 (0.27)	0.9 (0.27)
Phase/Temp Coefficient over temp. range -22 to + 104°F (-30 to +40°C) PPM/ F (PPM/ C)	-9 to +6 (-16 to +10)	-5 to +7 (-8 to +13)	+3 to +6 (+5 to +11)	+3 to +6 (+5 to +11)

* For delay lines, the approximate length can be determined by multiplying delay in nanoseconds by the ns/ft factor for the appropriate cable type.



Intermodulation Generation

Intermodulation (IM), the intermixing of fundamental signal frequencies in a nonlinear circuit, has been a problem in multichannel communication systems for years. IM produces additional spurious signals at frequencies close to the operating frequencies, which can create additional noise in the system or even swamp the channel and make it unavailable for traffic. The many channels in a modern wireless communications system are typically arranged into base station transmit and receive frequency bands. Depending on the particular generating signal frequencies, IM products can fall into these receive frequencies. It therefore becomes desirable to keep the IM level low enough to prevent additional noise at the receivers.

Any deviation from linearity in a circuit will cause some IM. Nonlinearity is present when the voltage is not exactly proportional to the current or if output power is not exactly proportional to input power. Imperfect contacts at conductor junctions and the presence of ferromagnetic materials in or near the current path are the two main causes of nonlinearity in passive circuits. Measured IM levels are not very dependent on frequency, but do depend on the signal amplitude. Thus, when measuring or specifying IM performance of a component, the power levels of the carriers must be specified. Typical transmit power level is 20 W (+43 dBm).

HELIAX cables, constructed from a single inner and single outer conductor deliver the best IM performance. Because current flow in coaxial cable is longitudinal, designs with many individual conductors require the current to cross numerous boundaries, each boundary being capable of producing IM products. It is not possible to apply high pressure between the individual conductors of a braided or foil-braid cable, for example, to improve IM performance. Figure 1 shows measured IM levels, at PCS frequencies, for an assembly that uses a foil-braided cable. Figure 2 shows measured IM levels for one that uses HELIAX cable (FSJ4-50B). Respective IM levels are -78 dBm and -113 dBm. Transmit power was +45 dBm (31.6 W).

Three factors are important in connector design to minimize IM generation. First, the number of individual contact surfaces must be a few as possible. Second, where contact surfaces are necessary, they must be designed for excellent contact by using means to generate high pressure or by using soldering. Third, base materials, platings, and underplatings at RF current-carrying surfaces must not be made of ferromagnetic materials. The table shows measured IM levels for various RF connectors fitted to short lengths of cable. Andrew connectors, designed and constructed using these principles for low IM generation, outperform other manufacturers' designs that deviate from these principles in one way or another.

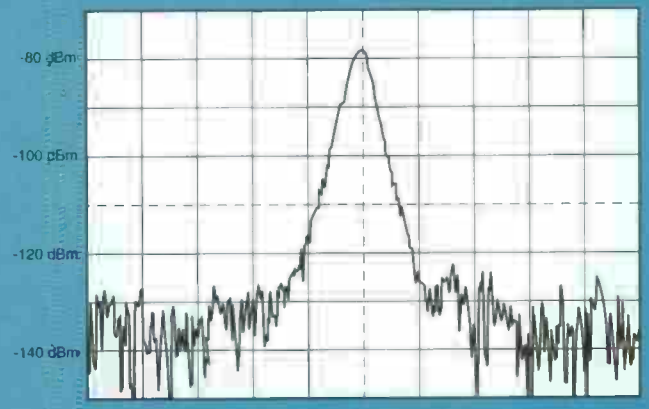


Figure 1

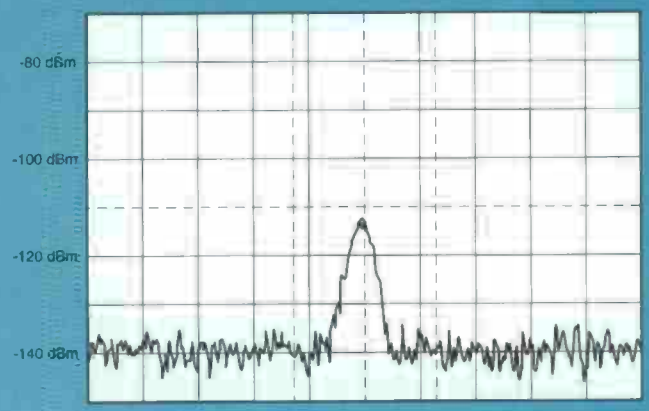
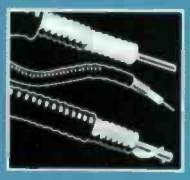


Figure 2

	dBm
Large number of components	-95
Low pressure contact, outer	-96
Low pressure contact, inner	-85
Nickel plating	-83
Low IM design	-120 to -130



HELIAX® Coaxial Cables

Figure 1 – Variation of Attenuation with Ambient Temperature

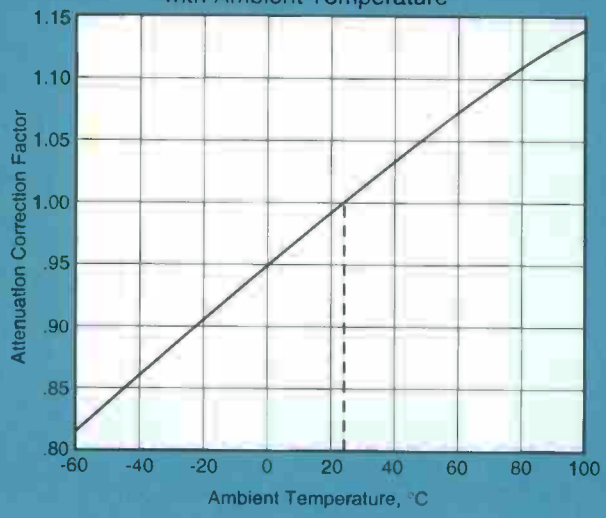
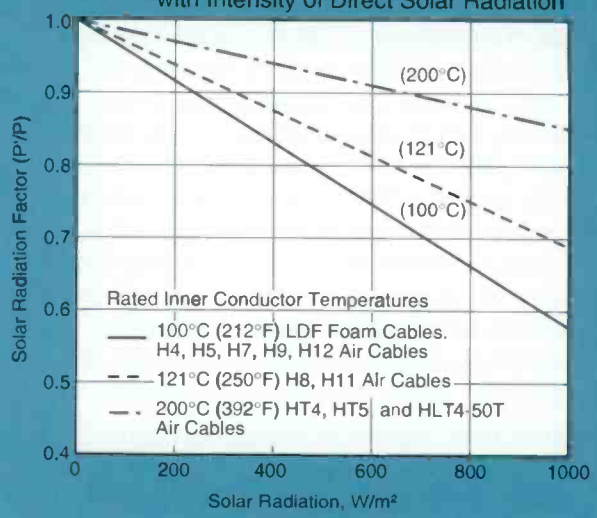


Figure 6 – Variation of Average Power Rating with Intensity of Direct Solar Radiation



Cable Technical Data

Temperature Ratings for HELIAX Coaxial Cables

	Recommended Temperature Range °C (°F) Storage	Installation and Operation
Standard Polyethylene Jacketed Cable, Foam and Air	-70° to 85° (-94° to 185°)*	-40° to 85° (-40° to 185°)
Connectors, Foam and Air	-70° to 100° (-94° to 212°)**	-40° to 150° (-40° to 302°)***
Fire Retardant, Type CATVX Jacketed Cable, Foam and Air	-30° to 80° (-22° to 176°)	-30° to 80° (-22° to 176°)
Fire Retardant, Type CATVR Jacketed Cable, Foam and Air	-30° to 80° (-22° to 176°)	-30° to 80° (-22° to 176°)
Fire Retardant, Type CATVP Jacketed Cable, Foam and Air	-20° to 150° (-4° to 302°)	-20° to 150° (-4° to 302°)†

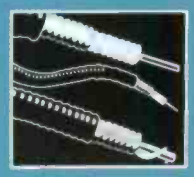
* Cable with connectors attached rated to -40° C (-40° F).
** Upper temperature limited by connector package material. Storage defined as packaged connectors, not connectors installed on cable.
*** If connectors are operated above 100° C (212° F) and then separated, interface seals (gaskets or O rings) should be replaced before remating. Air cable and connectors will operate below -40° C (-40° F), but may experience air pressure loss exceeding 1lb/in² (7kPa) in 24 hours.
† For CATVP, foam and air cables, 7/8" and larger, the installation temperature is 0° to 150° C (32° to 302° F).

Attenuation

The attenuation versus frequency characteristics of HELIAX coaxial cables are provided as part of the data for each cable in this catalog. The figures are guaranteed to within ±5%. The values provided are for 24°C (75°F) ambient and increase slightly with higher temperature or applied power, up to approximately 13% above the curves at 100°C (212°F) ambient temperature. Figure 1 shows this relationship.

Effect of Connector on Transmission Line Loss

Connector insertion loss is negligible compared with the attenuation of the cable. Connector insertion loss depends on both the VSWR of the cable and the frequency of operation, and is difficult to calculate. You can easily calculate the total transmission line insertion loss (the sum of cable attenuation and insertion loss of the connectors) using our I-L-CALC™ software. To approximate insertion loss for two connectors, add 0.1 dB to the transmission line loss.



Load VSWR Effect on Total Transmission Loss

When the transmission line is attached to a load, such as an antenna, the VSWR of the load increases the total transmission loss of the system. This effect is quite small for normal conditions. Figure 2 shows the minimum increase in loss with load VSWR, assuming a VSWR of 1.0 at the input of the transmission line. This requires use of an input matching device.

Power Rating Considerations

Both peak- and average-power ratings are required to fully describe the capabilities of a given transmission line. Typically, peak-power ratings limit usage with amplitude modulation at medium frequencies (530-1610 kHz) or pulsed usage, while average-power ratings limit the high frequency usage.

Peak-Power Rating

The peak-power rating of a transmission line is limited by voltage breakdown between the inner and outer conductors.

Voltage breakdown is essentially independent of RF frequency, but varies with line pressure and type of pressurizing gas. Peak-power ratings are, therefore, generally stated for the following standard conditions: VSWR = 1.0, zero modulation and one atmosphere absolute dry air pressure (0 lb/in² or 0 kPa gauge) at sea level.

The peak-power rating of the selected cable must be derated for modulation technique and VSWR, as follows:

Peak Power Derating for Modulation and VSWR

Modulation	Peak Power Derating Calculation
AM	$P_{MAX} = \frac{P_{PK}}{(1+M)^2 VSWR}$
FM	$P_{MAX} = \frac{P_{PK}}{VSWR}$
TV	$P_{MAX} = \frac{P_{PK}}{(1+AU+2\sqrt{AU})\ VSWR} = \frac{P_{PK}}{(2.09)\ VSWR}$

Where:

P_{MAX}	=	Derated peak power
P_{PK}	=	Peak power rating of cable
M	=	Amplitude modulation index (100% = 1.0)
VSWR	=	Voltage standing wave ratio
AU	=	Aural to visual ratio (20% Aural: AU = 0.2)
2.09	=	Modulation derating factor for TV, for AU=0.2

Rated transmitter power must be less than calculated derated peak power of the cable for safe operation.

From derating expressions, it can be seen that 100% amplitude modulation increases the peak power in the transmission line by a factor of 4. Also, the peak power in the transmission line increases directly with VSWR.

The transmission line peak-power rating can be significantly increased by pressurization. See page 590 for details.

Figure 3 – Pressurization Factors

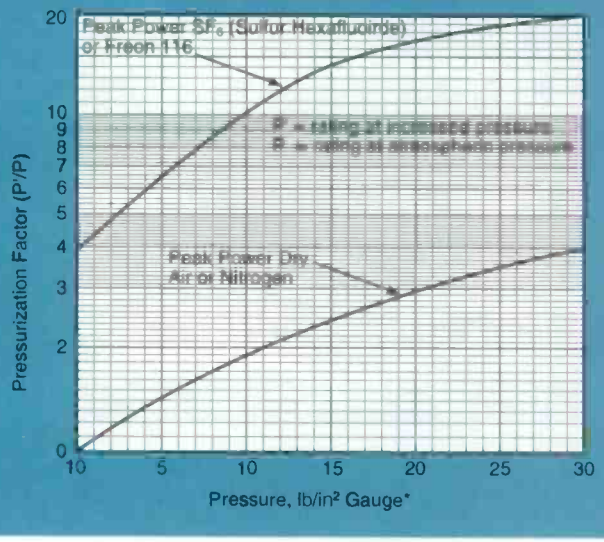
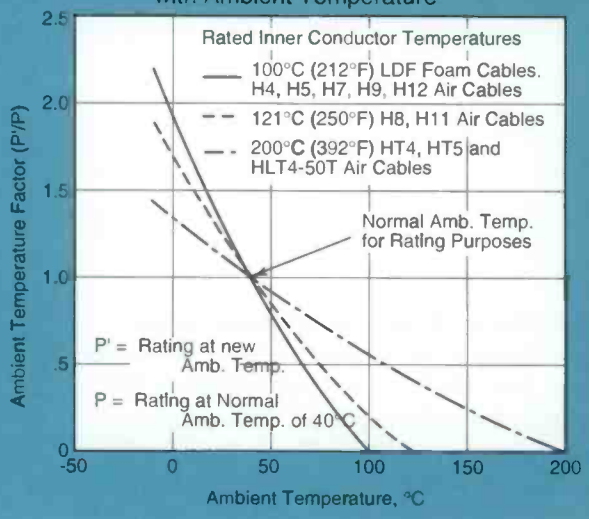


Figure 4 – Variation of Average Power Rating with Ambient Temperature



An adequate safety factor on peak power is necessary to safeguard against voltage breakdown which can result in permanent damage to the transmission line. All Andrew HELIAX coaxial cables are high-voltage tested to the equivalent of 200% of their rated peak power (safety factor of 1.4 on voltage) before shipment to the customer. This safety factor is intended as a provision for transmitter transients, lightning induced transients, and high voltage excursions due to other unforeseen causes. Andrew is known for its conservative specifications that insure long term, reliable performance. We continue to hold this commitment to our customers by maintaining the highest level of quality and performance.

HELIAX peak-power ratings are determined according to the relation:

$$P_{PK} = \frac{\left(\frac{Ep \times 0.707 \times 0.7}{1.4}\right)^2}{Zc}$$

Where:

P_{PK} = Cable Power Rating. Standard Conditions
E_P = DC production Test Voltage
0.707 = RMS factor
0.7 = DC to RF factor (empirically verified)
1.4 = Safety Factor on Voltage
Z_C = Characteristic Impedance

Typical DC production test voltages for common sizes of air-dielectric cables are shown below:

Nominal Size	7/8"	1-5/8"	2-1/4"	3"	3-1/8"	4"	5"
Ep. kV	6	11	13	16	19	21	27.5

Foam-dielectric cables have a greater dielectric strength than air-dielectric cables of similar size. For this reason they might be expected to have higher peak-power ratings than air cables. Higher peak-power ratings usually can not be realized, however, because the commonly used connectors for foam cables have air spaces at the cable/connector interface which limit the allowable RF voltage to "air cable" values. Andrew rates similar size foam-and air-dielectric cables alike for this reason.

Effect of Connector on Power Rating

The peak power handling capability of a cable assembly is the smaller of the values for the cable and the connectors. The following table shows power ratings for common connectors at standard conditions of VSWR = 1.0, zero modulation and one atmosphere dry air pressure (0 lb/in² or 0 kPa gauge) at sea level.

Connector Power Ratings

Connector Type	DC Test Voltage kV	Average Power kW*	Peak Power kW
SMA	1.0	0.1	2.5
BNC	1.5	0.1	5.6
TNC	1.5	0.3	5.6
UHF	2.0	0.3	10
N	2.0	0.6	10
HN	4.0	0.6	40
SC	4.2	1.2	44
7-16 DIN	4.0	3	40
4.1/9.5 DIN	2.5	1.2	16
LC	5.0	3.5	63
7/8" EIA	6.0	4.2	90
1-5/8" EIA	11	5.2	305
3-1/8" EIA	19	17	902
4-1/2" IEC	21	29	1100
6-1/8" EIA	27.5	60	1890

* Average power ratings of the connector interfaces are based on an operating frequency of 900 MHz. The values shown in this table are typical for most applications.

Increased Peak Power Ratings

Pressurization and/or the use of high-density gases with high dielectric strength can be used to increase peak-power ratings. These effects are shown in Figure 3.

For a given transmission line pressure, the increase in peak-power rating is significant. For example, a line pressure of 10 lb/in² (70 kPa) dry air increases the peak-power rating by a factor of 1.9. Pressurization above 30 lb/in² (207 kPa) is not recommended.

Figure 5 – Derating Factor for Average Power Due to VSWR

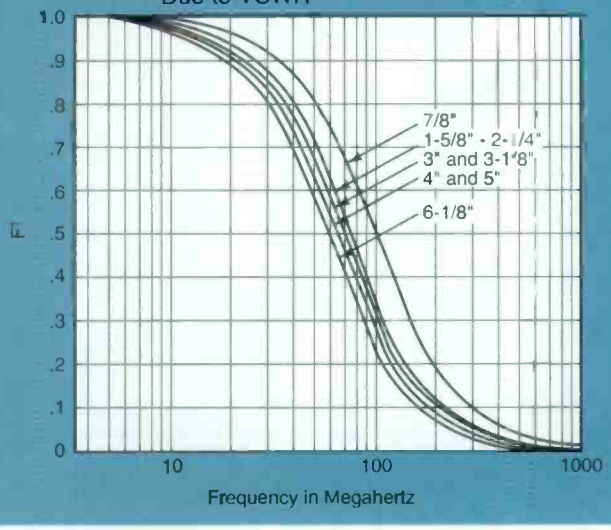
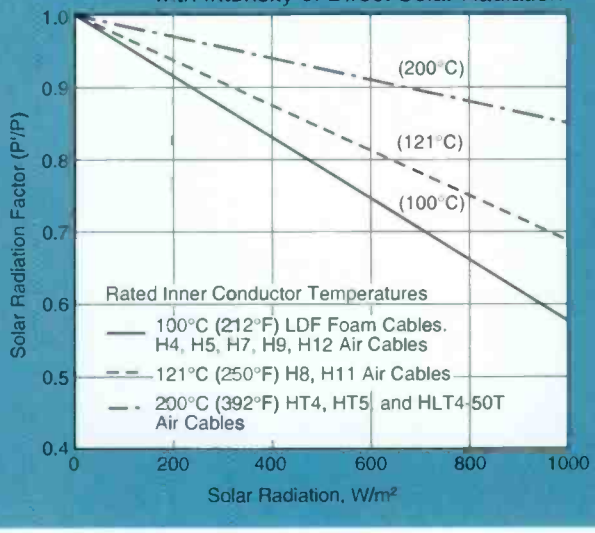


Figure 6 – Variation of Average Power Rating with Intensity of Direct Solar Radiation



Average Power Rating

Average-power ratings of transmission lines are governed by the safe long-term operating temperature of the dielectric. The maximum permissible inner conductor temperature varies with the type of dielectric and is based upon consideration of the long term life of the dielectric.

Andrew average power ratings are based on a VSWR of 1.0, atmosphere pressure and ambient temperature of 40°C (104°F).

Derating Average Power for Modulation Condition

To convert rated transmitter power to average power for television transmission, multiply by 0.8 (totally black picture + aural signal). For FM radio, the factor is 1.0 Transmission lines for AM radio at MF frequencies (530-1610 kHz) are usually peak power limited. At higher (HF) frequencies, the limitation is average power capability and the required derating factor is:

$$D.F. = 1 + \frac{M^2}{2}$$

where M is the modulation depth (100% = 1.0), expressed decimally.

Average Power Rating Adjustment for Ambient Temperature

The baseline power rating can be adjusted to meet the actual usage conditions. Figure 4 shows the variation of average power rating with ambient temperature.

Derating Average Power for VSWR

The derating factor (D.F) is calculated from the following formula:

$$D.F. = \frac{(VSWR^2 + 1)}{2\,(VSWR)} + \frac{F'\,(VSWR^2 - 1)}{2\,(VSWR)}$$

where F' is a factor that varies with frequency and line size. This calculation of derating factor is conservative in that it assumes all reflected power is re-reflected at the transmitter and absorption of the reflected signal by the line attenuation is small. Select the factor from the applicable curve in Figure 5, calculate factor D.F., and divide into the average power from the cable characteristics table.

For example: Calculate power rating for 3" HJ8-50B cable operating at 100 MHz with VSWR = 1.1, F' (from Figure 5) = 0.33:

$$D.F. = \frac{(1.1^2 + 1)}{2\,(1.1)} + \frac{0.33\,(1.1^2 - 1)}{2(1.1)} = 1.036$$

Average Power Rating at 1.00 VSWR = 42.5 kW (from page 523)

Average Power Rating at 1.1 VSWR = 42.5/1.036 = 41.0 kW

Derating Average Power for Direct Solar Radiation

The average power handling capability of a cable exposed to direct solar radiation will be reduced. The appropriate derating factors for the different cable types are shown in Figure 6.

The average radiation intensity for moderate climates is 300 W/m² or less. Hot, dry climates give solar radiation intensities which at the hottest time of the day can be 1,000 W/m² or higher. The mean value over the day, which is applicable to average power derating calculations provided absolute maximum temperatures are not exceeded, is about 400 W/m². These hot, dry locations are also subject to elevated ambient temperatures, which must also be considered (Figure 4).

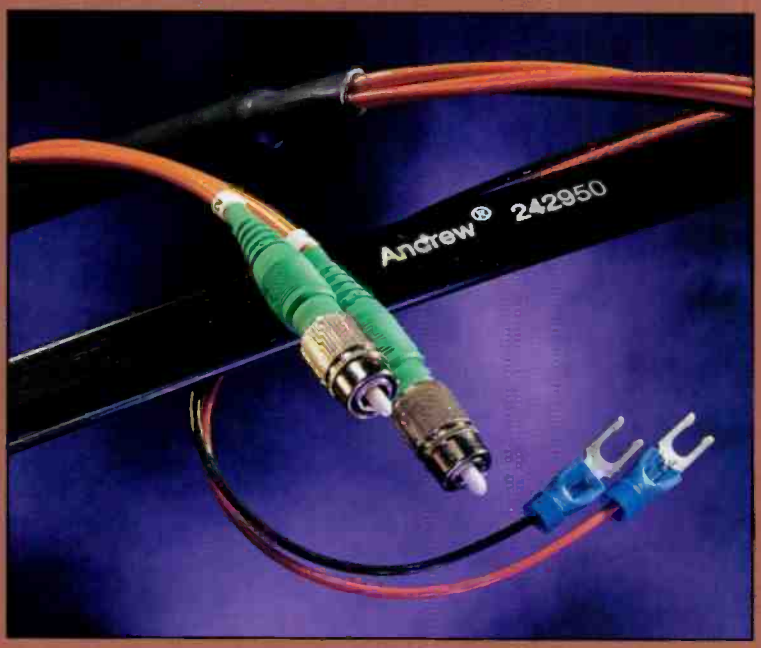
Efficiency

The efficiency of a transmission line depends on its length and attenuation. The efficiency is defined as the percent of transmitter power which reaches the antenna. It can be calculated as:

$$\text{Efficiency} = \frac{100\%}{10^{\left(\frac{dB}{10}\right)}}$$

where dB is the total attenuation of the transmission line at the frequency of interest.

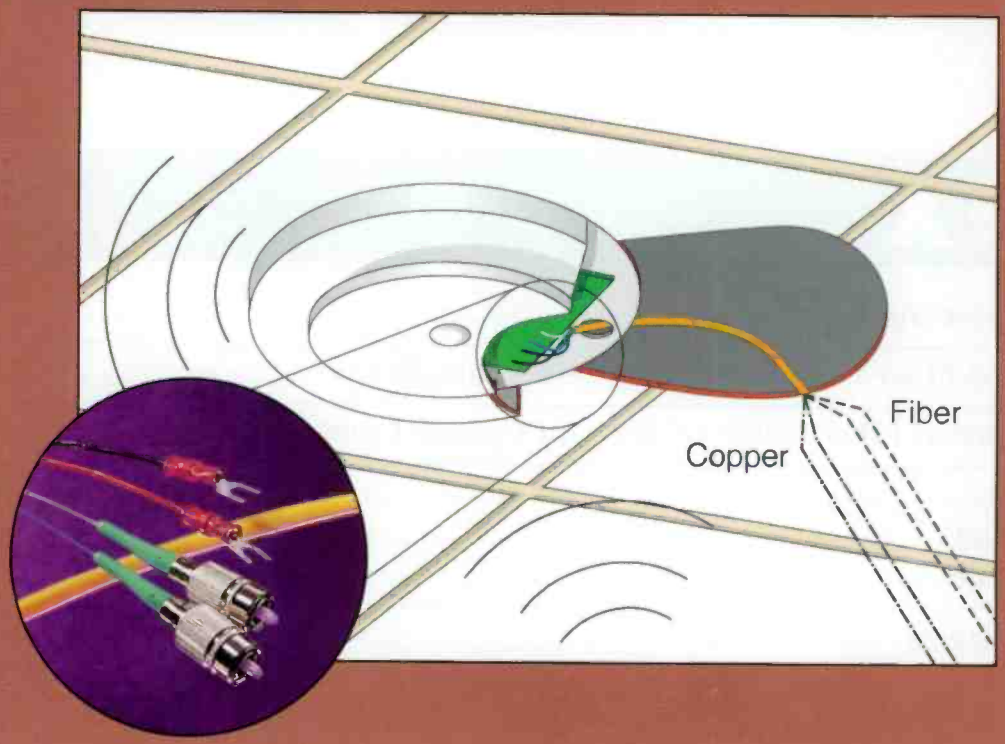
The remaining power is lost in the transmission line and is dissipated as heat.



Fiber Optic Cables

INDEX

Fiber Optic Cables



Composite Cable Systems

for PCS and Cellular Premise Antennas

Andrew premise antenna cables, featuring a unique blend of copper and fiber optic elements in one cable, simplify the design and decrease the installation costs of premise PCS and cellular systems. Andrew fully tests these assemblies to ensure electrical and optical performance. This testing reduces the risk of system installation defects due to inherent problems with field installation of fiber optic connectors.

Unique Composite Design. Andrew premise cables are specifically engineered for use within buildings in self-supporting cellular and PCS systems. The composite design runs electrical power and optical fiber together in one cable to each base station antenna, so there are no AC power or stepdown transformers to install. And there's no bulky ductwork*, because Andrew protects the cable with a unique sheathing design. Best of all, when you incorporate an integrated uninterruptible power supply at the head end you're assured of a reliable, completely independent communication system, even in power outages.

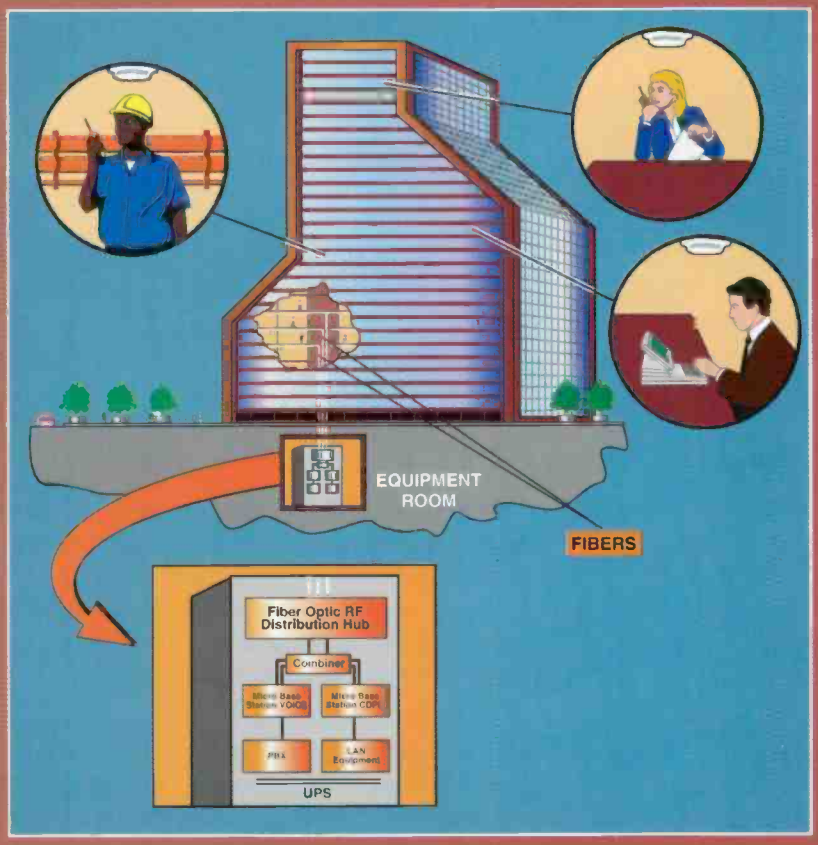
A Full Range of Options. For your convenience we maintain an inventory of the most common cable products and standard assembly lengths. We will also prepare complete fiber optic cable assemblies made to customer system requirements. Different wire gauges and single-mode, dispersion shifted singlemode, and multimode fiber types are all available. Finally, when field connectorization is desired, Andrew provides pigtail cords with connectors that can be spliced on cable assemblies for easy installation.

Lower Life Cycle Costs. The Andrew composite fiber optic solution minimizes installed and long-term costs. With the composite electro/optical cable designed specifically for these applications, the need for conduits and the associated maintenance costs is significantly reduced. And as your system expands the fiber optic cable can be accessed directly and easily to upgrade antenna system infrastructure or redirect cables.

Andrew composite premise antenna cables are another in a series of innovations from Andrew Corporation, a global provider of communications technologies that cover the entire spectrum of voice, data, and video transmission. Bringing reliability, flexibility, and lower costs to your premise PCS and cellular systems, Andrew composite premise antenna cables are the value-added solution to your antenna installation challenges.

*Subject to local codes

Fiber Optic Cables



Cut Installation Time and Costs with Andrew Composite Cables

Installation (Typical)

- Site Survey
- Install Ductwork
- Install Power & Transformer at Each Antenna Site
- Install Fiber Optic Cable
- Install Antenna & Base Station Equipment
- Commissioning

Simplified Installation with Andrew Composite Cables

- Site Survey
- Install Composite Cable
- Install Antenna & Base Station Equipment
- Commissioning

Savings:
TIME & COST
Ductwork and Local Power are Not Required with Andrew Composite Cables†

† Subject to local building codes.

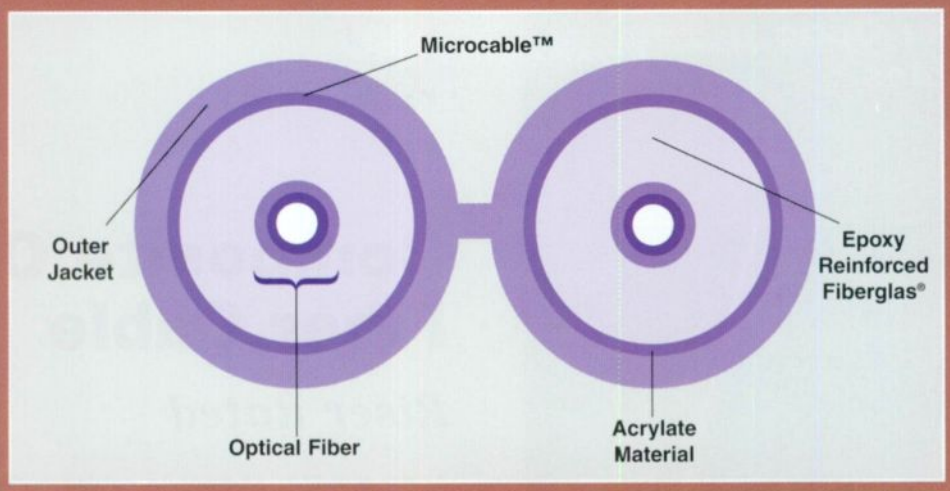
Duplex Optical Fiber Cable

Plenum Rated

Andrew indoor duplex cables combine two Andrew Microcable™ elements in one cable encapsulated in a figure-8 jacket. A plenum rated cable, it is ideally suited to indoor antenna remoting for cellular and PCS systems, in-building applications, and in industrial environments for communication and sensor systems.

Andrew Microcable is a unique product consisting of a singlemode or dispersion shifted singlemode optical fiber, encased in a reinforcing Fiberglas® epoxy matrix for high tensile strength and crush resistance in a light-weight, compact package. The two singlemode or dispersion shifted singlemode Microcable elements provide the duplex cable with a tensile strength of 180 lb (81.7 kg) and allow easy and robust ST®, SC, FC, and other connector attachment. The duplex cable is also suitable for riser applications, and can be easily divided into two single cables.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



Mechanical Characteristics

Cable Type Numbers	242750-1	242750-2
Number of Fibers	2	2
Fiber Type	Singlemode	Dispersion Shifted Singlemode
Fiber Buffer Type	Tight, Fiberglas® Epoxy	Tight, Fiberglas Epoxy
Fiber Buffer Diameter, in (mm)	0.032 (0.8)	0.032 (0.8)
Cable Diameter, in (mm)	0.095 X 0.180 (2.4 X 4.6)	0.095 X 0.180 (2.4 X 4.6)
Cable Weight, lb/1000 ft (kg/km)	11 (16)	11 (16)
Tensile Strength		
Installation, Short Term, lb (N)	180 (800)	180 (800)
Operational, Long Term, lb (N)	60 (267)	60 (267)
Minimum Bend Radius,		
Installation, Short Term, in (mm)	2 (50)	2 (50)
Operational, Long Term, in (mm)	1.5 (38)	1.5 (38)
Operating Temperature Range, °F (°C)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
UL Listing	OFNP	OFNP
Jacket Material	PVDF	PVDF
Cable Assembly Type Numbers		
FC/APC	**242761-1**	**242761-5**
FC	**242761-2**	**242761-6**
ST®	**242761-3**	**242761-7**
SC	**242761-4**	**242761-8**

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode
Maximum Attenuation at 1310 nm, dB/km	0.5	0.5
Maximum Attenuation at 1550 nm, dB/km	0.6	0.35
Cable Cutoff Wavelength (nm)	<1260	<1260
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8
Cladding Non-Circularity (%)	≤1.0	≤1.0
Coating Diameter (µm)	245 ± 10	245 ± 10
FC/APC Maximum Insertion Loss (dB)	0.5	0.5
FC, ST®, SC Maximum Insertion Loss (dB)	0.4	0.4
FC/APC Minimum Return Loss (dB)	60	60
FC, ST, SC Minimum Return Loss (dB)	50	50

ST is a registered trademark of AT&T.

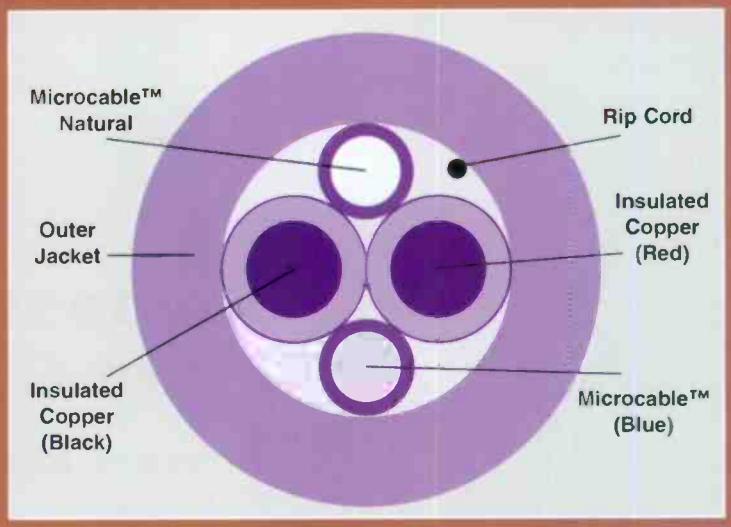
Composite Optical Fiber Cable

Riser Rated

Andrew indoor composite cables combine two Andrew Microcable™ elements with two insulated copper conductors to provide electrical current and fiber optic capability in one cable. This riser rated cable is ideally suited to indoor antenna remoting for cellular and PCS systems and for communication and sensor systems in industrial environments.

Several configurations of composite cable are available, including singlemode and dispersion shifted singlemode fibers with 18 or 14 AWG copper conductors. Andrew Microcable is a unique product consisting of a singlemode or dispersion shifted singlemode optical fiber, encased in a reinforcing Fiberglas® epoxy matrix for high tensile strength and crush resistance in a lightweight, compact package. The Microcable elements provide easy and robust connector attachment, while the copper conductors can be terminated with any standard electrical wire termination. A No. 6 spade terminal is installed on the copper conductor in the cable assemblies. A rip cord provides fast and efficient access to the cable's optical and electrical elements.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



Mechanical Characteristics

Cable Type Numbers	242748-1	242748-2	242748-4	242748-5
Number of Fibers	2	2	2	2
Fiber Type	Singlemode	Singlemode	Dispersion Shifted Singlemode	Dispersion Shifted Singlemode
Fiber Buffer Type	Tight, Fiberglas® Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy
Fiber Buffer Diameter, in (mm)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)
Cable Diameter, in (mm)	0.21 (5.3)	0.27 (6.9)	0.21 (5.3)	0.27 (6.9)
Cable Weight, lb/1000 ft (kg/km)	27 (40)	52 (78)	27 (40)	52 (78)
Tensile Strength				
Installation, Short Term, lb (N)	180 (800)	180 (800)	180 (800)	180 (800)
Operational, Long Term, lb (N)	60 (267)	60 (267)	60 (267)	60 (267)
Minimum Bend Radius				
Installation, Short Term, in (mm)	4 (100)	5.4 (135)	4 (100)	5.4 (135)
Operational, Long Term, in (mm)	3 (75)	4 (100)	3 (75)	4 (100)
Operating Temperature Range, °F (°C)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Number of Copper Conductors	2	2	2	2
Copper Conductor, AWG (Stranding)	18 (7 X 26)	14 (41 X 30)	18 (7 X 26)	14 (41 X 30)
Nominal DCR, ohms/1000 ft (ohms/km)	5.86 (19.2)	2.53 (8.30)	5.86 (19.2)	2.53 (8.30)
Nominal Maximum Current (amperes)	10	17	10	17
UL Listing	CL2R-OF	CL2R-OF	CL2R-OF	CL2R-OF
Jacket Material	PVC	PVC	PVC	PVC
Cable Assembly Type Numbers				
FC/APC	**242755-1**	**242757-1**	**242755-5**	**242757-5**
FC	**242755-2**	**242757-2**	**242755-6**	**242757-6**
ST®	**242755-3**	**242757-3**	**242755-7**	**242757-7**
SC	**242755-4**	**242757-4**	**242755-8**	**242757-8**

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode
Maximum Attenuation at 1310 nm, dB/km	0.5	0.5
Maximum Attenuation at 1550 nm, dB/km	0.6	0.35
Cable Cutoff Wavelength (nm)	<1260	<1260
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8
Cladding Non-Circularity (%)	≤1.0	≤1.0
Coating Diameter (µm)	245 ± 10	245 ± 10
FC/APC Maximum Insertion Loss (dB)	0.5	0.5
FC, ST®, SC Maximum Insertion Loss (dB)	0.4	0.4
FC/APC Minimum Return Loss (dB)	60	60
FC, ST, SC Minimum Return Loss (dB)	50	50

Composite Optical Fiber Cable

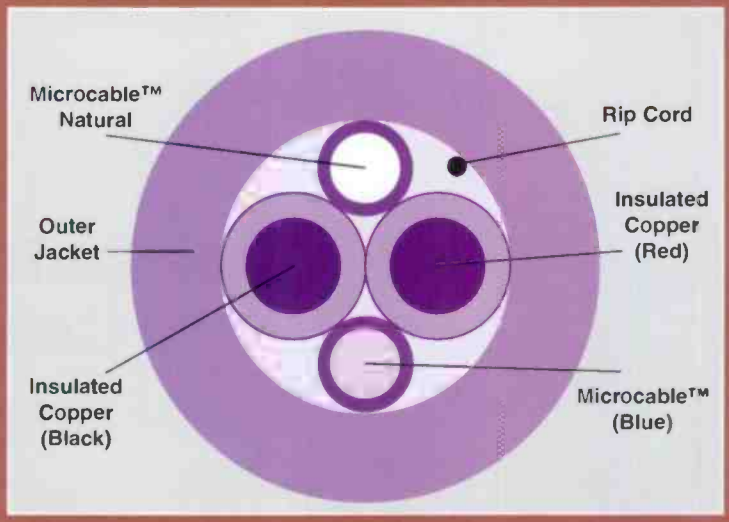
Plenum Rated

Andrew indoor composite cables combine two Andrew Microcable™ elements with two insulated copper conductors to provide electrical current and fiber optic capability in one cable. This plenum rated cable is ideally suited to indoor antenna remoting for cellular and PCS systems and for communication and sensor systems in industrial environments.

Several configurations of composite cable are available, including singlemode and dispersion shifted singlemode fibers with 18 or 14 AWG copper conductors. Andrew Microcable is a unique product consisting of a singlemode or dispersion shifted singlemode optical fiber, encased in a reinforcing Fiberglas® epoxy matrix for high tensile strength and crush resistance in a lightweight, compact package. The Microcable elements provide easy and robust connector attachment, while the copper conductors can be terminated with any standard electrical wire termination. A No. 6 spade terminal is installed on the copper conductor in the cable assemblies. A rip cord provides fast and efficient access to the cable's optical and electrical elements.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479



Mechanical Characteristics

Cable Type Numbers	242749-1	242749-2	242749-4	242749-5
Number of Fibers	2	2	2	2
Fiber Type	Singlemode	Singlemode	Dispersion Shifted Singlemode	Dispersion Shifted Singlemode
Fiber Buffer Type	Tight, Fiberglas® Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy
Fiber Buffer Diameter, in (mm)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)
Cable Diameter, in (mm)	0.21 (5.3)	0.27 (6.9)	0.21 (5.3)	0.27 (6.9)
Cable Weight, lb/1000 ft (kg/km)	27 (40)	52 (78)	27 (40)	52 (78)
Tensile Strength				
Installation, Short Term, lb (N)	180 (800)	180 (800)	180 (800)	180 (800)
Operational, Long Term, lb (N)	60 (267)	60 (267)	60 (267)	60 (267)
Minimum Bend Radius				
Installation, Short Term, in (mm)	4 (100)	5.4 (135)	4 (100)	5.4 (135)
Operational, Long Term, in (mm)	3 (75)	4 (100)	3 (75)	4 (100)
Operating Temperature Range, °F (°C)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Number of Copper Conductors	2	2	2	2
Copper Conductor, AWG (Stranding)	18 (7 X 26)	14 (41 X 30)	18 (7 X 26)	14 (41 X 30)
Nominal DCR, ohms/1000 ft (ohms/km)	5.86 (19.2)	2.53 (8.30)	5.86 (19.2)	2.53 (8.30)
Nominal Maximum Current (amperes)	10	17	10	17
UL Listing	CL2R-OF	CL2R-OF	CL2R-OF	CL2R-OF
Jacket Material	PVDF	PVDF	PVDF	PVDF
Cable Assembly Type Numbers				
FC/APC	**242756-1**	**242758-1**	**242756-5**	**242758-5**
FC	**242756-2**	**242758-2**	**242756-6**	**242758-6**
ST®	**242756-3**	**242758-3**	**242756-7**	**242758-7**
SC	**242756-4**	**242758-4**	**242756-8**	**242758-8**

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode
Maximum Attenuation at 1310 nm, dB/km	0.5	0.5
Maximum Attenuation at 1550 nm, dB/km	0.6	0.35
Cable Cutoff Wavelength (nm)	<1260	<1260
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8
Cladding Non-Circularity (%)	≤1.0	≤1.0
Coating Diameter (µm)	245 ± 10	245 ± 10
FC/APC Maximum Insertion Loss (dB)	0.5	0.5
FC, ST®, SC Maximum Insertion Loss (dB)	0.4	0.4
FC/APC Minimum Return Loss (dB)	60	60
FC, ST, SC Minimum Return Loss (dB)	50	50

Composite Optical Fiber Cable

Outdoor Rated

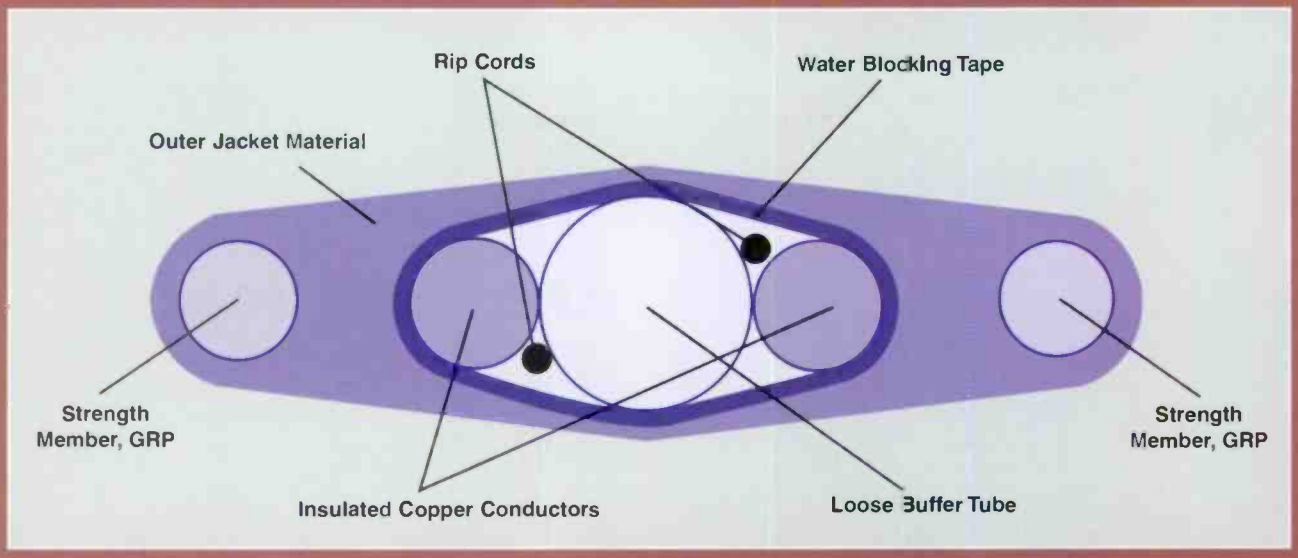
Outdoor composite cables from Andrew Corporation combine one to six optical fibers with two insulated copper conductors to provide electrical and fiber optic capability in one cable. This cable can be terminated with standard optical and electrical connectors in a variety of lengths to provide cable assemblies. These outdoor products are ideally suited to outdoor antenna remoting for cellular, PCS, VSAT, and SATCOM systems, and for communication, process control, and sensors in industrial environments.

The cable consists of a central gel-filled, water-blocked, loose buffer tube flanked by two parallel insulated 18- or 10-gauge stranded copper conductors. Each buffer tube contains one to six color-coded singlemode optical fibers. Two rip cords provide fast and efficient access to the cable's optical and electrical elements. The copper conductors, buffer tube, and rip cords are surrounded by a water blocking tape that provides longitudinal water blocking. The entire core, along with a GRP strength member on either side, is surrounded by a UV stabilized polyethylene jacket.

Several configurations of composite cable and assemblies are available, all using singlemode optical fiber. The optical fibers provide easy and robust FC/APC, ST®, SC, FC, and other connector attachment, while the copper conductors can be terminated with any standard electrical wire termination.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.

ST is a registered trademark of AT&T.



Mechanical Characteristics

Cable Type Numbers	242949-(*)	242951-(*)	242953-(*)
Number of Fibers	1,2,4 or 6	1,2,4 or 6	1,2,4 or 6
Fiber Type	Singlemode	Singlemode	Singlemode
Fiber Buffer Type	Loose, Gel Filled	Loose, Gel Filled	Loose, Gel Filled
Fiber Buffer Diameter, in (mm)	0.118 (3.0)	0.118 (3.0)	0.118 (3.0)
Cable Diameter, in (mm)	0.30 X 0.62 (7.6 X 15.7)	0.30 X 0.62 (7.6 X 15.7)	0.24 X 0.45 (6.1 X 11.4)
Cable Weight, lb/1000 ft (kg/km)	78 (116)	140 (209)	42 (61)
Tensile Strength			
Installation, Short Term, lb (N)	500 (2200)	600 (2700)	400 (1800)
Operational, Long Term, lb (N)	112 (500)	135 (600)	90 (400)
Minimum Bend Radius,			
Installation, Short Term, in (mm)	6 (150)	6 (150)	5 (125)
Operational, Long Term, in (mm)	4.5 (115)	4.5 (115)	3.6 (90)
Operating Temperature Range, °F (°C)	-40 to 140 (-40 to 60)	-40 to 185 (-40 to 85)	-40 to 140 (-40 to 60)
Storage Temperature Range, °F (°C)	-40 to 140 (-40 to 60)	-40 to 185 (-40 to 85)	-40 to 140 (-40 to 60)
Number of Copper Conductors	2	2	0
Copper Conductor, AWG (Stranding)	18 (7 X 26)	10 (105 X 30)	–
Nominal DCR, ohms/1000 ft (ohms/km)	5.86 (19.2)	.99 (3.24)	–
Nominal Maximum Current (amperes)	10	25	–
Jacket Material	LLDPE	HDPE	LLDPE
Cable Assembly Type Numbers			
FC/APC	**242950-(*)1**	**242952-(*)1**	**242954-(*)1**
FC	**242950-(*)2**	**242952-(*)2**	**242954-(*)2**
ST®	**242950-(*)3**	**242952-(*)3**	**242954-(*)3**
SC	**242950-(*)4**	**242952-(*)4**	**242954-(*)4**

Optical Characteristics

Fiber Type	Singlemode
Maximum Attenuation at 1310 nm, dB/km	0.45
Maximum Attenuation at 1550 nm, dB/km	0.35
Cable Cutoff Wavelength (nm)	<1260
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00
Zero Dispersion Wavelength (nm)	1301.5–1321.5
Cladding Diameter (µm)	125.0 ± 1.0
Core-Clad Concentricity (µm)	≤0.8
Cladding Non-Circularity (%)	≤1.0
Coating Diameter (µm)	245 ± 10
FC/APC Maximum Insertion Loss (dB)	0.5
FC, ST®, SC Maximum Insertion Loss (dB)	0.4
FC/APC Minimum Return Loss (dB)	60
FC, ST, SC Minimum Return Loss (dB)	50

* Please specify number of fibers 1, 2, 4 or 6.
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Fiber Optic Cables

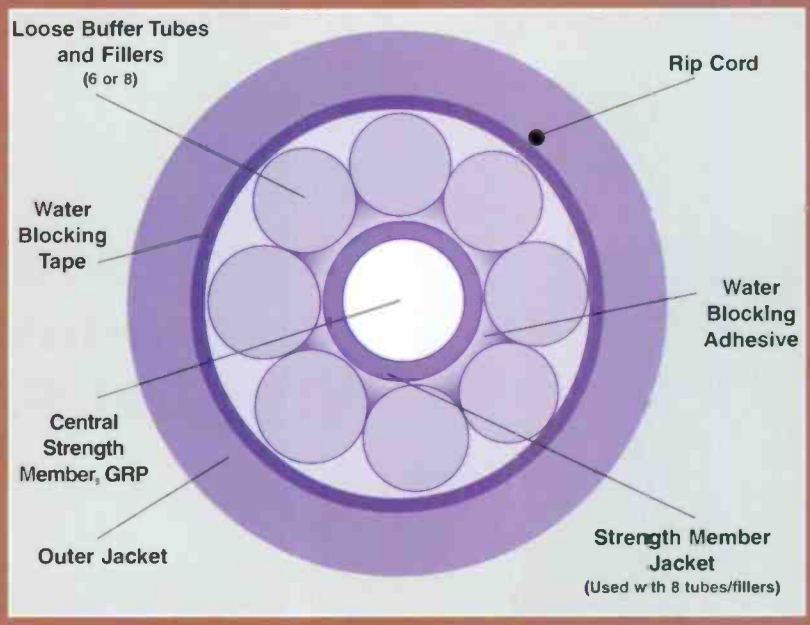
Duct Optical Fiber Cable

6-48 Fibers

Duct fiber optic cables from Andrew Corporation provide excellent mechanical protection to the enclosed optical fibers. Due to their rugged yet lightweight construction, these cables are ideally suited to tray and underground conduit applications as well as aerial applications, and can be lashed to messenger lines.

The duct cable's dielectric construction prevents the formation of electrical ground loops, while the loose buffer fiber core has a water blocking tape that prevents water from moving through the cable. A rip cord permits fast and efficient fiber access. The cable jacket is made from a low friction, UV stabilized polyethylene. Each gel-filled loose buffer tube contains six color-coded fibers.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



Mechanical Characteristics

Cable Type Numbers	242751-1-(*)	242751-2-(*)	242751-3-(*)
Number of Fibers	6, 12, 18, 24, 30, 36, 42 or 48	6, 12, 18, 24, 30, 36, 42 or 48	6, 12, 18, 24, 30, 36, 42 or 48
Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Fiber Buffer Type	Loose, Gel Filled	Loose, Gel Filled	Loose, Gel Filled
Fiber Buffer Diameter, in (mm)	0.094 (2.4)	0.094 (2.4)	0.094 (2.4)
Cable Diameter, in (mm) 6-36 Fibers	0.41 (10.4)	0.41 (10.4)	0.41 (10.4)
Cable Diameter, in (mm) 42-48 Fibers	0.46 (11.7)	0.46 (11.7)	0.46 (11.7)
Cable Weight, lb/1000 ft (kg/km) 6-36 Fibers	76 (113)	76 (113)	76 (113)
Cable Weight, lb/1000 ft (kg/km) 42-48 Fibers	89 (132)	89 (132)	89 (132)
Tensile Strength			
Installation, Short Term, lb (N)	600 (2700)	600 (2700)	600 (2700)
Operational, Long Term, lb (N)	135 (600)	135 (600)	135 (600)
Minimum Bend Radius, 6-36 Fibers			
Installation, Short Term, in (mm)	8.2 (210)	8.2 (210)	8.2 (210)
Operational, Long Term, in (mm)	6.1 (155)	6.1 (155)	6.1 (155)
Minimum Bend Radius, 42-48 Fibers			
Installation, Short Term, in (mm)	9.2 (235)	9.2 (235)	9.2 (235)
Operational, Long Term, in (mm)	6.9 (175)	6.9 (175)	6.9 (175)
Operating Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Jacket Material	LLDPE	LLDPE	LLDPE

Optical Characteristics

* Specify number of fibers, 6, 12, 18, 24, 30, 36, 42 or 48.

Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Maximum Attenuation at 850 nm, dB/km	–	–	3.75
Maximum Attenuation at 1300 nm, dB/km	–	–	1.50
Maximum Attenuation at 1310 nm, dB/km	0.45	–	–
Maximum Attenuation at 1550 nm, dB/km	0.35	0.30	–
Maximum Bandwidth at 850 nm (MHz•km)	–	–	160
Maximum Bandwidth at 1300 nm (MHz•km)	–	–	500
Cable Cutoff Wavelength (nm)	<1260	<1260	–
Core Diameter (µm)	–	–	62.5 ± 3.0
Core None-Circularity (%)	–	–	≤5.0
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65	–
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565	1332-1354
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 1.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8	≤3.0
Cladding Non-Circularity (%)	≤1.0	≤1.0	≤2.0
Numerical Aperture	–	–	0.275 ± 0.015
Coating Diameter (µm)	245 ± 10	245 ± 10	245 ± 10

Fiber Optic Cables

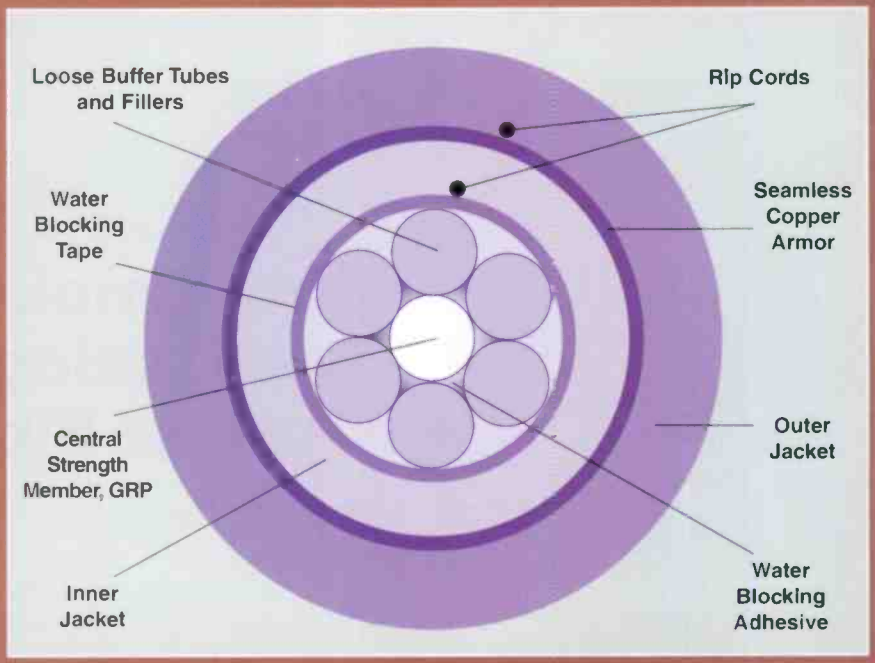
Hazardous Environment Optical Fiber Cable

Copper Armored 6-36 Fibers

Copper armored fiber optic cables from Andrew Corporation employ welded corrugated copper armor construction to provide excellent mechanical and hermetic protection to the optical fibers within. These cables are ideally suited to direct burial and underground conduit applications. The rugged yet lightweight construction is also suitable for aerial applications, can be lashed to messenger lines, and is appropriate for hazardous material environments, such as vertical shafts, refineries, wetlands, and flooded ducts.

The loose buffer fiber core has a water blocking tape that prevents water from moving through the cable. A rip cord permits fast and efficient fiber access. The welded corrugated copper armor also provides a hermetic (moisture and hydrogen) barrier to the optical fibers. The cable jacket is made from a low friction, UV stabilized polyethylene. Each gel-filled loose buffer tube contains six color-coded fibers.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



Mechanical Characteristics

Cable Type Numbers	241568-1-(*)	241568-2-(*)	241568-3-(*)
Number of Fibers	6, 12, 18, 24, 30 or 36	6, 12, 18, 24, 30 or 36	6, 12, 18, 24, 30 or 36
Fiber Type	Singlemode	Dispersion Shifted Singlemoce	Multimode
Fiber Buffer Type	Loose, Gel Filled	Loose, Gel Filled	Loose, Gel Filled
Fiber Buffer Diameter, in (mm)	0.094 (2.4)	0.094 (2.4)	0.094 (2.4)
Cable Diameter, In (mm)	0.63 (16.0)	0.63 (16.0)	0.63 (16.0)
Cable Weight, lb/1000 ft (kg/km)	190 (283)	190 (283)	190 (283)
Tensile Strength			
Installation, Short Term, lb (N)	600 (2700)	600 (2700)	600 (2700)
Operational, Long Term, lb (N)	135 (600)	135 (600)	135 (600)
Minimum Bend Radius, 6-36 Fibers			
Installation, Short Term, in (mm)	12.6 (320)	12.6 (320)	12.6 (320)
Operational, Long Term, in (mm)	9.5 (240)	9.5 (240)	9.5 (240)
Operating Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Jacket Material	LLDPE	LLDPE	LLDPE

* Specify number of fibers, 6, 12, 18, 24, 30 or 36.

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Maximum Attenuation at 850 nm, dB/km	–	–	3.75
Maximum Attenuation at 1300 nm, dB/km	–	–	1.50
Maximum Attenuation at 1310 nm, dB/km	0.45	–	–
Maximum Attenuation at 1550 nm, dB/km	0.35	0.30	–
Minimum Bandwidth at 850 nm (MHz•km)	–	–	160
Minimum Bandwidth at 1300 nm (MHz•km)	–	–	500
Cable Cutoff Wavelength (nm)	<1260	<1260	–
Core Diameter (µm)	–	–	62.5 ± 3.0
Core Non-Circularity (%)	–	–	≤5.0
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65	–
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565	1332–1354
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 2.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8	≤3.0
Cladding Non-Circularity (%)	≤1.0	≤1.0	≤2.0
Numerical Aperture	–	–	0.275 ± 0.015
Coating Diameter (µm)	245 ± 10	245 ± 10	245 ± 10

Fiber Optic Cables

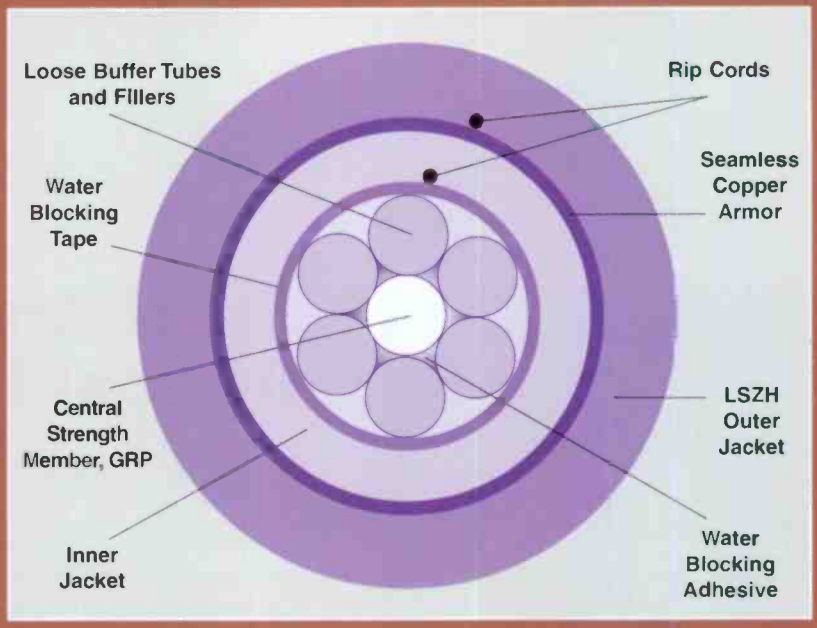
Low Smoke, Zero Halogen Optical Fiber Cable

6-36 Fibers

Hazardous environment fiber optic cables from Andrew Corporation employ welded corrugated copper armor construction to provide excellent mechanical and hermetic protection to the optical fibers within. These cables are ideally suited to tunnel, indoor, and tray applications where low smoke/zero halogen performance is required. Their rugged yet lightweight construction makes them suitable for aerial applications, and they can be lashed to messenger lines or another cable.

The loose buffer fiber core has a water blocking tape that prevents water from moving through the cable. Dual rip cords permit fast and efficient fiber access. The welded corrugated copper armor also provides a hermetic (moisture and hydrogen) barrier to the optical fibers. The cable jacket is made from a low smoke/zero halogen material. This hazardous environment cable has passed IEC 332 Parts 1 and 3, BS 6425 Part 1, and IEC 1034.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



Mechanical Characteristics

Cable Type Numbers	242982-1-(*)	242982-2-(*)	242982-3-(*)
Number of Fibers	6, 12, 18, 24, 30 or 36	6, 12, 18, 24, 30 or 36	6, 12, 18, 24, 30 or 36
Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Fiber Buffer Type	Loose, Gel Filled	Loose, Gel Filled	Loose, Gel Filled
Fiber Buffer Diameter, in (mm)	0.094 (2.4)	0.094 (2.4)	0.094 (2.4)
Cable Diameter, in (mm)	0.63 (16.0)	0.63 (16.0)	0.63 (16.0)
Cable Weight, lb/1000 ft (kg/km)	190 (283)	190 (283)	190 (283)
Tensile Strength			
Installation, Short Term, lb (N)	600 (2700)	600 (2700)	600 (2700)
Operational, Long Term, lb (N)	135 (600)	135 (600)	135 (600)
Minimum Bend Radius, 6-36 Fibers			
Installation, Short Term, in (mm)	12.6 (320)	12.6 (320)	12.6 (320)
Operational, Long Term, in (mm)	9.5 (240)	9.5 (240)	9.5 (240)
Operating Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Flame Resistance-Jacket (Oxygen Index, ASTM D2863)	40	40	40
Flame Resistance-Jacket (Temperature Index, BS2782)	300° C	300° C	300° C
Flame Propagation-Cable, Single Cable, IEC332 Part 1	Pass	Pass	Pass
Flame Propagation-Cable, Bunched Cable, IEC332 Part 3	Pass	Pass	Pass
Flame Propagation-Cable, IEE 383	Pass	Pass	Pass
Corrosive/Acid Gas Emission-Jacket, BS6425 Part 1 (%)	<0.5	<0.5	<0.5
Smoke Emission-Jacket, IEC1034	Pass	Pass	Pass
Jacket Material	LSZH Thermoplastic	LSZH Thermoplastic	LSZH Thermoplastic

* Specify number of fibers, 6, 12, 18, 24, 30 or 36.

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Maximum Attenuation at 850 nm, dB/km	–	–	3.75
Maximum Attenuation at 1300 nm, dB/km	–	–	1.50
Maximum Attenuation at 1310 nm, dB/km	0.45	–	–
Maximum Attenuation at 1550 nm, dB/km	0.35	0.30	–
Minimum Bandwidth at 850 nm (MHz•km)	–	–	160
Minimum Bandwidth at 1300 nm (MHz•km)	–	–	500
Cable Cutoff Wavelength (nm)	<1260	<1260	–
Core Diameter (µm)	–	–	62.5 ± 3.0
Core Non-Circularity (%)	–	–	≤5.0
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65	–
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565	1332–1354
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 2.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8	≤3.0
Cladding Non-Circularity (%)	≤1.0	≤1.0	≤2.0
Numerical Aperture	–	–	0.275 ± 0.015
Coating Diameter (µm)	245 ± 10	245 ± 10	245 ± 10

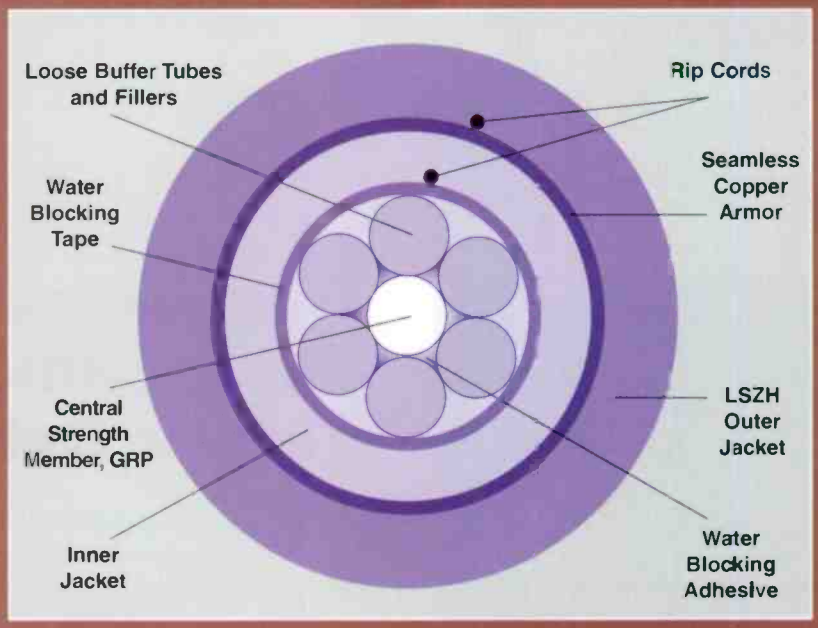
Steel Armored Optical Fiber Cable

6-48 Fibers

Steel armored fiber optic cables from Andrew Corporation provide excellent mechanical and rodent protection to the enclosed optical fibers. These cables are ideally suited to direct burial, tunnel, and underground conduit applications. This rugged construction is also suitable to aerial applications and can be lashed to messenger lines.

The loose buffer fiber core has a water blocking tape that prevents water from moving through the cable. Dual rip cords permit the removal of the steel armor for fast and efficient fiber access. The cable jacket is made from a low friction, UV stabilized polyethylene. Each gel-filled loose buffer tube contains six color-coded fibers.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.



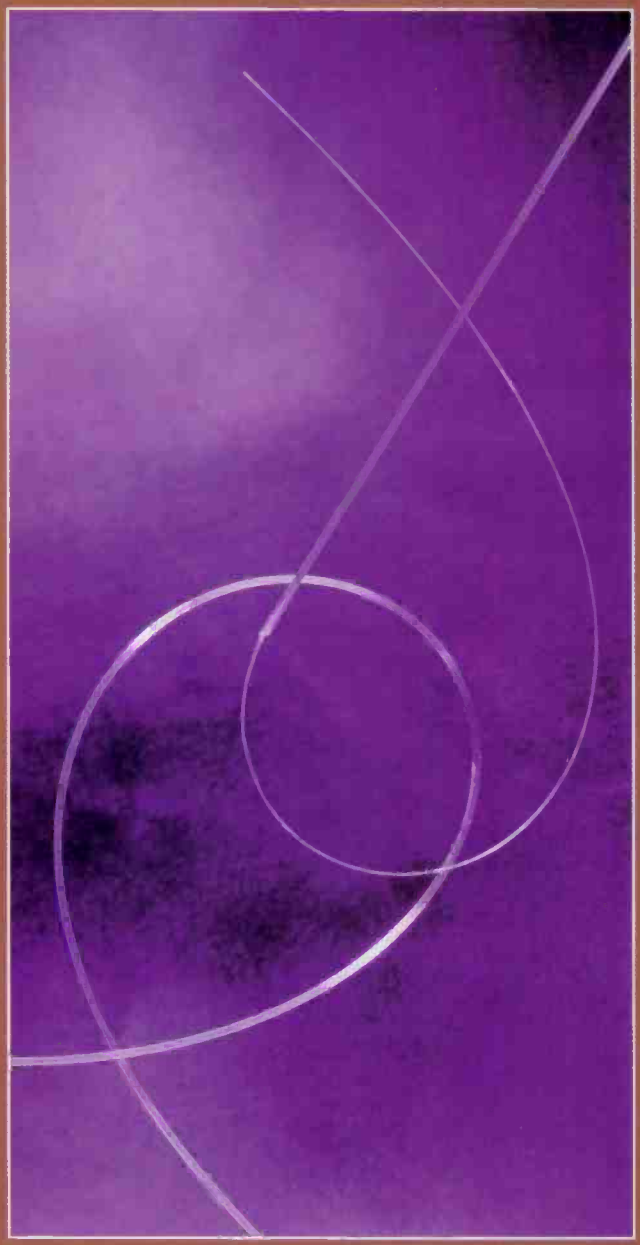
Mechanical Characteristics

Cable Type Numbers	242981-1-(*)	242981-2-(*)	242981-3-(*)
Number of Fibers	6, 12, 18, 24, 30, 36, 42 or 48	6, 12, 18, 24, 30, 36, 42 or 48	6, 12, 18, 24, 30, 36, 42 or 48
Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Fiber Buffer Type	Loose, Gel Filled	Loose, Gel Filled	Loose, Gel Filled
Fiber Buffer Diameter, in (mm)	0.094 (2.4)	0.094 (2.4)	0.094 (2.4)
Cable Diameter, in (mm) 6-36 Fibers	0.52 (13.2)	0.52 (13.2)	0.52 (13.2)
Cable Diameter, in (mm) 42-48 Fibers	0.58 (14.7)	0.58 (14.7)	0.58 (14.7)
Cable Weight, lb/1000 ft (kg/km) 6-36 Fibers	150 (223)	150 (223)	150 (223)
Cable Weight, lb/1000 ft (kg/km) 42-48 Fibers	158 (235)	158 (235)	158 (235)
Tensile Strength			
Installation, Short Term, lb (N)	600 (2700)	600 (2700)	600 (2700)
Operational, Long Term, lb (N)	135 (600)	135 (600)	135 (600)
Minimum Bend Radius, 6-36 Fibers			
Installation, Short Term, in (mm)	10.4 (265)	10.4 (265)	10.4 (265)
Operational, Long Term, in (mm)	7.8 (200)	7.8 (200)	7.8 (200)
Minimum Bend Radius, 42-48 Fibers			
Installation, Short Term, in (mm)	11.6 (295)	11.6 (295)	11.6 (295)
Operational, Long Term, in (mm)	8.7 (220)	8.7 (220)	8.7 (220)
Operating Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Jacket Material	LLDPE	LLDPE	LLDPE

* Specify number of fibers, 6, 12, 18, 24, 30, 36, 42 or 48.

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Maximum Attenuation at 850 nm, dB/km	–	–	3.75
Maximum Attenuation at 1300 nm, dB/km	–	–	1.50
Maximum Attenuation at 1310 nm, dB/km	0.45	–	–
Maximum Attenuation at 1550 nm, dB/km	0.35	0.30	–
Minimum Bandwidth at 850 nm (MHz•km)	–	–	160
Minimum Bandwidth at 1300 nm (MHz•km)	–	–	500
Cable Cutoff Wavelength (nm)	<1260	<1260	–
Core Diameter (µm)	–	–	62.5 ± 3.0
Core Non-Circularity (%)	–	–	≤5.0
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65	–
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565	1332–1354
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 2.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8	≤3.0
Cladding Non-Circularity (%)	≤1.0	≤1.0	≤2.0
Numerical Aperture	–	–	0.275 ± 0.015
Coating Diameter (µm)	245 ± 10	245 ± 10	245 ± 10



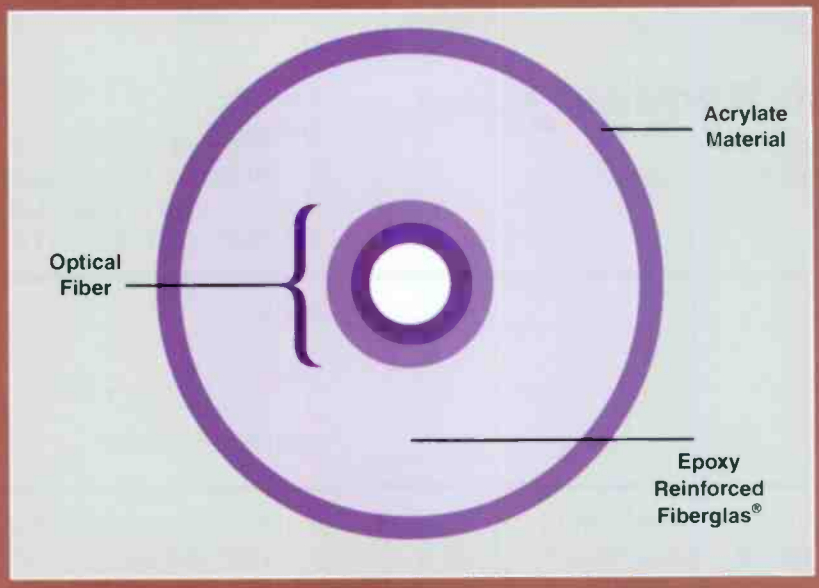
Ruggedized Microcable™ Tether Cable

Andrew ruggedized Microcable™ tether cable is a high quality cable available at low cost, making it ideal for expendable applications. A lightweight and durable optical data link, it is intended for use in both wet and dry locations within moderate temperature ranges. Continuous lengths range from a few meters up to 20,000 meters.

The Microcable tether cable is ideal for use as a patch cord with ST®, SC, FC, and other connectors, and can be used as a fiber optic element in various all-fiber or composite cable configurations. Andrew Microcable is a unique product consisting of a singlemode or dispersion shifted singlemode optical fiber, encased in a reinforcing Fiberglas® epoxy matrix for high tensile strength and crush resistance in a lightweight, compact package.

All Andrew fiber optic cables meet strict performance standards, ensuring quality and reliability, and follow in the tradition of HELIAX® and RADIAX® cables, offering the best value for your investment.

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479



Mechanical Characteristics

Cable Type Numbers	241106-3*	241106-4	241106-5	241106-6
Number of Fibers	1	1	1	1
Fiber Type	Dispersion Shifted Singlemode	Multimode	Singlemode	Dispersion Shifted Singlemode
Fiber Buffer Type	Tight, Fiberglas® Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy	Tight, Fiberglas Epoxy
Fiber Buffer Diameter, in (mm)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)
Cable Diameter, in (mm)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)	0.032 (0.8)
Cable Weight, lb/1000 ft (kg/km)	0.61 (0.9)	0.61 (0.9)	0.61 (0.9)	0.61 (0.9)
Tensile Strength				
Ultimate, lb (N)	90 (400)	60 (266)	90 (400)	80 (355)
Working, lb (N)	30 (133)	20 (89)	30 (133)	30 (133)
Minimum Bend Radius				
Working, in (mm)	0.7 (18)	1.5 (38)	0.7 (18)	0.7 (18)
Operating Temperature Range, °F (°C)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)	14 to 158 (-10 to 70)
Storage Temperature Range, °F (°C)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)	-40 to 158 (-40 to 70)
Crush Resistance, ft•lb/in (N/cm)	12.5 (22)	10 (17)	12.5 (22)	12.5 (22)
Hydrostatic Pressure Resistance, lb/in² (kPa)	9000 (62,000)	8000 (55,000)	9000 (62,000)	9000 (62,000)
Specific Gravity	1.74	1.74	1.74	1.74

* Product complies with NOSC Specification 946-0004-91, 3 Feb 1992.

Optical Characteristics

Fiber Type	Singlemode	Dispersion Shifted Singlemode	Multimode
Maximum Attenuation at 850 nm, dB/km	–	–	5.0
Maximum Attenuation at 1300 nm, dB/km	–	–	1.75
Maximum Attenuation at 1310 nm, dB/km	0.5	0.5 (0.4*)	–
Maximum Attenuation at 1550 nm, dB/km	0.6	0.35 (0.25*)	–
Minimum Bandwidth at 850 nm (MHz•km)	–	–	160
Minimum Bandwidth at 1300 nm (MHz•km)	–	–	500
Cable Cutoff Wavelength (nm)	<1260	<1260	–
Core Diameter (µm)	–	–	62.5 ± 3.0
Core Non-Circularity (%)	–	–	≤5.0
Mode-Field Diameter at 1310 nm (µm)	9.30 ± 0.50	–	–
Mode-Field Diameter at 1550 nm (µm)	10.50 ± 1.00	8.10 ± 0.65	–
Zero Dispersion Wavelength (nm)	1301.5–1321.5	1535–1565	1332–1354
Cladding Diameter (µm)	125.0 ± 1.0	125.0 ± 1.0	125.0 ± 2.0
Core-Clad Concentricity (µm)	≤0.8	≤0.8	≤3.0
Cladding Non-Circularity (%)	≤1.0	≤1.0	≤2.0
Numerical Aperture	–	–	0.275 ± 0.015
Coating Diameter (µm)	245 ± 10	245 ± 10	245 ± 10

* Specification applies to product 241106-3 only.

Information Request Form

Duplicate, complete and return this form

- Phone: (708) 349-5191
- Write to: Andrew Corporation, 10500 W. 153rd St. Orland Park, IL 60462 U.S.A.
- FAX: (708) 349-5179

Name: _____ Phone: _____

Company Name: _____ FAX: _____

Reference Number: _____ Andrew Salesman: Date:

1. Type of Cable or Application (check one)
   - ❒ Direct Bury, Outdoor
   - ❒ Duct, Outdoor
   - ❒ Tray, Indoor
   - ❒ Aerial, Outdoor
   - ❒ Tunnel/Outdoor Structure
   - ❒ Indoor (Premise)
   - ❒ Industrial (exposure to industrial gasses and fluids)
   - ❒ Other _____

2. Specific Requirements (check all that apply)
   - ❒ Flame Retardent
   - ❒ Low Smoke/Zero Halogen
   - ❒ Water Blocking
   - ❒ UL Riser or Plenum Rating (circle one)
   - ❒ UV Resistant (exposed to the sun)
   - ❒ Rodent Protection
   - ❒ Hermetic Armor (water/gas)
   - ❒ Gas Blocked
   - ❒ Armoring
     - ❒ Welded Corrugated Copper Tube
     - ❒ Lapped Corrugated Steel Tube
   - ❒ Assemblies with Connectors and Tested
   - ❒ Certification
     - ❒ NEC ❒ UL
     - ❒ CSA ❒ Other _____
     - ❒ IEC
   - ❒ Other _____

3. Operating Temperature Range:
   − _____ to + _____ ❒ °F
   or ❒ °C

4. Fiber Types (check requirements) and Quantities:
   - ❒ Singlemode _____
   - ❒ Singlemode Dispersion Shifted _____
   - ❒ Multimode
     - ❒ 50/125 _____
     - ❒ 62.5/125 _____
     - ❒ 100/140 _____
   - ❒ Other _____

5. Fiber Attenuation at Room Temperature 72°F (22°C):
   @ 850 nm _____ dB/kilometer
   @ 1300 nm _____ dB/kilometer
   @ 1550 nm _____ dB/kilometer

6. Electrical Conductors, AWG wire gauges (check one) and Quantities:
   - ❒ 18 _____ ❒ 10 _____
   - ❒ 14 _____ ❒ Other _____

7. Optical Connectors and/or Electrical Contacts (specify type, configuration and pigtail length):
   _____
   _____

8. Andrew Type Number or description of the product
   _____

9. Deliverable Lengths (feet or meters) and Quantities of Each: _____
   _____

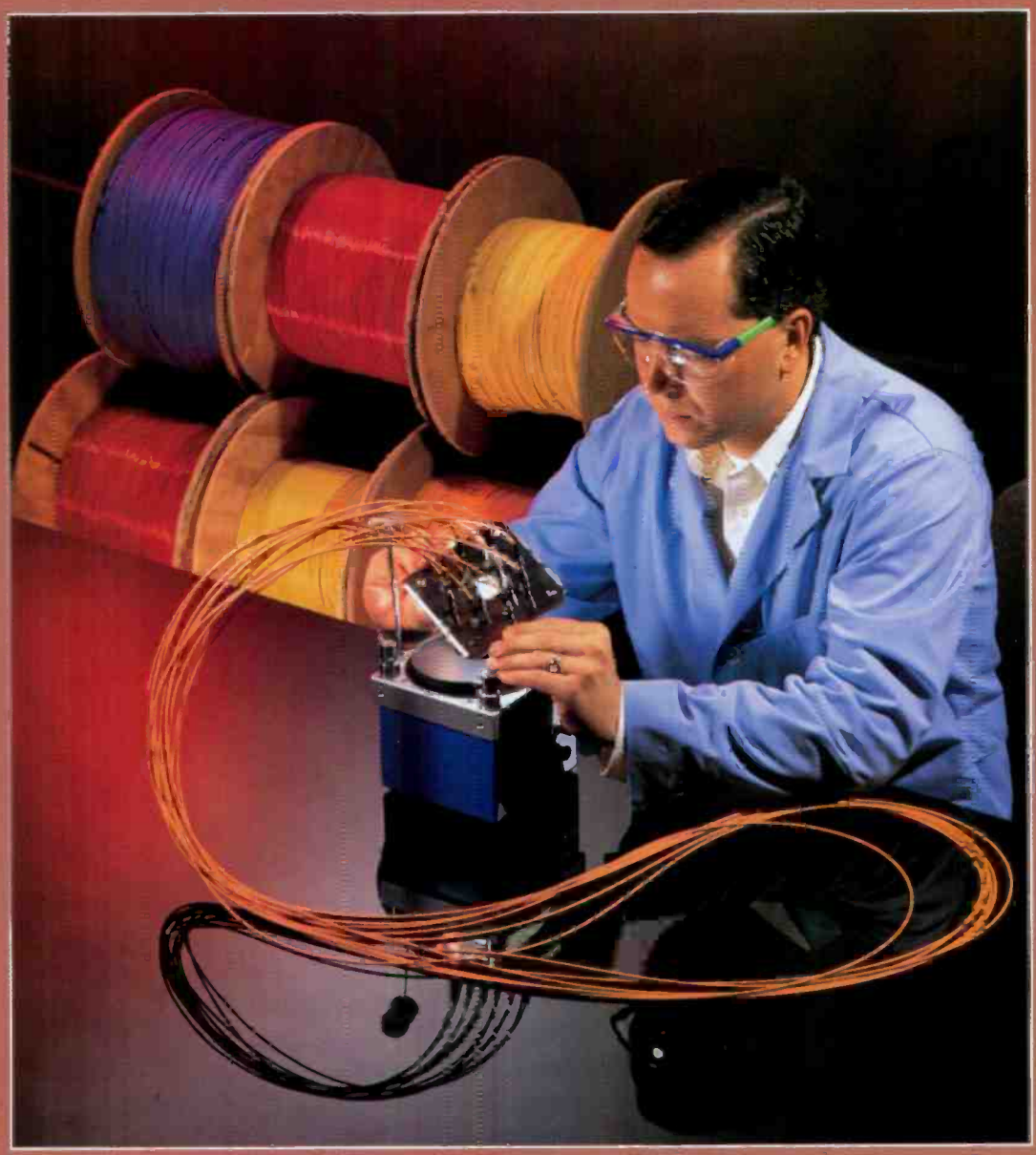
10. Special Marking, Packaging and Shipping Instructions: _____
    _____
    _____
    _____

11. Requested Product Delivery Date: _____

12. Provide Quotation By (Date): _____

13. Other Requirements: _____
    _____
    _____
    _____
    _____
    _____

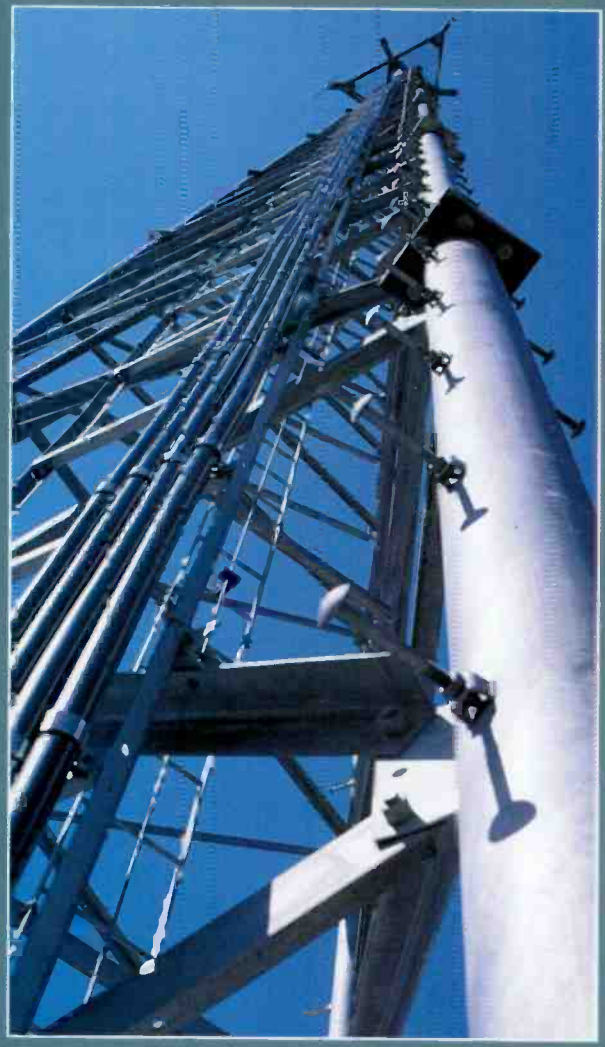
Fiber Optic Cables



Towers

INDEX

Towers



Why Select an Andrew Tower...

- *For the most comprehensive selection of tower products and accessories available on the market today, designed to meet your requirements.*
- *For the fastest, most direct path to system installation using Andrew "Single Source" capabilities.*
- *For a thorough pre-purchase quotation.*
- *For an accurate delivery schedule that balances manufacturing capacity with a sincere desire to get you on line as quickly as possible.*
- *To minimize the costly pre-installation delays associated with obtaining community and zoning approval.*
- *For a responsible, high quality, low cost buying decision.*
- *For additional "After The Sale" customer services such as tower analysis (for additional, unplanned antenna loading) and maintenance of drawing archives.*

There are no substitutes for the high degree of product quality, experience and value obtained with the purchase of an Andrew tower.

Here are some of the reasons why...

Expeditious...

Speed of installation lowers costs and puts you on line sooner.

Andrew uses Tower Application Design (TAD) and Computer Aided Design (CAD) computer programs to eliminate the delays that normally go along with "field engineering". You'll know exactly what to expect ahead of time.

Because Andrew is the only company that manufactures all system components from antenna and cable to towers and shelters, we have a unique ability to coordinate the manufacture and shipping of the various system components to facilitate an efficient, timely system installation.

When it comes to site civil construction requirements, Andrew site supervisors are available to perform all aspects of site construction. Services include initial layout, roadwork, concrete and foundation installation, fencing, etc.

Forecasted stock of major tower components is maintained at the Andrew factory in Denton, Texas.

Experience and Technical Support...

The worst delays can occur even before the installation begins, if you don't have Andrew on your team.

Working with the community where you want to install an antenna system can be a long and tedious process, unless you have Andrew on your side. Our engineering staff will provide the information you need to streamline the zoning approval process including:

- *Foundation design.*
- *Tower permit drawing packages.*
- *Copies of the tower design analysis.*
- *Professional Registered Engineer stamped prints for tower and foundation.*
- *A professional engineering staff to answer local zoning board questions.*
- *Licensed Professional Registered Engineers available in all 50 states.*

Andrew brings a history of more than 30 years of successful and safe installations to your project.

Cost...

Choosing Andrew lowers the costs associated with your tower over the life of the installation.

- *Andrew towers provide high value and competitive pricing for today's market demands.*
- *Reduced installation costs resulting from time efficient installation.*
- *Lower maintenance costs are built into Andrew towers.*
- *All tower members, including guywire and hardware, are hot-dipped galvanized to provide maximum protection against corrosion.*
- *Tower models constructed of formed plate members promote accessibility to all surface areas facilitating inspection and preventative maintenance against corrosion damage.*
- *Tower models incorporating tubular members are constructed with "flow through" capability from top of tower to base, preventing build up of condensation and minimizing the possibility of corrosion inside of the member. All surfaces of tubular members are thoroughly galvanized, both inside and outside, to provide maximum protection against corrosion.*
- *Tower models incorporating solid round members provide reduced surface area minimizing the potential for damaging corrosion.*
- *Andrew towers can be designed and provided to facilitate future expansion. Certain models of the Andrew tower product line provide significant advantages and reduced costs associated with the strengthening and rework required to safely support additional loads.*

Confidence...

Choosing Andrew reduces the risks involved in selecting a Tower Systems company.

Andrew will verify the tower type and model best suited for your application and help determine the options and accessories that will most efficiently keep your system operational and trouble free. The Tower Design Data Sheet in the Tower Selection section allows you to specify the tower and equipment required for your application. Upon request, we will conduct a free budget analysis of the tower you've indicated.

Following tower selection, our Program Management service can assure the efficient, cost effective coordination of all installation steps, freeing you to attend to other aspects of your business. We are fast, responsive to changing demands, and economical.

Every tower is thoroughly inspected to insure that it meets your requirements and our standards of quality, durability and manufacturing excellence.

After a tower is installed and signed over to you, the customer, Andrew doesn't simply walk away. We continue to support our products through the Site Inspection program. An Andrew site inspection is inexpensive, providing an extremely cost-effective way to protect your revenue flow by reducing the possibility of down time and expensive repairs. Andrew provides tower analysis and drawing archive services that may not be available from other tower suppliers.

Over thirty years of experience and a strong future means we will be there whenever you need us. The Andrew reputation for quality and value stands behind every Andrew tower.

Selecting the Right Tower...

Andrew will provide the right tower best suited to your needs based on information and parameters that you provide.

There are several factors to consider when determining what type of Andrew tower is best for your application:

Land Requirements...

Guyed towers require more land than self-supporting towers. For example, a 250 ft (76 m) guyed tower may require more than four acres, while a 250 ft (76 m) self-supporting tower requires less than one acre. For assistance in determining land requirements for guyed towers, refer to "Guyed Tower Land Requirements" on page 623. For more plot size information on Andrew self-supporting towers, contact Andrew and request the following bulletins:

- *3ST - Bulletin 8749*
- *LST - Bulletin 8773*

Cost Comparison...

Guyed towers typically cost less than self-supporting towers due to reduced steel usage. Most self-supporting foundations are more costly than guyed tower foundations. Erection time for guyed towers is generally less than for self-supporting towers.

Maintenance...

In general, self-supporting towers require slightly less maintenance. It is recommended that guyed towers undergo an annual inspection including a determination of guy wire tensions. Proper tensioning of guy wires ensures minimum deflection of antennas under extreme wind conditions.

Tower Specifications...

Tower design must meet:

- ***Customer Specifications***
  - *Configuration*
  - *Height*
  - *Design Code or Standard (EIA/TIA-222-F)*
- ***Loading Requirements***
  - *Wind Speed and Ice Loading*
  - *Antennas*
  - *Ladders*
  - *Platforms*
- ***Operational Requirements***
  - *Limitations on Movement (Twist and Sway) to insure satisfactory performance of Microwave Antennas*

Required Tower Design Information...

In order to tailor an Andrew tower product to your specific needs, and to provide a tower structure that is the most efficient and economical solution to your particular requirements, certain information must be provided by you to our tower engineers. A detailed listing of this required information is included below.

The Tower Design Data Sheet on page 622 includes the basic information needed for a quotation. By completing this data sheet and including it with your Tower Inquiry or Request For Quotation, you insure a prompt, complete, and economical response in the form of an accurate tower quotation.

Required Information:

- *Tower type (guyed or self-supporting).*
- *Tower height.*
- *Any future increase in tower height.*
- *Basic wind speed for design.*
- *Exposure coefficient, Kz, and gust response factor, Gh, if other than recommended by EIA/TIA-222-F.*
- *Basic wind speed for rigidity.*
- *Design ice load.*
- *Antenna types (manufacturers and models).*
- *Antenna sizes.*
- *Antenna angular deflection limits (twist and sway).*
- *Initial and future antenna elevations, azimuths and operating frequencies.*
- *Horizontal separation and sectorization angle (normally 120°) of cellular antennas.*
- *Ice shields for initial and future antennas.*
- *Initial and future waveguide and coaxial cable information.*
- *Tower lighting and marking requirements.*
- *Grounding (earthing) requirements.*
- *Type of climbing facility and safety climb device required.*
- *Tower base topography and details.*
- *Soil reports for foundation designs.*
- *Implementation schedule.*
- *Special documentation requirements.*
- *Frost depth.*
- *Special loading conditions other than from antennas (seismic, attachments to tower, etc.).*

All of these items factor into the design of your specific tower requirements. Please remember, this information is necessary to properly match the tower product to your specific application

Andrew has compiled a tower procurement specification for your use. It is available in hard copy and on floppy disk (IBM compatible) in WordPerfect (IBM compatible) format or Microsoft Word (Macintosh or IBM compatible) for you to edit and create your own specification. The tower specification requirements are structured to result in the purchase of quality tower products. This specification can be customized by you to meet your requirements.

Tower Design Data Sheet

All information on this form is necessary to prepare an accurate tower quotation.

Andrew Corporation
10500 W 153rd Street
Orland Park, IL 60462
Tel: 1-800-255-1479
FAX: 1-800-349-5444

Design Load (EIA/TIA-222 Most Current Spec.)

Customer _____

Telephone No. _____

Contact Name _____

Site Name _____

County _____ State _____

Date Requested By _____

Tower Height _____

Tower Type

SST_____ Guyed_____ Monopole_____

Standard Design Code

EIA RS-222-C

_____ lb/ft² (PSF) + _____ Ice

EIA-222-D/E/F*

_____ mph + _____ Ice

** EIA/TIA-222-F Unless Specified*

Special Design Codes _____
(BOSCA, SSBC, UBC, SFBC, etc.)

Rigidity Specifications

Operating Frequency _____

____Standard 20 lb/ft² + 0 Ice
____Other____lb/ft² + ____Ice
____Standard 50 mph + 0 Ice (EIA RS-222-D/E)
____Other____mph +____Ice

Antenna Loading

Qty	Size	Type	Radome	Level	Azimuth	Wg/Coax	Initial/Future

Tower Mounts	Qty
Microwave Antenna Pipe Mount	____
6-ft Side Arms	____
3-ft VHF Side Arms	____

Platforms/Star Mounts	
Cellular Platform	____
Cellular Platform with retractable arms	____
Star Mount 20 ft separation	____
Universal Mount	____
Sectorized 20 ft separation Star Mount	____

Climbing Devices	Qty
Step Bolts	____
Climbing Ladder	____
Cable Safety Climb	____
Rigid Safety Climb	____

Waveguide Supports/Ladders

Waveguide Ladder	Qty
13 Run	____
10 Run	____
8 Run	____
6 Run	____

Waveguide Bridges	
4-1/2" x 10 ft (4 Runs)	____
13-1/2" x 10 ft (12 Runs)	____
20" x 10 ft (24 Runs)	____
Cable Support Kit	____

FAA Lighting/Paint	Qty
Strobe Lighting System	____
FAA Lighting	____
Dual Lighting System	____
Latex Field-Applied Paint	____

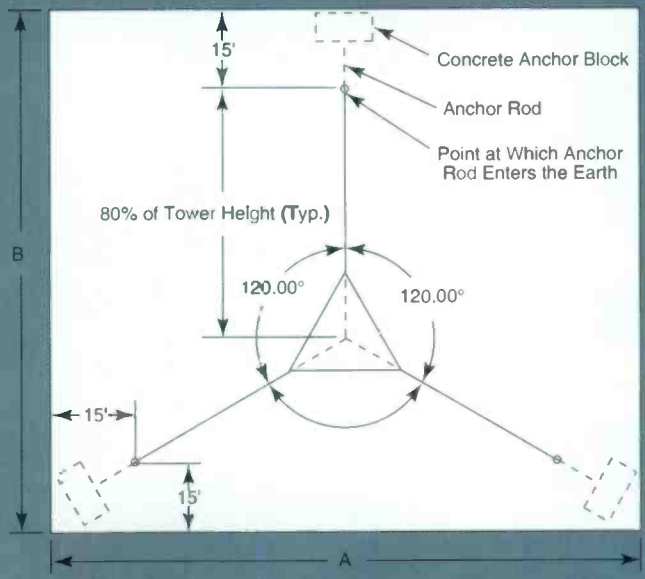
Other Accessories	
EIA Grounding	____
Ice Shields	____

Guyed Tower Land Requirements

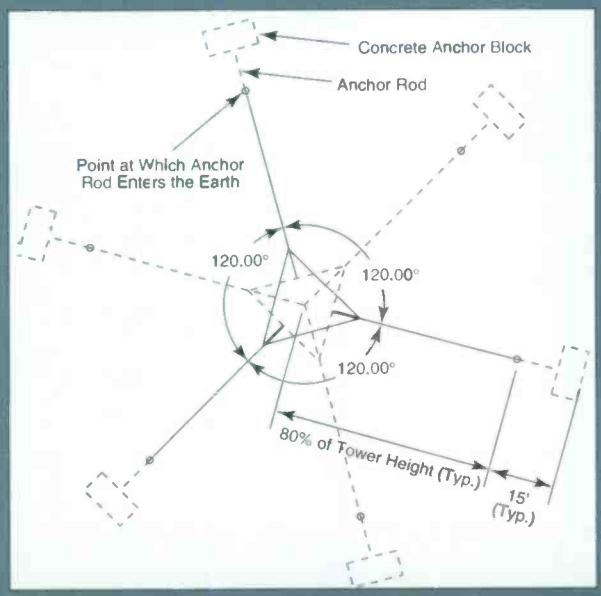
at 80% Guying*

Tower Height	Layout 1 Acres	A	B	Layout 2 Acres	C
120'	0.80	200'	175'	1.16	225'
130'	0.94	215'	190'	1.32	240'
140'	1.04	225'	200'	1.49	255'
150'	1.16	240'	210'	1.67	270'
160'	1.32	255'	225'	1.93	290'
170'	1.46	270'	235'	2.14	305'
180'	1.64	285'	250'	2.35	320'
190'	1.76	295'	260'	2.58	335'
200'	1.92	310'	270'	2.81	350'
210'	2.13	325'	285'	3.14	370'
220'	2.31	340'	295'	3.40	385'
230'	2.50	350'	310'	3.67	400'
240'	2.68	365'	320'	3.95	415'
250'	2.88	380'	330'	4.24	430'
260'	3.13	395'	345'	4.65	450'
270'	3.34	410'	355'	4.96	465'
280'	3.57	420'	370'	5.29	480'
290'	3.80	435'	380'	5.63	495'
300'	4.03	450'	390'	5.97	510'
310'	4.33	465'	405'	6.45	530'
320'	4.53	475'	415'	6.82	545'
330'	4.84	490'	430'	7.20	560'
340'	5.10	505'	440'	7.59	575'
350'	5.37	520'	450'	8.00	590'
360'	5.71	535'	465'	8.54	610'
370'	5.94	545'	475'	8.97	625'
380'	6.30	560'	490'	9.40	640'
390'	6.60	575'	500'	9.85	655'
400'	6.91	590'	510'	10.31	670'
410'	7.23	600'	525'	10.93	690'
420'	7.55	615'	535'	11.41	705'
430'	7.96	630'	550'	11.90	720'
440'	8.29	645'	560'	12.40	735'
450'	8.64	660'	570'	12.91	750'
460'	9.00	670'	585'	13.61	770'
470'	9.36	685'	595'	14.15	785'
480'	9.80	700'	610'	14.69	800'
490'	10.18	715'	620'	15.25	815'
500'	10.49	725'	630'	15.81	830'

* The distance between the tower and outer guy anchor equals 80% of the tower height. Other ratios to 60% can usually be accommodated.



Layout 1
Minimum Area of land required. This area will not always permit orienting tower in the best position for antenna path direction.



Layout 2
The minimum area of land required to permit orienting the tower in any position for optimizing antenna path direction.

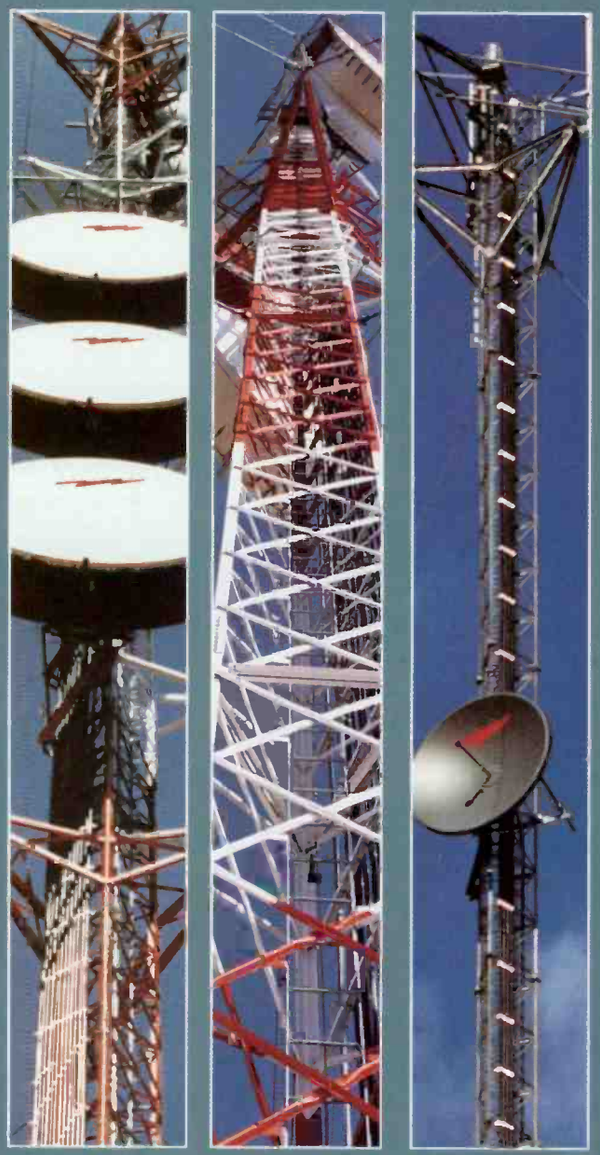
General Notes:

1. Space allowance has been made for concrete anchors as shown on layouts.
2. Information in table is based on outer anchors being located 80% of tower height from base and oriented 120° apart.
3. All information is based on level ground site conditions.
4. Height of tower = H (ft)

   A (ft) = [(H x 0.80) COS 30] x 2 + 30

   B (ft) = [(H x 0.80) x (1 + SIN 30)] + 30

   C (ft) = [(H x 0.80) + 15] x 2



Guyed Towers

Andrew guyed towers are the most economical support systems available. Guyed towers will usually provide lower steel, foundation, and erection costs. They also have a larger range of heights

The guyed tower is composed of a central small-faced towermast which is tethered and supported by guy wires. These guy cables are the main means of support for a guyed tower. The cables extend from the tower at designated pulloffs or torque stabilizers and are anchored into the ground at various distances away from the tower. The guy wires serve to stabilize the tower from twist and sway. To accomplish this, the guy wires are maintained at calculated tensions in relation to the length and diameter of the guy wire.

Guyed towers can accommodate a variety of applications by simply increasing the face width and member size. A 36-inch (915 mm) face width tower can easily accommodate most cellular applications with cellular platforms, antennas, and transmission lines. A 46-inch (1170 mm) face width can carry a large range of microwave communications from high-performance antennas to horn antennas with access platforms. Towers of this sort can carry a combination of cellular and microwave communications.

Andrew can computer-design a guyed tower to meet specific requirements utilizing our four standard tower designs, having face widths of 36, 42 and 46 inches (915, 1067 and 1170 mm).

Standard Features

Andrew offers guyed tower designs utilizing bolted and all welded design to accommodate the preferences of you the end user.

Optimum Design. The Andrew computer analysis program ensures maximum tower stiffness, minimum twist and sway and minimum bending moment. The computer program contains a variety of leg, diagonal and guy cable sizes as well as bracing patterns and spans between supports. Andrew guyed towers are thus made more efficiently for a wide range of heights and corresponding antenna, wind and ice loading combinations. All Andrew towers are designed in accordance with the latest EIA Standard RS-222 and local codes where applicable.

High Strength Legs. Legs used on all guyed towers are made of 50,000 lb/in^2 (345 MPa) yield strength steel for increased strength and lower weight design.

Stress-Free Foundation. An articulated base eliminates stress from uneven foundation settlement or wind-induced tower translation ensuring perfect, stress-free tower alignment. Anchor bolts are not necessary. A fixed base is available for special applications.

Reduced Guy Vibration. Flexible anchor shafts have a dampening effect on wind-induced guy vibrations. The shafts are galvanized and coated below grade with bitumastic paint to resist corrosion.

Integrated Transmission Line Support. Prepunched transmission line support channels are a built-in feature of our guyed tower bracing systems. No clamps or angle adapters are required for cable or waveguide attachment.

Support channels are mounted at 4 foot (1.2 m) intervals inside, outside or on both sides of one or more tower faces. The supports are provided with 7/16 inch holes for mounting standard HELIAX® cable and elliptical waveguide hangers and with 3/4 inch holes to accommodate Andrew snap-in hangers.

Heavy-Duty Cable and Hardware. All guy cable on Andrew towers is either Extra-High Strength or Bridge Strand. Forged steel turnbuckles provide for future tensioning. Preformed dead-end type grips are standard. Fist grips are available on request.

Construction. The all-bolted construction of the M36 and M46 tower models minimizes freight costs and readily accommodates future modifications and fast, easy replacement of tower members. The all-welded, solid round construction of the S36 and S42 tower model facilitates faster tower construction and minimizes wind load on the tower structure due to the streamline effect of the solid rounds.

Climbing Ladder. All towers, except the S36 and S42, can be fitted with a 12 inch (305 mm) wide ladder with 5/8 inch (16 mm) rungs at 16 inch (406 mm) intervals. Step bolts are provided on one leg of each M36, but a ladder mounted on the outside may be substituted. Ladders for the larger towers are standard and are internally mounted such that two tower faces form a safety cage. The ladder on the S36 and S42 is an integral part of the structure and requires no additional climbing device.

U.S. FAA Requirements. Field applied latex paint and/or lighting is provided for towers that require marking under FAA regulations. Refer to pages 642 and 643 for information on tower lighting systems.

Lightning Protection. Andrew offers grounding components and systems to meet the minimum standards prescribed by EIA/TIA-222-F. Technical expertise is also available to assist you in specifying and obtaining more reliable protection than afforded by the minimum standards. See pages 639 and 640 for more details.

Rigidity. Tower column stiffness is controlled through the design and selection of various leg and diagonal sizes. Guy wires are attached at levels located to minimize bending moments. Torque stabilizers are utilized to resist twisting induced by large eccentric forces.

Hot-Dip, Galvanized, Certified Structural Steel is used for all tower components. Andrew obtains certification on the physical and chemical characteristics of all steel used for its towers.

Guyed Tower Selection

Guyed tower types S36, S42, M36, and M46 differ in face width, type of construction, maximum tower height, and maximum antenna loading. A selection chart is presented below. For additional information on these towers, see pages 626-629.

Formed plate legs provide superior strength and straightness.

Andrew guyed towers use flexible anchor shafts to dampen guy vibrations caused by wind gusts.

Formed diagonal bracing contributes greatly to tower column rigidity and eliminates bending moments caused by bolt connection eccentricity. These bracing members are used on the popular M36 and M46 guyed tower models.

Guyed Tower Selection Chart

Guyed Tower	Typical Application	Construction Type	Face Width in (mm)	Maximum Tower Height ft (m)
S36	RSA Cellular Light Microwave Lightweight LPTV	Solid Round	36 (915)	400 (122)
S42	RSA Cellular Light/Medium Microwave Lightweight LPTV	Solid Round	42 (1065)	500 (152)
M36	Cellular Light/Medium Microwave	Formed Plate	36 (915)	400 (122)
M46	Cellular Light/Medium Microwave CATV LPTV	Formed Plate	46 (1170)	480 (146)

- *RSA Cellular*
- *Light Microwave*
- *Trunking*
- *Lightweight LPTV*

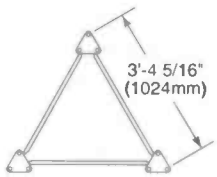
Guyed Towers

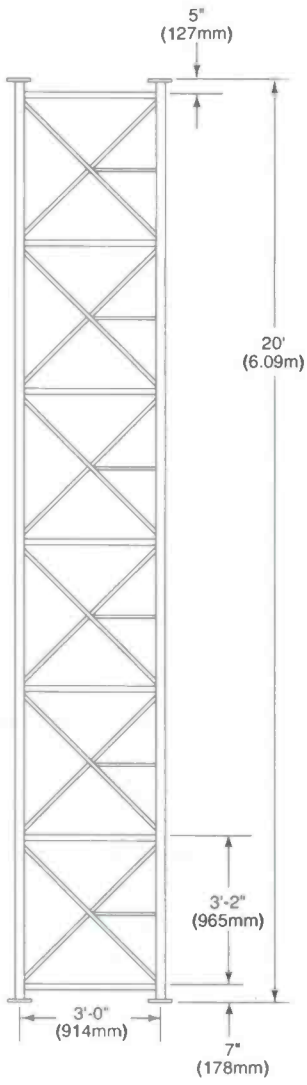
S36 Series

The S36 is a 36-inch (915 mm) face width and features an all-welded construction. The use of high strength solid rounds for tower legs and bracing provides durability and minimal wind resistance. The 20 ft (6 m) pre-fabricated sections bolt together for quick assembly.

The all-welded design allows for faster erection minimizing the cost and risk of lengthy erection schedules.

- ***Maximum Height:*** *400 ft (122 m).*
- ***Section Lengths:*** *20 ft (6 m), may vary due to the height of the tower.*
- ***Tower Face Width:*** *36-inch (915 mm) face width.*
- ***Bracing System:*** *Single Z-braced and X-braced.*
- ***Tower Members:*** *All legs and bracing are solid round bar.*
- ***Climbing Device:*** *Built-in ladder on one face.*
- ***Transmission Line Supports:*** *Cable supports are built-in on all faces. Hangers just snap into the holes provided.*
- ***Construction:*** *All-welded, only the sections bolt together.*





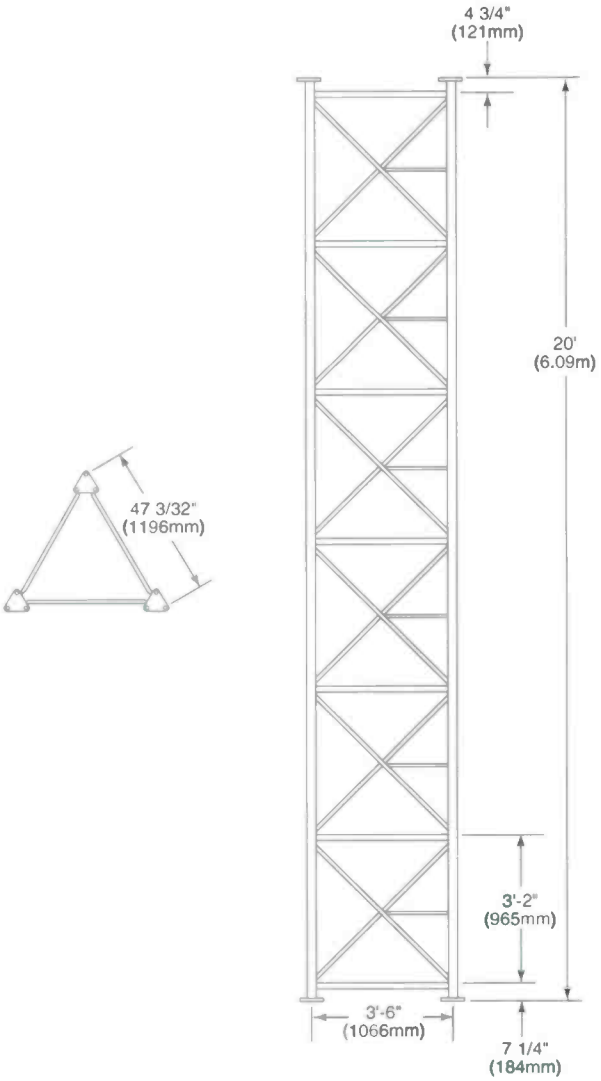
Guyed Towers

S42 Series

The S42 is a 42-inch (1065 mm) face width and features an all-welded construction. The use of high strength solid rounds for tower legs and bracing provides durability and minimal wind resistance. The 20 ft (6 m) pre-fabricated sections bolt together for quick assembly.

The all-welded design allows for faster erection minimizing the cost and risk of lengthy erection schedules.

- ***Maximum Height:*** *500 ft (152 m).*
- ***Section Lengths:*** *20 ft (6 m), may vary due to the height of the tower.*
- ***Tower Face Width:*** *42-inch (1065 mm) face width.*
- ***Bracing System:*** *Single diagonal or X-braced.*
- ***Tower Members:*** *All legs and bracing are solid round bar.*
- ***Climbing Device:*** *Built-in ladder on one face.*
- ***Transmission Line Supports:*** *Cable supports are built-in on all faces. Hangers just snap into the holes provided.*
- ***Construction:*** *All-welded, only the sections bolt together.*



- *RSA Cellular*
- *Light/Medium Microwave*
- *Trunking*
- *Lightweight LPTV*

- *Light/Medium Cellular*
- *Light Microwave*
- *Land Mobile Radio*
- *Light CATV/LPTV*

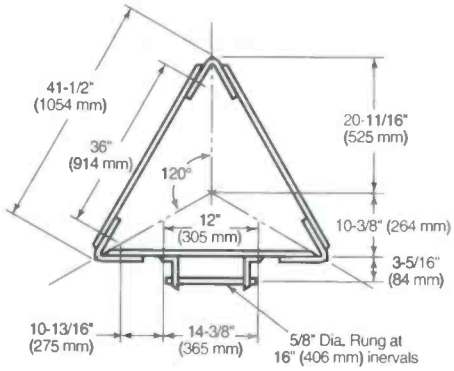
Guyed Towers

M36 Series

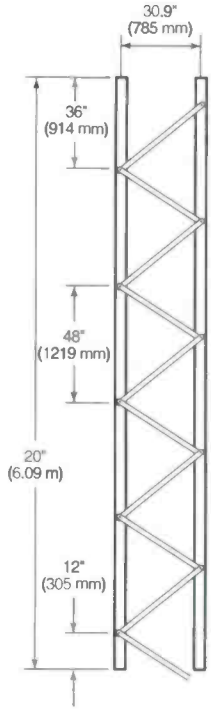
The M36 is a 36-inch (915 mm) face width, all bolted construction guyed tower.

The tower will support a cellular platform with twelve omnidirectional antennas and up to four 8 ft (2.4 m) diameter parabolic microwave antennas.

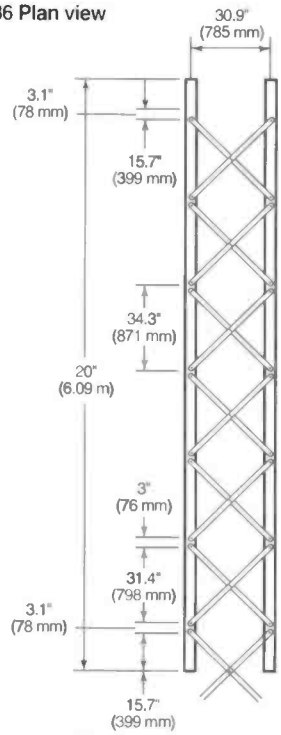
- ***Maximum Height:*** *400 ft (122 m).*
- ***Tower Face Width:*** *36-inch (915 mm).*
- ***Bracing System:*** *Single diagonal or X-bracing.*
- ***Tower Legs:*** *Angular and made from formed high strength steel plate.*
- ***Transmission Line Supports:*** *The integrated supports carry up to 12 runs of elliptical or coaxial cable on any one face. When the inside and outside supports are used, up to 24 runs of transmission lines per face can be carried*



M36 Plan view



M36 Single Diagonal Braced Section



M36 X-Braced Section

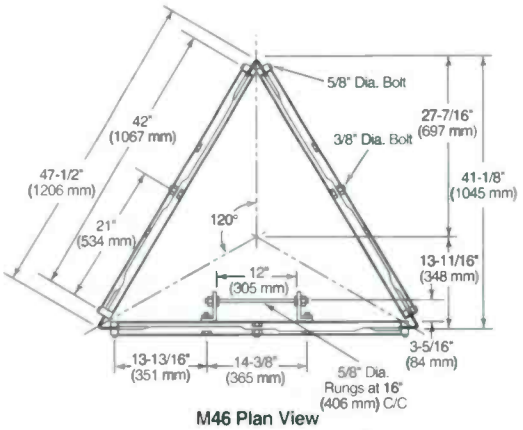
Guyed Towers

M46 Series

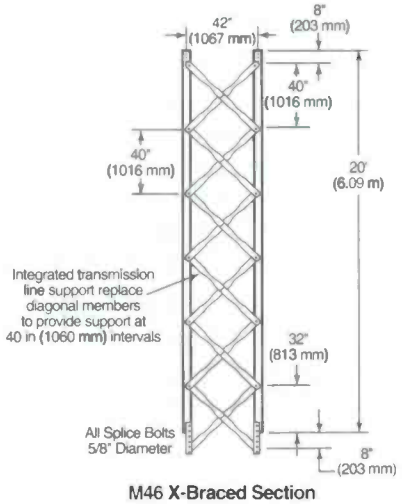
The M46 is a 46-inch (1170 mm) face width, all bolted construction guyed tower and can accommodate most microwave systems.

By varying leg, diagonal, and guy cables as well as bracing patterns and spans between supports, the M46 tower is made versatile for a wide range of heights and corresponding antenna, wind, and ice loading combinations. This versatility in design makes the M46 one of our most popular guyed towers.

- ***Maximum Height:*** *480 ft (146 m).*
- ***Tower Face Width:*** *46-inch (1170 mm).*
- ***Bracing System:*** *The M46 is X-braced in 40-inch (1 m) bays throughout to provide an extremely strong and rigid mast. It can also be provided with the dual slope bracing system.*
- ***Tower Legs:*** *Angular and made from formed high strength steel plate.*
- ***Transmission Line Supports:*** *Integrated transmission line supports carry up to 12 runs of cable and waveguide per face. When inside and out side are used, up to 24 runs of transmission lines per face can be carried.*



M46 Plan View



M46 X-Braced Section

- *Medium Cellular*
- *Medium Microwave*
- *Medium CATV/LPTV*

Towers

Self-Supporting Towers

A self-supporting tower is a free-standing space frame. It requires less land than a guyed tower and can accommodate more and larger antennas. Because of its bolted construction, it can easily be modified to increase antenna capacity. Because of these reasons a self-supporting tower is usually the best choice when microwave communication is needed in addition to cellular.

Self-supporting towers can be provided as three-sided or four-sided structures. A triangular tower is usually preferred over the square tower because it has fewer parts and the fourth side of a square tower does not add as much capacity to the tower as it does cost. A three-sided tower is lighter and more economical to erect and requires a less expensive foundation. Because of this, Andrew only offers three-sided towers as a standard product.

Andrew provides a choice in self-supporting tower construction types, offering both formed plate (3ST, SCAT) and tubular leg (LST) tower models. Many leg and diagonal sizes are available for each tower section making the Andrew self-supporting tower very versatile and economical.

Standard Features

Optimum Design. Andrew uses TAD (Tower Analysis Design) to consider antenna loads and effects on member stresses and displacements. The displacement of the actual tower is determined for every joint, and then used to calculate tower twist and sway. All Andrew towers are designed in accordance with EIA/TIA-222-F and local codes where applicable.

High Strength Legs. All tower legs are made of 50,000 lb/in^2 (345 MPa) yield strength steel for increased strength and lower weight design. The 3ST incorporates flat steel plate formed into a 60° leg member. The LST uses tubular steel for reduced wind loading.

High Strength Angle Bracing. All tower legs are braced along both planes to ensure rigidity. Further internal bracing provides required torsional stability and rigidity. Secondary horizontal and diagonal members are provided where required to adequately support the main members.

High Strength Leg Splices. High strength 3/4 inch (19 mm) or larger bolts are used in all leg splices. Bolts are secured with lock washers and nuts torqued to exceed minimum requirements.

All-Bolted Construction. The all-bolted construction of the LST, 3ST and SCAT towers permit compact and economical shipment. The tower is shipped completely knocked-down to minimize freight costs. Bolted construction readily accommodates fast, easy replacement of tower bracing members, if required for future modifications.

Climbing Ladder. The 3ST and LST towers can be provided with a 12 inch (305 mm) wide ladder with 5/8 inch (16 mm) diameter rungs at 16 inch (406 mm) intervals. The ladder is internally mounted so that two tower faces form a safety cage.

Plate leg members and high strength bolts ensure structural rigidity.

U.S. FAA Requirements. Field applied latex paint and/or lighting is provided for towers that require marking under FAA regulations. Refer to pages 642 and 643 for information on tower lighting.

Lightning Protection. Andrew offers grounding components and systems to meet minimum standards prescribed by EIA/TIA-222-F. Technical expertise is also available to assist you in specifying and obtaining more reliable protection than that afforded by the minimum standards. See pages 639 and 640 for more details.

Foundation Designs. The cost of the foundation design is included with the tower purchase. Andrew will custom design the foundation using a customer-supplied soil analysis at no additional charge. Standard foundations consist of three or four isolated spread footings or drilled piers. Andrew is also fully prepared to design non-conventional foundations such as piling, rock anchorage, etc., where unusual soil conditions exist.

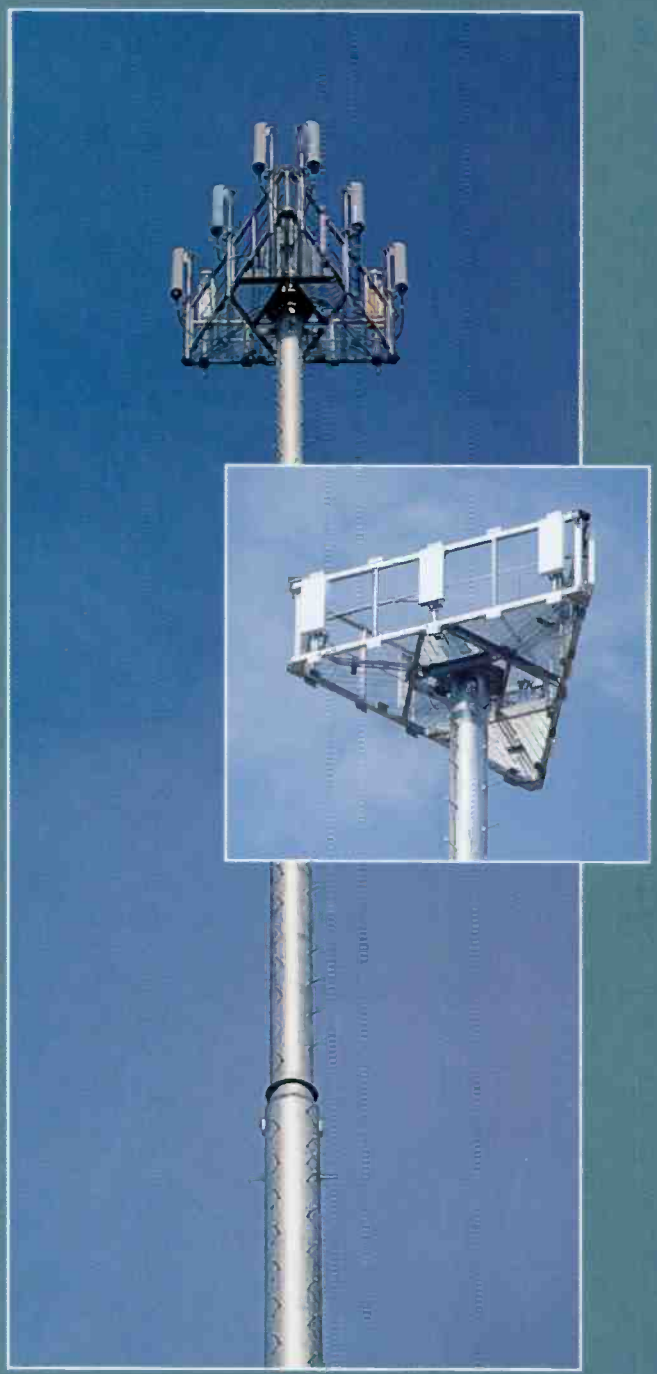
Hot-Dip Galvanized, Certified Structural Steel. All tower components are protected by hot-dipped galvanizing. Andrew obtains certification on the physical and chemical characteristics of all steel used for its towers.

Self-Supporting Tower Selection Chart

Tower	Typical Applications	Construction Type	Tower Section	Section Height ft (m)	Maximum Tower Height ft (m)
Monopole	Cellular, Light Microwave, Radio By-Pass, CATV, LPTV Paging, Two-Way	Pole	–	Varies up to 40 (12.2)	180 (55)
LST	Light Microwave, Cellular, Radio Bypass CATV, LPTV Paging, Two-Way	Pipe	All	20 (6.1)	360 (110)
3ST	Light/Medium Microwave Heavy Cellular Radio Light Broadcast	Formed Plate	1-21 22, 23	20 (6.1) 40 (12.2)	540 (165)
SCAT	Heavily Loaded Cellular and Microwave	Formed Plate	All	20 (6.1)	360 (110)

Towers

- *Light Cellular*
- *Light Microwave*
- *Light CATV/LPTV*



Self-Supporting Towers

Step-Tapered Monopole

The Monopole is a steel, tubular pole structure constructed from structural pipe. The proprietary modular design employs tubular sections that incorporate "hidden" flanges at each transition point, resulting in an aesthetically pleasing profile.

The Step-Tapered Monopole has many advantages for PCS/PCN and cellular applications:

- *Lower long term costs.*
- *Greater expansion options.*
- *Faster installation.*
- *Minimal land space requirements.*

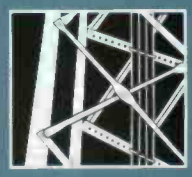
Monopoles are used where minimal land is available and/or aesthetics is of prime concern. The Monopole has the advantage of quick, easy erection. Transmission lines can be run down the inside of the pole. The curved surface of the tower has less exposed area to the wind, resulting in reduced loads.

The monopole has a limited capacity for supporting microwave antennas. It can accommodate both top mounted and intermediate level cellular platforms and has a variety of accessories to handle omnidirectional whip-type antennas. Typically, it can handle two parabolic antennas.

- ***Maximum Height:*** *180 ft (55 m).*
- ***Section Length:*** *May vary up to 40 ft (12.2 m) long.*
- ***Design:*** *Hot-dipped galvanized, certified structural steel.*
- ***Ladder Bracket Climbing Device:*** *Step bolts are the only means of climbing a monopole tower Monopoles include step bolt brackets and removable ladder steps that run the full length of the tower*

Optional Features

- ***All Welded Cellular Platform:*** *The all welded platform is an exclusive Andrew design with ease of installation in mind. All handrails are pre-fabricated and use handrail post as antenna mounting pipes minimizing expensive installation time.*
- ***Cellular Platforms:*** *Cellular plafforms support Omni and sectorized antennas as described on page 638. Andrew plafforms are adaptable to monopoles with a modified flange.*
- ***Band-On Antenna Mounts:*** *Band-on mounts properly support the antenna to manufacturer's specifications. Two hand holes and one waveguide port are provided directly in the tower at each antenna height to facilitate the mounting of feeds to antennas.*



Self-Supporting Towers

LST Series

- *Light/Medium Cellular*
- *Light Microwave*
- *Light/Medium CATV/LPTV*

The LST Series tower is an economical, lightweight, triangular tower with tubular legs. The basic "X-braced" framing configuration of the LST tower simplifies erection, allowing shortened installation schedules, reduced labor costs, and a clearly "un-cluttered" appearance. The tower is designed to cover a wide range of loading configurations.

- ***Maximum Height:*** *360 ft (108 m)*
- ***Section Length:*** *20 ft (6 m)*
- ***Taper:*** *22-inches (559 mm) per 20 ft (6 m)*
- ***Tower Legs:*** *The LST tower leg is made of high strength tubular steel for reduced wind loading. The leg is designed to eliminate flux pockets insuring proper coverage during galvanizing and guarding against the possibility of corrosion. Welded gussets are included for attaching bracing members.*
- ***Flange Leg Splices:*** *The use of "flow-thru" flanged leg splices prevents condensation and moisture build up inside the leg, and guards against internal corrosion. High strength splice bolts transfer leg loads between tower sections.*
- ***Bracing System:*** *Single X-bracing provides high strength, torsional rigidity and low part count. Bracing members are bolted to gussets welded on the tower legs.*
- ***Climbing Devices:*** *Standard LST towers include step bolts on the outside of one leg for the full height of the tower for climbing purposes. Internal climbing ladders and safety climb devices (for ladders or step bolts) can be provided when specified. The larger, wide faced, lower tower sections are provided with step bolts on all three legs (standard) to facilitate tower erection.*

LST Tower Section Dimensions - Light Duty Towers

Section	Base Width ft (m)	Tower Height ft (m)
1D	2.75 (0.84)	20 (6.10)
1C	3.00 (0.91)	40 (12.19)
1B	3.50 (1.07)	60 (18.29)
1A	4.00 (1.22)	80 (24.38)
1	5.83 (1.78)	100 (30.48)
2	7.67 (2.33)	120 (35.58)
3	9.50 (2.89)	140 (42.67)
4	11.33 (3.45)	160 (48.77)
5	13.17 (4.01)	180 (54.86)
6	15.00 (4.57)	200 (60.96)
7	16.83 (5.12)	220 (67.06)
8	18.67 (5.68)	240 (73.15)
9	20.50 (6.24)	260 (79.25)
10	22.33 (6.80)	280 (85.35)
11	24.17 (7.35)	300 (91.44)
12	26.00 (7.91)	320 (97.54)
13	27.83 (8.47)	340 (103.63)
14	29.66 (9.03)	360 (115.83)

Note: Section used as the base may vary due to antenna, wind, and ice loading.

Towers

- *Heavy Cellular*
- *Medium/Heavy Microwave*
- *Medium/Heavy CATV/LPTV*
- *Light Broadcast*

Self-Supporting Towers

3ST Series

The 3ST Series tower is a triangular, medium/heavy self-supporting tower designed to meet a wide range of applications. Its steep taper makes it very attractive in limited site space applications.

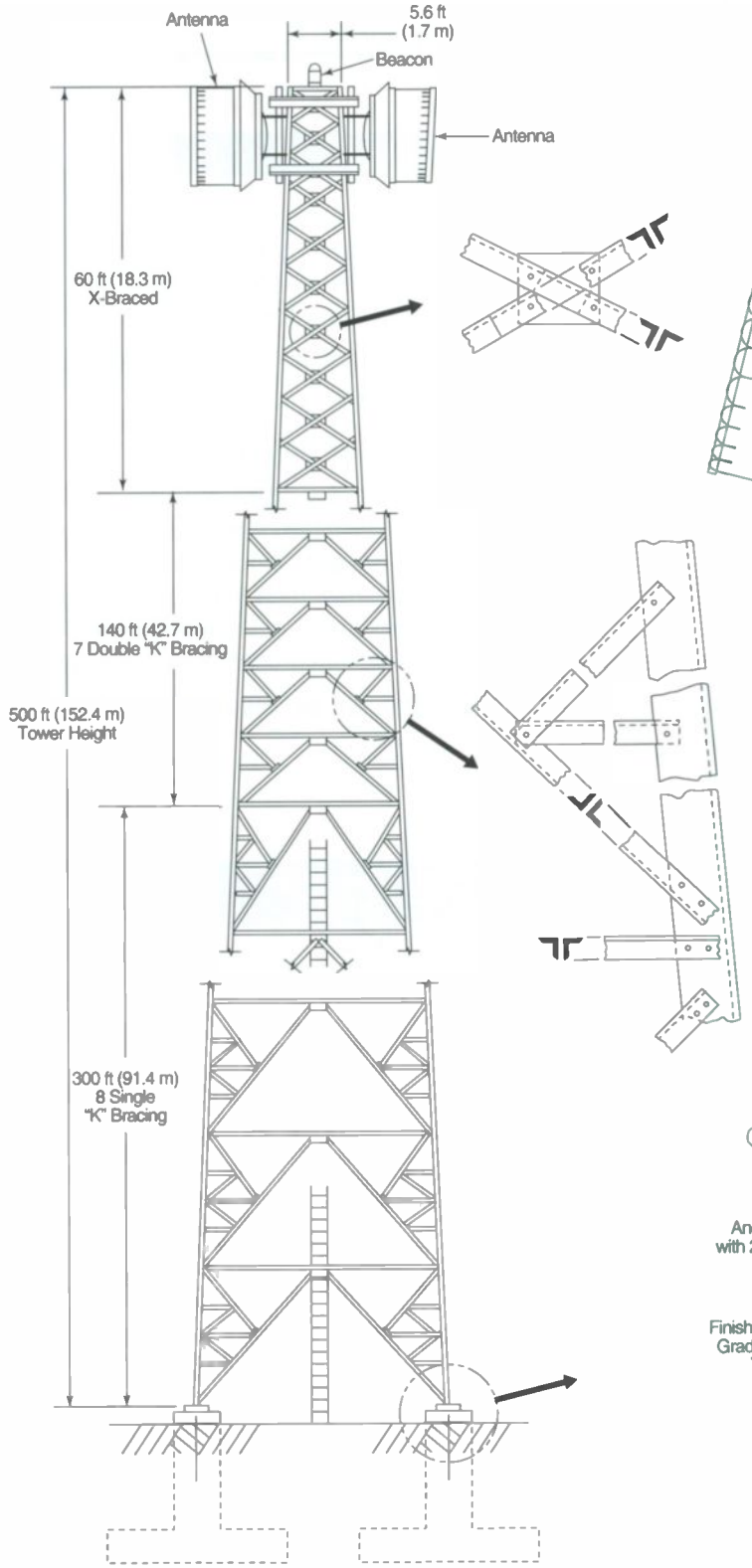
The three main legs are constructed from plate formed to a 60° angle creating an equilateral triangular cross-section. Combined with the internal bracing system the 3ST tower becomes an exceptionally stable and rigid structure. Many leg and diagonal sizes are available for each tower section making the 3ST versatile and economical. The formed plate construction facilitates reinforcement and strengthening to resist future loading requirements unforeseen at the time of the initial design.

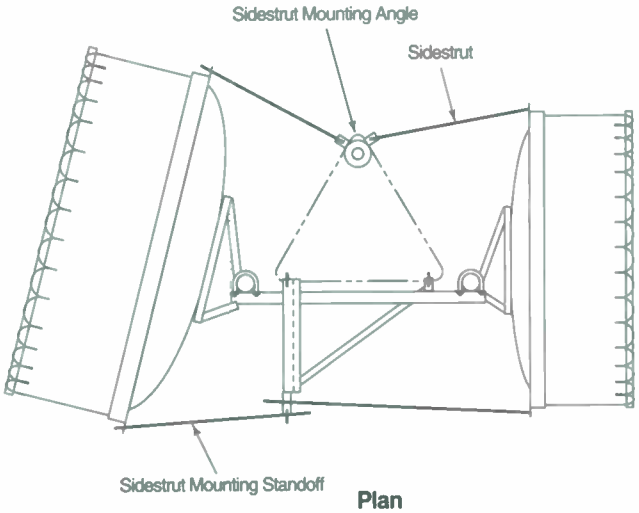
- ***Maximum Height:*** *540 ft (165 m).*
- ***Section Length:*** *Sections 1 thru 21 are 20 ft (6 m) long. Sections 22 and 23 are 40 ft (12 m) long.*
- ***Taper:*** *21-inches (533 mm) per 20 ft (6 m).*
- ***Bracing System:*** *The 3ST is X-braced in the top five sections, double K-braced in the following seven sections and single K-braced for the remaining lower sections. All braces are angular in a back-to-back configuration to eliminate eccentricity in compression.*
- ***Tower Legs:*** *Angular and made from formed high strength steel plate.*

Dimensions

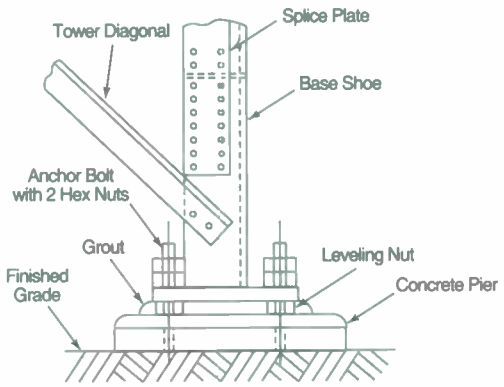
Section	Base Width ft (m)	Tower Height ft (m)
1	3.75 (1.20)	20 (6.10)
2	5.25 (1.60)	40 (12.19)
3	7.00 (2.13)	60 (18.29)
4	8.75 (2.59)	80 (24.38)
5	10.50 (3.20)	100 (30.48)
6	12.25 (3.73)	120 (36.58)
7	14.00 (4.26)	140 (42.67)
8	15.75 (4.80)	160 (48.77)
9	17.50 (5.33)	180 (54.86)
10	19.25 (5.86)	200 (60.96)
11	21.00 (6.40)	220 (67.06)
12	22.75 (6.93)	240 (73.15)
13	24.50 (7.47)	260 (79.25)
14	26.25 (8.00)	280 (85.34)
15	28.00 (8.53)	300 (91.44)
16	29.75 (9.07)	320 (97.54)
17	31.50 (9.60)	340 (103.63)
18	33.25 (10.1)	360 (109.73)
19	35.00 (10.6)	380 (115.82)
20	36.75 (11.2)	400 (121.92)
21	38.50 (11.7)	420 (128.02)
22	42.00 (12.8)	440 (134.11)
23	45.50 (13.9)	460 (140.21)

Note: Section used as the base may vary due to antenna, wind, and ice loading.

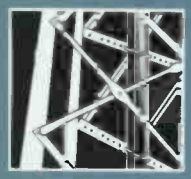




Plan



Tower Base Detail



Towers

- *Heavy Cellular*
- *Medium/Heavy Microwave*
- *Medium/Heavy CATV/LPTV*
- *Light Broadcast*

Self-Supporting Towers

SCAT Series

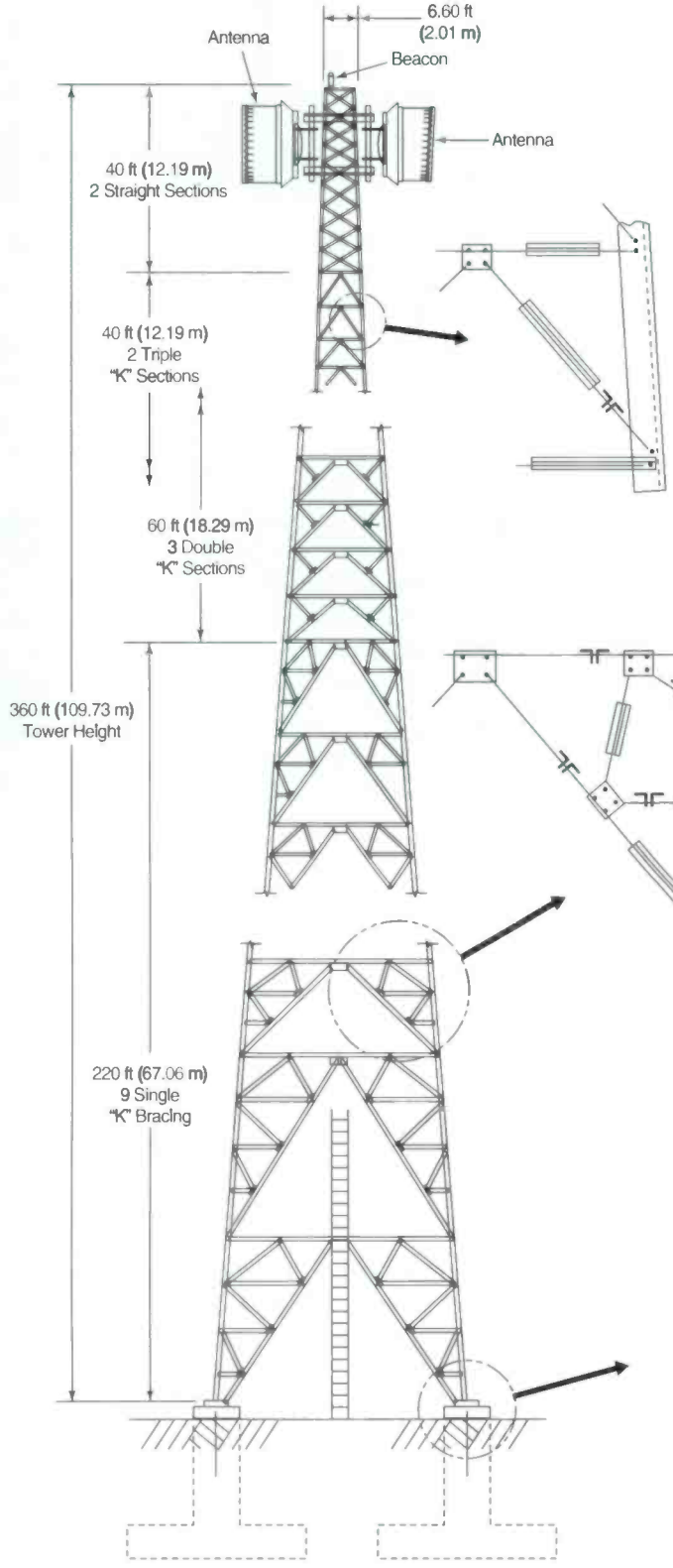
The SCAT Series tower is suitable for heavily loaded cellular and microwave applications. Similar to the popular 3ST Series tower, the SCAT has a greater base spread and less taper for increased capacity.

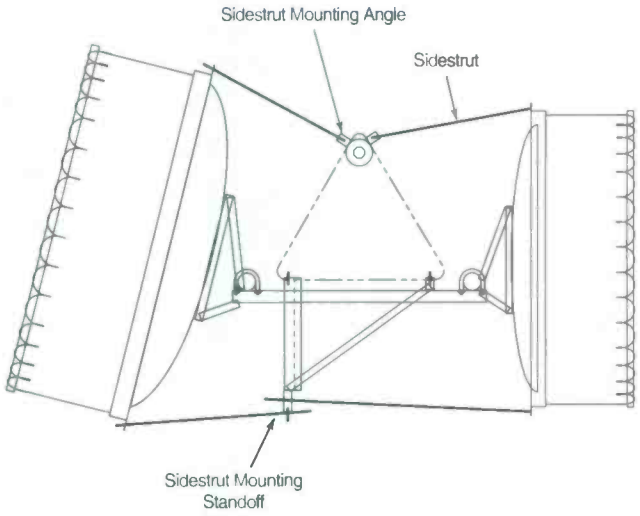
- ***Maximum Height:*** *360 ft (110 m).*
- ***Section Length:*** *20 ft (6 m) long.*
- ***Taper:*** *36-inches (914 mm) per 20 ft (6 m).*
- ***Bracing System:*** *The SCAT is X-braced in the top two straight sections, triple K-braced in the next two sections, double K-braced in the following three sections and single K-braced in the remaining lower sections. All braces are angular in a back-to-back configuration to eliminate eccentricity in compression.*
- ***Tower Legs:*** *Angular and made from formed high strength steel plate.*

Dimensions

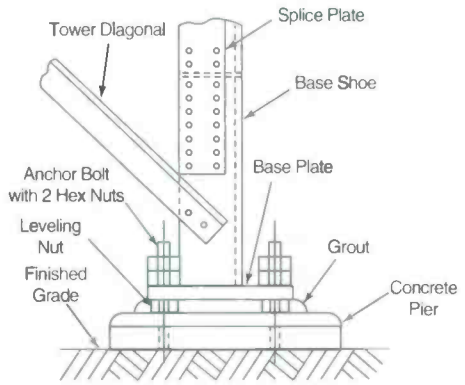
Section	Base Width ft (m)	Tower Height ft (m)
1	6.50 (1.98)	20 (6.10)
2	9.25 (2.82)	40 (12.19)
3	12.00 (3.65)	60 (18.29)
4	15.00 (4.57)	80 (24.38)
5	18.00 (5.48)	100 (30.48)
6	20.75 (6.32)	120 (36.58)
7	23.75 (7.24)	140 (42.67)
8	26.75 (8.15)	160 (48.77)
9	29.75 (9.06)	180 (54.86)
10	32.75 (9.98)	200 (60.96)
11	35.75 (10.8)	220 (67.06)
12	38.75 (11.8)	240 (73.15)
13	41.75 (12.7)	260 (79.25)
14	47.75 (14.5)	280 (85.34)
15	46.33 (14.1)	300 (91.44)

Note: Base section may vary due to antenna, wind, and ice loading.



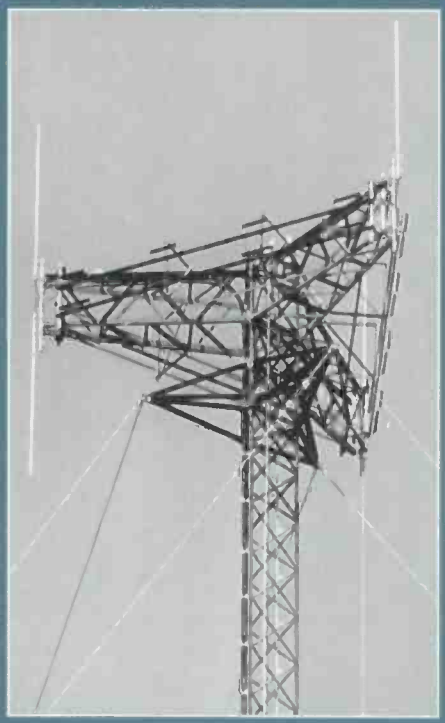


Plan

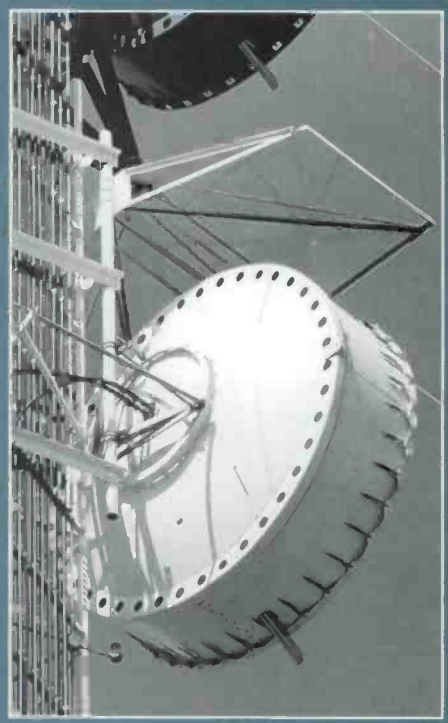


Tower Base Detail

Cellular platforms provide a safe and easy access for antenna installation. Maximum antenna separation is achieved by adding retractable arms.



Cellular star mounts, available for 20-ft separation, can provide support for up to 12 directional, omnidirectional or sectorized antennas.



Tower antenna pipe supports are selected for each type of antenna and are designed to transmit loads into the tower members with maximum rigidity.

Optional Equipment

All Tower appurtenances fully complement the particular antenna system required for your application.

Cellular Antenna Platforms

Square and triangular shaped platforms are available to provide safe working environments for antenna installation and adjustment of up to twelve whip antennas and/or up to twelve directional panel antennas. The antennas can easily be arranged for 90° sectors on the square and 120° sectors on the triangular platforms. Normal spacing is 11.5 ft (3.5 m) for whip antennas and 8 ft (2.4 m) between outer panel antennas. The spacing can be increased to a maximum of 20 ft (6.1 m) by utilizing the optional retractable arms.

Attachments are available for down-tilting each panel antenna up to 20° in measured 1° increments and for rotating each panel antenna 15° in measured 2° increments to modify the cell shape.

Cellular Star Mounts

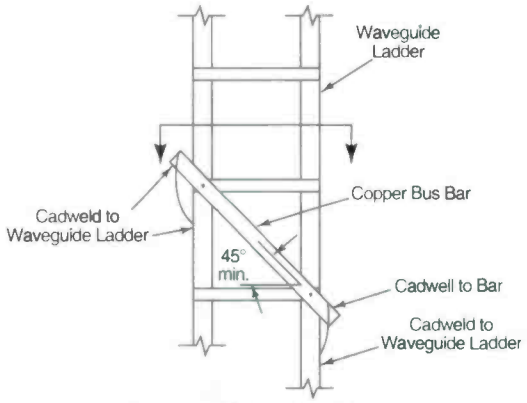
These triangular shaped frames can support up to twelve whip antennas with the outer antennas separated by 20 ft (6.1 m). Directional whip antennas can be uniformly arranged on each of three mount faces in 120° sectors.

Universal Cellular Directional Rotatable Mount

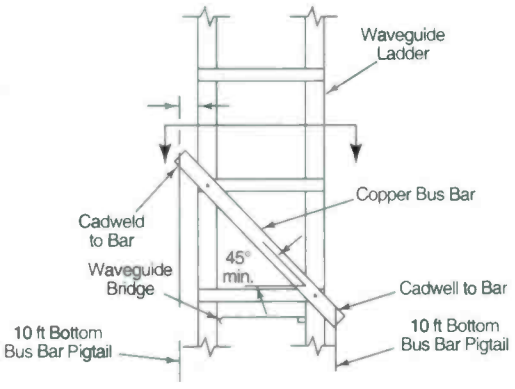
This mount is an alternative for a rotating platform. It consists of a panel frame with six mounting pipes. Four pipes have tilt-down capabilities in 1° increments to a maximum of 18° downward tilt. The two outside pipes are stationary. Each mount is capable of supporting up to four directional panel antennas and two whip antennas, with the outermost antennas separated by 10 ft (3.0 m). One mount is required for each sector such that three mounts are needed for achieving 120° sectorization.

Each mount is installed on a typical tower corner pipe mount which allows the mount to be rotated in a horizontal plane through a 120° arc, thereby allowing the user to change the sector orientation with respect to the tower.

Note: *The pipe mount that interfaces the universal mount to the tower is sold separately.*

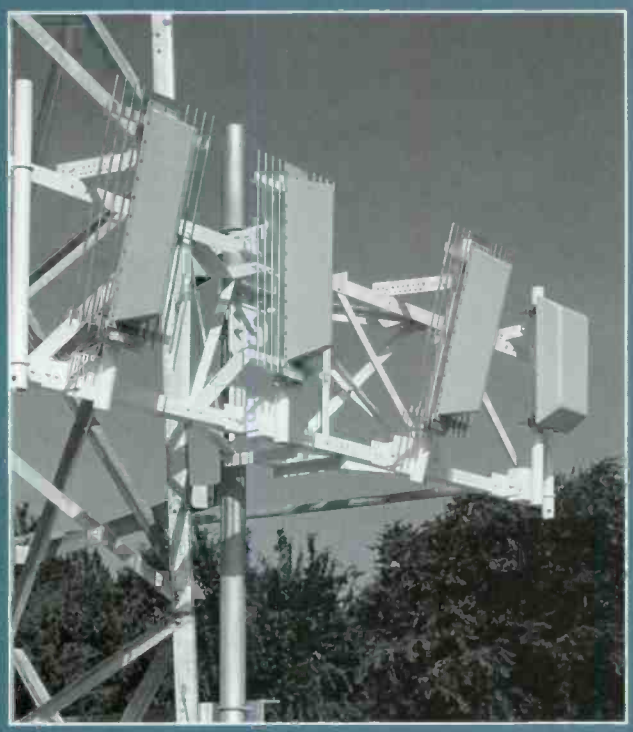


Top and Middle Section



Bottom

Tower Mounted Bus Bar Ground



Universal cellular mount allows sectorization of antennas at any tower height. The frame can be rotated horizontally up to 120° and downtilted to 18°.

Tower and Shelter Grounding

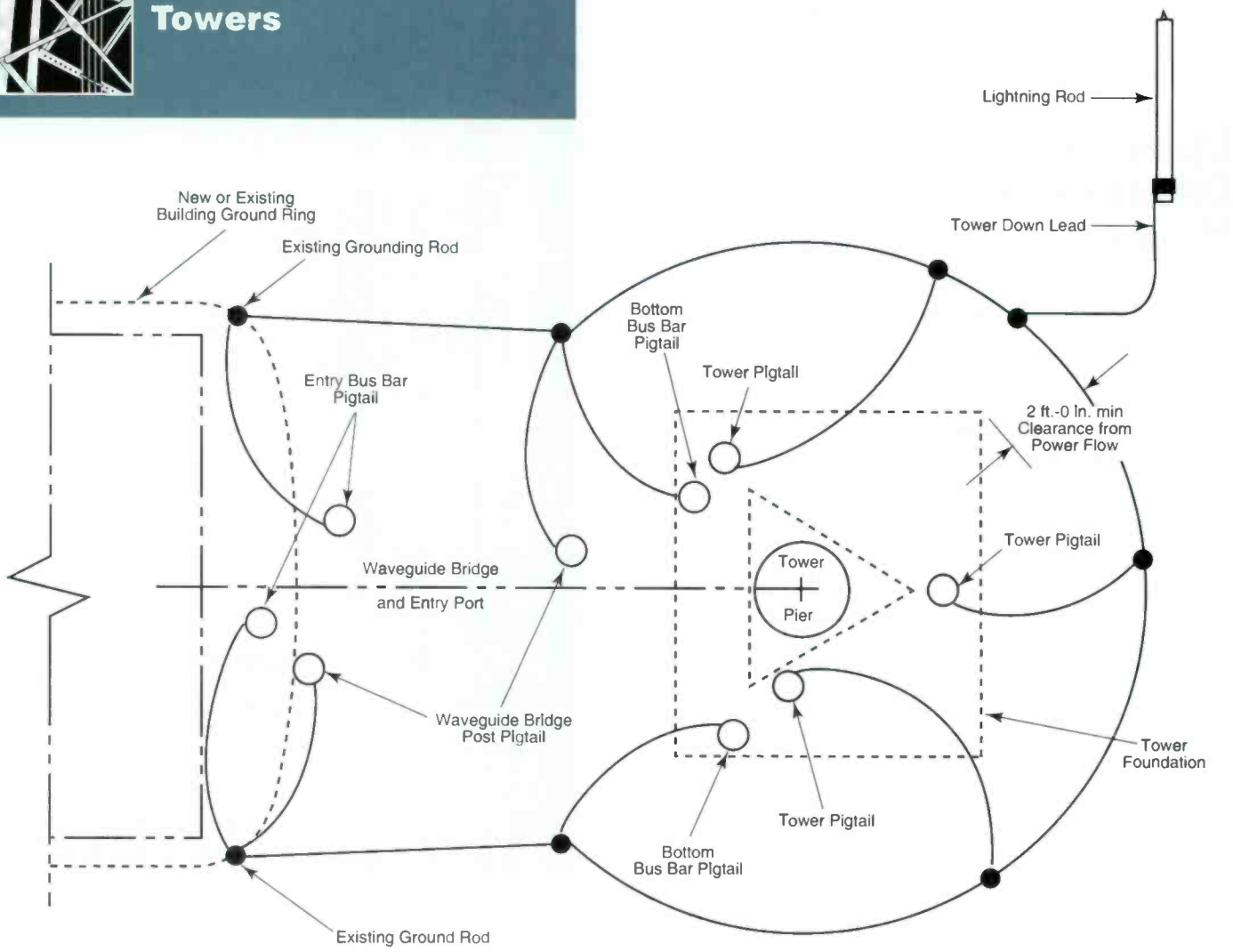
Andrew considers effective tower and shelter grounding to be essential to reliable radio and microwave communications. Proper grounding during tower installation offers the most economical "first step" in system lighting protection.

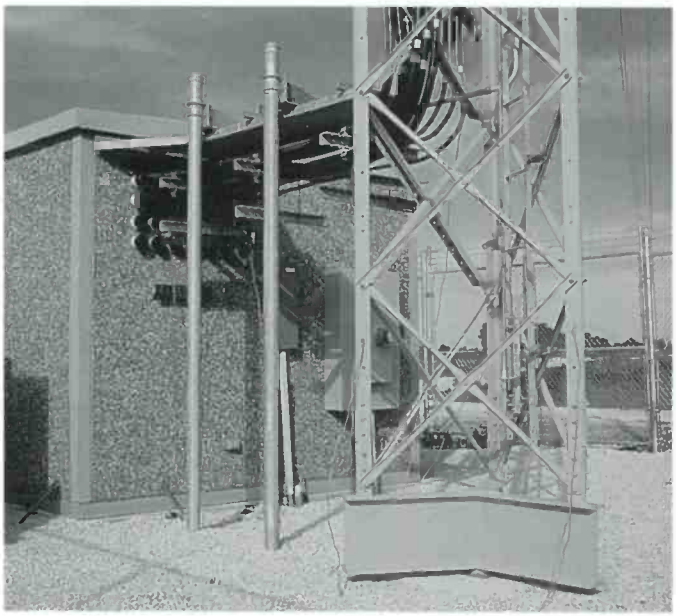
The addition of grounding materials to an existing system, at any time, is always an available opportunity to improve system performance.

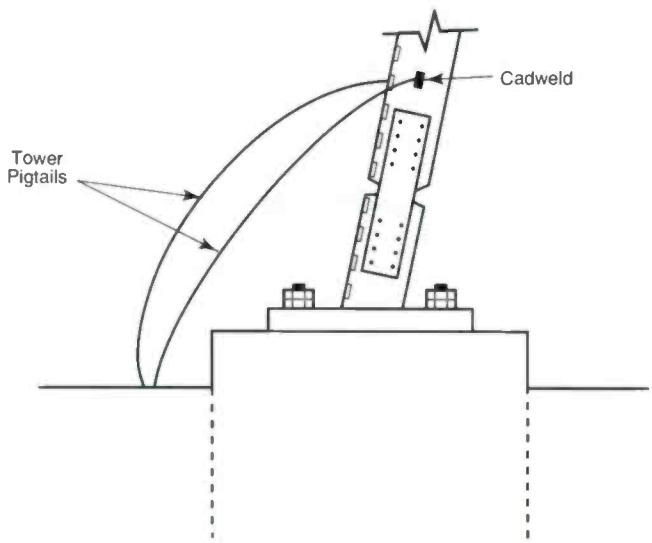
Some grounding material and service options include:

- *Soil resistivity measurements.*
- *Cadwelded ground ring systems using copperclad or galvanized ground rods.*
- *Systems for grounding transmission lines within the shelter.*
- *Lightning protected tower light controllers.*
- *AC power system surge protection and coaxial cable surge arrestors.*

The following pictures and illustrations show typical attention to grounding systems that outperform typical EIA minimum grounding standards.







Base Detail

Typical Tower Ground Ring System

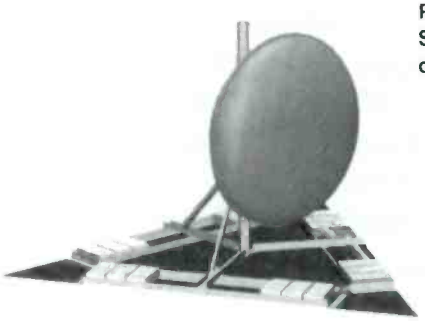
Roof Top Mounts

Roof Top mounts have been specifically design for PCS applications. The Self-stabilizing design eliminates the need for roof top penetration, standard concrete blocks are used as Ballast. Parts have been specifically designed with transportation limitations in mind. All parts are capable of being transported in elevators, eliminating the need of costly equipment.

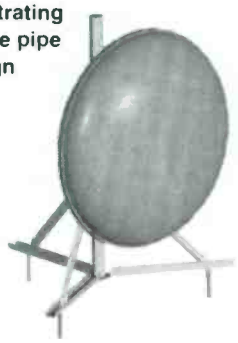
A variety of designs are available, including a triangular single pipe designs for up to 6 ft (1.8 m) diameter standard antennas in both penetrating and non-penetrating models.

For PCS/Cellular applications, a T-shaped single-pipe design, a rectangular two-pipe design, a rectangular three-pipe design and a four-pipe design all with approximately 4 ft (1.2 m) spacing between antennas.

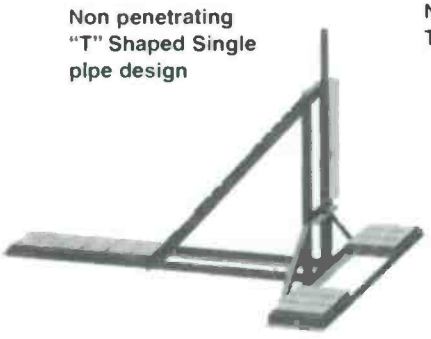
All PCS/Cellular roof top mounts are available with either 5.25 ft (1.6 m) or 8 ft (2.4 m) long pipes.



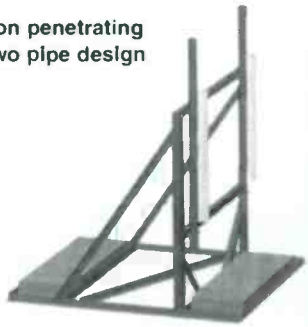
Penetrating
Single pipe
design



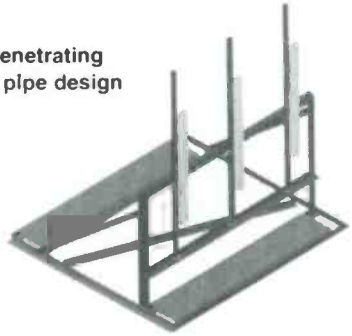
Non penetrating
"T" Shaped Single
pipe design



Non penetrating
Two pipe design



Non penetrating
Three pipe design



Rectangular two pipe design with 4 ft (1.2 m) separation between antennas.

Rectangular three pipe design with 4 ft (1.2 m) separation between antennas.

Tower Lighting Systems

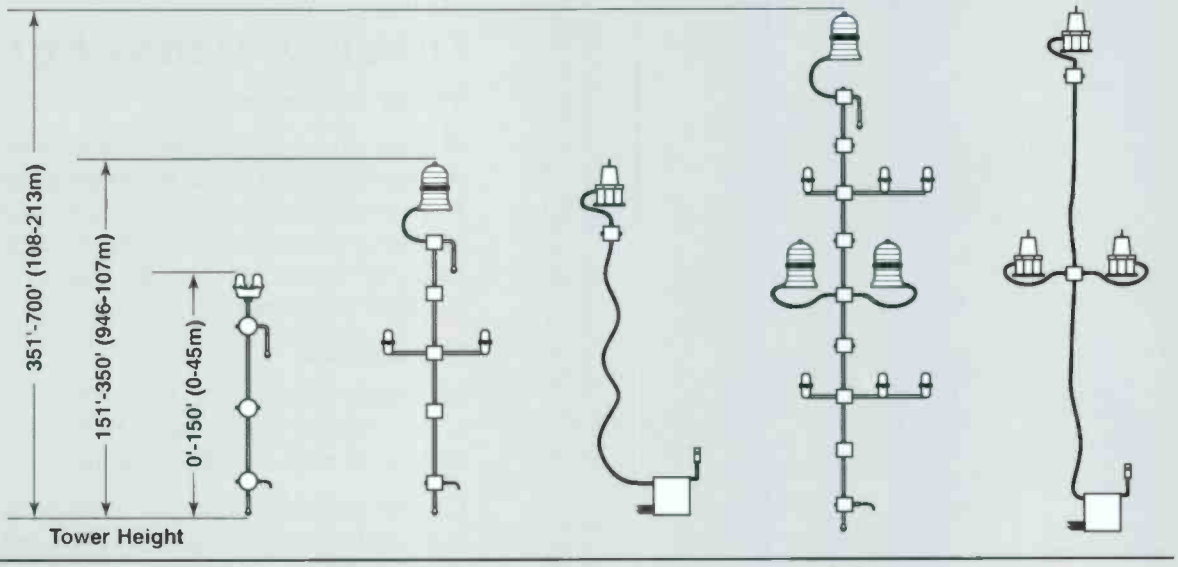
According to the FAA and FCC all towers over 200 ft must have markings which are visible to air traffic. Towers under 200 ft do not require marking unless special circumstances such as proximity to an airport warrant special consideration. Marking a tower with lights is the most common means of meeting such requirements. Recent changes to FAA specifications on towers over 350 ft require two flashing lights at the tower's midlevel height instead of one.

Andrew tower lighting is designed to cover a wide range of applications using red lighting, dual lighting or strobe lighting. All lighting systems meet the requirements of the following specifications:

- *FAA Advisory Circular AC 70/7460-1H (Obstruction Marking & Lighting).*
- *FAA Advisory Circular #150/5345-43D (Specifications for Obstruction Lighting Equipment).*
- *FCC Rules and Regulations, Part 17 (Construction, Marking, and Lighting of Antenna Systems.*
- *ICAO Aerodromes Annex 14 (International Standards and Recommended Practices).*
- *Transport Canada TP382E.*

Andrew light kits offer the following advantages:

- *FAA approved lighting.*
- *Kits can be used on either self-supporting or guyed towers.*
- *Kits come in 25 ft increments.*
- *Standardized drawings.*
- *Simplified part number system for ordering.*
- *Color-coded wiring.*
- *Indoor/outdoor NEMA 4 controller box.*
- *Technical support.*



Red Lights Only	A-0	A-1		A-2	
Strobe Lights Only			D-1		D-2
*Dual Lights			E-1		E-2

* Some systems combine both Beacon and Strobe into one fixture.

Red Lighting Systems

Red lights (flashing beacons and steady burn lights) are used to identify a tower strictly at night. Towers with red lights must be painted for daytime and twilight. Andrew red lights are approved for L-864 and L-810 systems. All kits come with wiring and conduit. The controller for red lights can either come with the light kit or purchased separately.

Strobe Lighting Systems

Medium Intensity White Strobe

Omnidirectional medium intensity strobe lighting systems provide visibility of a tower both day and night. During daytime operation the strobe puts out 20,000 candelas of intensity. At night the intensity drops down to 2,000 candelas. Use of the strobe system eliminates FAA required tower painting and the related costs of towers under 500 ft.

The medium intensity strobe includes a flashing white beacon, a power supply, a photocell and controller. The photocell switches the system to a higher intensity during the day and lowers the light intensity at night. The strobe lighting system is FAA L-865 and L-866 approved.

The medium intensity strobe is available in two styles. Option 1: the power supply is located directly beneath the flashhead on the tower. This eliminates the need to run high voltage up the tower. Option 2: the power supply is located at the base of the tower. This eliminates the need to climb up the tower to replace the power supply.

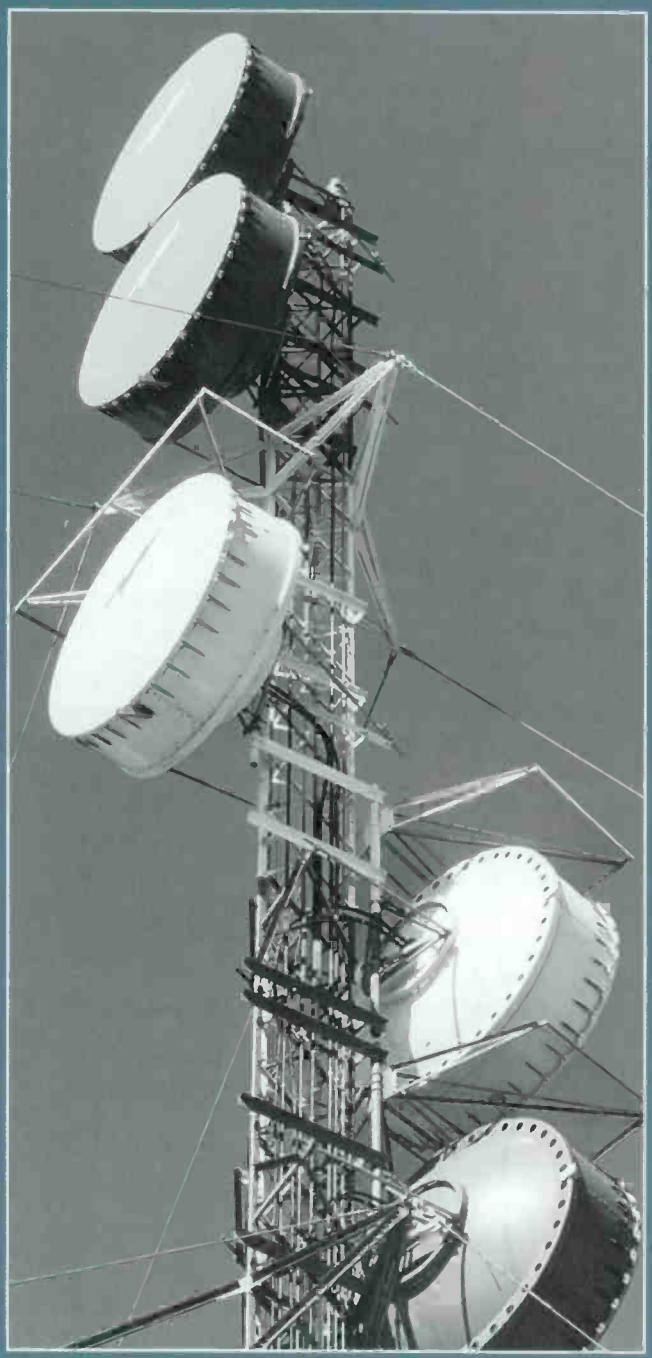
Due to the possible impact to the surrounding environment, medium intensity strobes are usually not recommended on towers under 200 ft.

Dual Lighting System

In areas where strobes may be a nuisance to the surrounding neighborhood, a dual lighting system may be used as an alternative. Andrew offers the dual lighting system which combines the functions of red lighting at night and medium intensity strobes during the day. This system eliminates FAA required painting of towers under 500 ft.

Tower Paint

Towers are available unpainted or with optional latex paint. Painting is typically done in the field. Factory applied paint is also available for situations where field application is not feasible.



Ice shields protect antennas at lower levels from damage caused by falling ice or other windblown debris.

Other Optional Equipment

Tower Hardware

Andrew stocks a wide range of high-strength bolt and nut hardware and tower accessories for quick delivery. The components are manufactured specifically for Andrew and are carefully controlled for quality and reliability. Contact Andrew for a detailed list of the available components.

Ice Shields

Ice shields offered in 8, 10 and 12 ft (2.4, 3.0 and 3.7 m) models are available for parabolic antennas. Ice shields for horn-reflector antennas are also available.

On new installations, the ice shield attaches to an extended antenna support pipe. On existing installations, Andrew provides an extension support pipe and tiebacks to interface with the existing antenna support.

Work/Rest Platforms

Platforms are available as specified. Handrails, extended gratings and kick plates are provided according to supplied specifications.

Tower Analysis

Andrew professional registered engineers can analyze any existing Andrew tower using TAD proprietary computer-design software to recommend the modifications necessary to adapt the tower to expanded applications. Andrew angle member towers can be reinforced to meet additional loading requirements without sacrificing the structural integrity of the tower. Andrew maintains a drawing file of all purchased towers which goes back nearly 30 years. This file proves to be invaluable when an analysis is required and the customer's copy of the drawings cannot be located. Andrew can also analyze non-Andrew towers upon receipt of customer-supplied tower drawings.

Analysis Data for Existing Tower

Site: _____

Height: _____

Model: _____

Type (circle): Self-Support or Guyed

Key Assembly Drawing No. : _____

(S/N): _____

City: _____

Country/State: _____

Present Owner: _____

Original Purchaser: _____

Year Purchased: _____

Design Standard for Analysis: _____

_____

Basic Wind Speed: _____

Structural: _____ Rigidity: _____

Ice to be included (circle) Y or N if so, how much _____

Cellular or Microwave Antennas

	Manufacturer and Type	Center Line	Azimuth	Transmission Line Type	Radome (Y/N)	Existing or New?
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Contact

Name: _____

Company: _____

Mailing Address: _____

_____

_____

_____

Telephone No.: _____

Fax No.: _____

Type of Request (circle one):

Engineering Review or Full Analysis

Purchase Order No.:

_____

Authorization Signature:

_____

Accessories
Selection Guide

- ***Ease of Ordering***
- ***Hundreds of Items***
  - *Microwave Mounts*
  - *Cellular Antenna Mounts*
  - *Platforms*
  - *Waveguide Bridges*
  - *Waveguide Supports*
  - *Climbing Ladders*
  - *and More*
- ***Fast Delivery***

Andrew understands the need for quick response to the customers need. With that in mind, Andrew can supply you with an easy-to-use reference guide for ordering Andrew tower accessories. The "Accessories Selection Guide" (Bulletin 3715) includes hundreds of items that can be ordered by type number, expediting the order entry process. Many accessories are pre-manufactured, packed, and stocked for quick delivery.

Tower Antenna Pipe Support

Each parabolic and grid antenna is supplied with an antenna mount which is attached to the tower using a 4-1/2 in (114 mm) tower antenna pipe support as an interface. Pipe support side strut angles are available to increase the support provided each microwave antenna. Tower antenna pipe supports are designed to ensure antenna rigidity and pointing stability with side struts positioned as required by the antenna manufacturer.

The tower antenna pipe support includes a pipe a minimum of 10.5 ft (3.2 m) in length to allow all antenna mounts to be securely attached between the pipe support members and to accommodate bottom struts if desired.

Tower antenna pipe supports can also be supplied for mounting UHF, VHF, CATV and broadcast antennas.

Horn-reflector antenna tower pipe supports are available for platform, pipe and beam mount configurations. Platform tower mounts on guyed towers incorporate the antenna support with torque stabilizers to ensure rigidity.

For pipe-mounted horn antennas, schedule 80 pipe, 16 ft (4.9 m) long, ensures adequate working space for antenna and waveguide support auxiliary platform attachment.

Waveguide Support Systems

Waveguide support systems are built into all Andrew guyed towers. A variety of transmission line supports are available for Andrew self-supporting towers. Supports bolt directly to the tower bracing for mounting waveguide or coaxial cable hangers without angle adapters or special brackets. Support ladders can be provided for applications where 2, 8, 12 or more runs are required.

Waveguide Bridge Kit

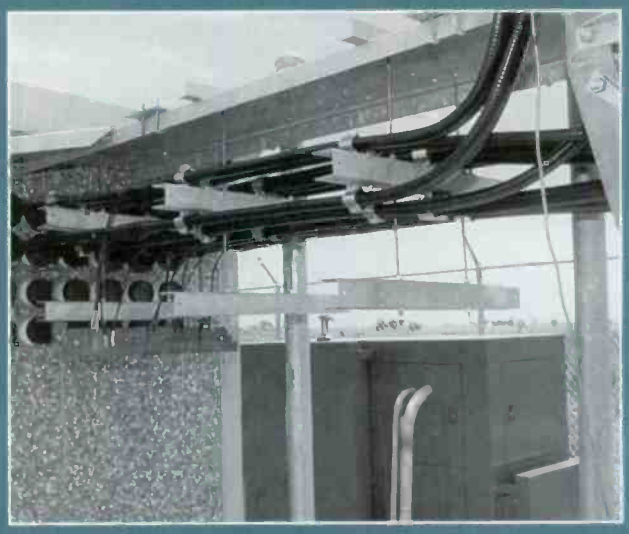
Waveguide Bridges are typically installed between the tower and the shelter ports to protect transmission lines from falling ice. Bridges are offered in standard widths of:

- *20.0 inches (508 mm) to support 24 cable runs*
- *13.5 inches (343 mm) to support 12 cable runs*
- *4.5 inches (114 mm) to support 4 cable runs*

Bridges are 10 ft (3.05 m) long and can be easily trimmed to meet field requirements. For longer distances, refer to the extension kit below.

Each waveguide bridge comes complete with two self-supporting pipes, 10 ft (3.05 m) of formed sheet galvanized metal, and three sets of cable hangers.

Antenna pipe mounts are available for supporting antennas to the tower. The mount ensures antenna rigidity and pointing stability.



Pipe supported bridges are available for routing transmission line from the tower to the equipment shelter.

Equipment Shelters

INDEX

Equipment Shelters

Newnan, Georgia

Sacramento, California

When You Select an Andrew Equipment Shelter

- *You have the lightest concrete shelter available*
- *You decrease transportation costs*
- *You minimize handling expenses*
- *You accelerate installation time*
- *You safeguard your valuable electronic equipment*
- *You receive the benefit of an experienced, full service organization*

You guarantee the success of your project now and in the future.
And...
Your customers enjoy reliable, uninterrupted service.

Concrete Shelter Weight Comparisons

	Weight, lb (kg)
Solid Hardrock Concrete	60,000 (27,215)
Solid Lightweight Concrete	55,000 (24,950)
Glass Fiber Reinforced Concrete	45,000 (20,410)
Andrew FCS II Shelter	44,000 (19,960)
Andrew IsoCrete	30,000 (13,610)

Based on a typically equipped 12 x 28 ft (3.7 x 8.5 m) shelter

Andrew Leads the Industry

Andrew leads the industry again with our new satellite shelter manufacturing facilities. Only Andrew offers the flexibility, time and cost savings of regionalized shelter manufacturing locations. Keep your projects on schedule when your fully integrated shelters are shipped from our new satellite facilities.

Our new shelter headquarters in Newnan, GA. serves the Eastern and Midwest communications markets with world-class, state-of-the-art manufacturing techniques and equipment. Production capabilities of this facility are supplemented by our satellite facility in Sacramento, California serving the Midwest, West Coast and international markets.

We invite you to visit our headquarters in Newnan to see how Andrew offers you a total solution for your communication shelter needs.

Factory Direct Support-
24 Hours a Day

We are available to answer any questions and provide assistance for your shelter projects. We can be reached toll free at... 1-800-453-5874.

Equipment Shelters

Schedule Savings

Andrew can pre-equip shelters at the factory, minimizing on-site installation time and costs for electrical systems, environmental control systems and customer-supplied electronics. All systems are tested at our factory and arrive completely assembled and ready for use. By using Andrew, you have an extra measure of security that is required during on-site installation of such systems.

We Take Care of the Details

Andrew is a recognized, certified manufacturer and meets or exceeds the toughest state standards. To help with approval of specific installations, Andrew will submit shelter design drawings, stamped by a Registered Professional Engineer, along with any necessary forms and fees to the appropriate state agency.

Engineering Backup. Drawings of your shelter are stamped by a Registered Professional Engineer, when requested. Our in-house engineers will provide designs to insure structural and code specific requirements.

Project Management. Our project managers provide a point of contact directly at the shelter facility. They handle your project from order entry through shelter site setup and are responsible for your complete satisfaction of your shelter requirements.

Fast Coordination for Multi-Site Systems

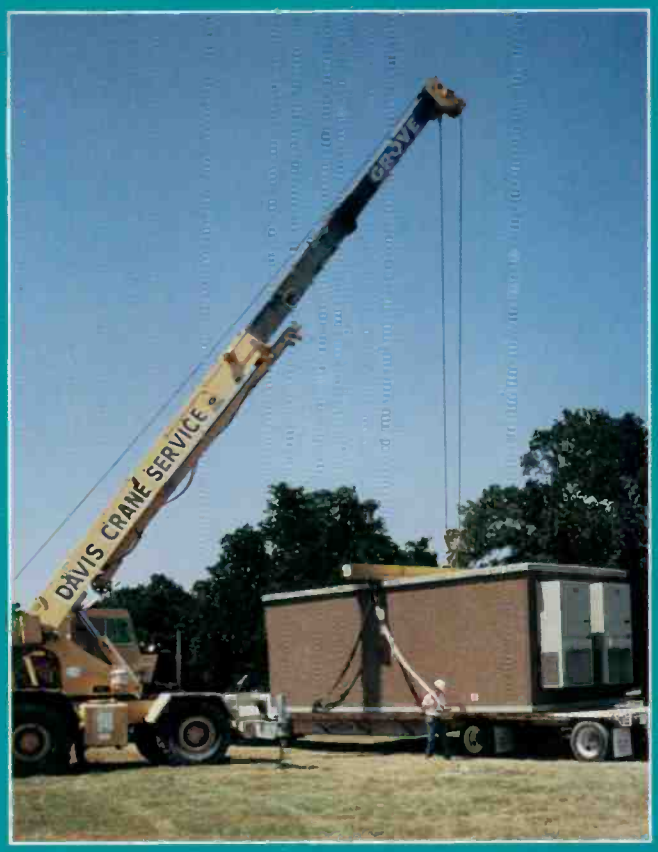
Your specifications are incorporated into each shelter at our factory. We coordinate the manufacturing, equipping and delivery so that shelter fabrication, customer site acquisition and site preparation occur in parallel.

Safe Delivery

A cast-in-place, steel angle around the perimeter of the shelter floor adds an additional level of security and strength.

Highly Secure Construction Integrity

Andrew shelters provide secure protection for your equipment. They are fabricated using solid panels of lightweight, structural reinforced concrete, making them fire, bullet and vandal resistant. The result is a light, secure space for your electronic equipment that provides you and your customers the assurance of constant on-air service.



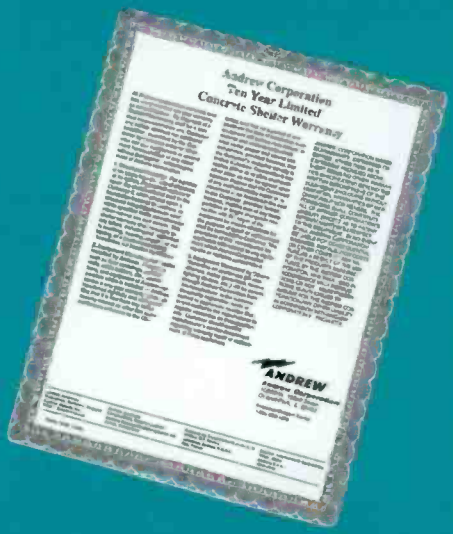
Andrew shelters are quickly and easily offloaded. They also allow more flexibility when selecting crane size because they're so light.

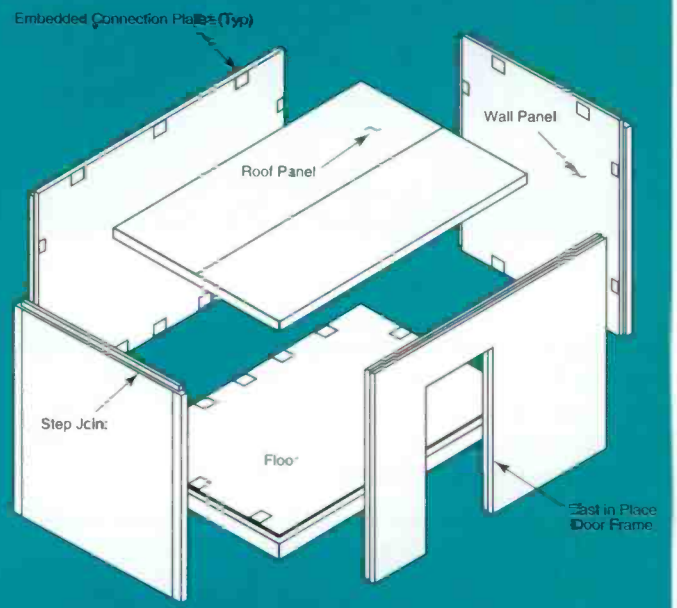
In addition, the structural integrity of an Andrew shelter ensures that operations are not interrupted due to gale-force winds or seismic disturbances. Protection from lightning also can be provided by equipping your shelter with suitable grounding systems.

Positive compression seals make exterior doors virtually airtight, ensuring a dust-free environment for your sensitive equipment.

And, with the selection of interior climate control components, damage to your valuable equipment caused by extremes in temperature and excessive humidity can be avoided, safeguarding operations and revenues.

Equipment Shelters





Guaranteed Savings

The Andrew Reputation

The 60 year Andrew reputation for quality and reliable products stands behind every Andrew shelter. You—and your customers—can be sure of continuous, dependable service when you choose Andrew.

Factory Direct Support- 24 Hours a Day

We are available to answer any questions and provide assistance for your shelter projects. We can be reached toll free at... **1-800-453-5874**.

Your 10-Year Warranty from Andrew

All Andrew shelters include this 10-year Warranty: we will repair or replace your shelter at no cost to you if its structural integrity fails when used within the specified loads on a structurally sound foundation. For complete details on the Andrew Corporation Ten Year Limited Concrete Shelter Warranty, contact our Customer Support Center and request Bulletin 1545.

Structural Options

Shelter Construction Details

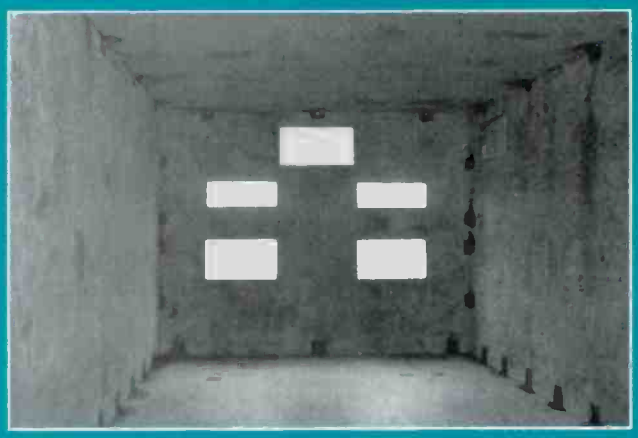
The Andrew shelter offers the time enduring benefits of solid concrete without the heavyweight headaches.

Flat Panel Roof. The roof is a flat panel of reinforced concrete, 4 in thick, with a 1/8 in/ft pitch for drainage. Reinforcement consists of No. 4 rebar. The roof panels of an Andrew equipment shelter will resist penetation from falling objects such as a block of ice weighing up to 100 pounds (45 kg) dropped from a height of 200 ft (61 m) based on Ballistics Research Laboratory calculations.

Flat Panel Walls. The walls are flat panels of reinforced concrete. Reinforcement consists of No. 4 rebar. Door frames are cast into the concrete wall panels for security and to prevent water leakage around the frames.

Waffle Panel Floor. The floor is a 6 in (152 mm) deep waffle slab of reinforced concrete. The waffling is formed by longitudinal ribs, and transverse ribs. Reinforcement consists of No. 6 rebar through each rib and around the edges of the panel. The floor deck is reinforced with WWF. The perimeter of the floor is reinforced with a steel angle to eliminate damage caused from transportation stresses or during installation of the building on the foundation.

Panel Connections. Steel panel connection plates are cast into the roof, wall, and floor panels and welded together after assembly and panel alignment.



Panel connection plates embedded into the panels of assembled shell.

Moisture Protection

Shelters are fabricated using solid, one-piece panels. There are no expansion joints. All joints between panels (wall-to-ceiling, wall-to-wall, wall-to-floor) are sealed with a permanent weather seal that provides additional moisture protection.

Earthquake-Proof

Andrew shelters, properly secured to a foundation, offer protection from damage caused by earthquakes. Andrew shelters meet the requirements of the Seismic Zone 4 classification, the most stringent structural standard specified for buildings located in areas subject to frequent and major seismic activity.

Standard Structural Wind Loading

The standard design wind loading is 150 mph (240 km/h).

Floor/Roof Loading

The standard floor and roof loading capacities exceed all national/state building code requirements. Floor load ratings can be increased, if a full slab foundation is used.

Foundations

Recommended foundation design drawings are provided free upon request with each Andrew shelter.

Architectural Options

Architectural Considerations

Andrew shelters meet or exceed all national/state structural codes minimizing the expense of local modifications required to obtain your permits.

The basic Andrew shelter complies with the following list of building codes. Andrew engineers also can provide designs to accommodate any non-standard structural or code-specified requirements.

- *Uniform Building Code (UBC)*
- *Building Officials and Code Administrators (BOCA)*
- *Southern Building Code (SBC)*
- *American Concrete Institute (ACI)*
- *American National Standard Institute (ANSI)*
- *American Standard Testing Methodology (ASTM)*
- *National Fire Protection Association (NFPA)*
- *Ohio Basic Building Code (OBBC)*
- *National Electrical Code (NEC)*

Shelter Aesthetics

Exterior Finish. A washed aggregate finish is standard on the shelter. The aggregate is rugged fascia fabricated as the shelter panel is poured-not glued to the surface, and provides the strength and durability of solid concrete.

Equipment Shelters

In addition to the basic electrical components, this electrical system features an array of options including a manual transfer switch, a surge arrestor, a safety switch, alarm cabinets, emergency lighting, a power failure alarm, a door alarm, and timer. Halo ground systems are installed with ground drops, pigtailed for on-site connection.

Exterior view of redundant air conditioning system.

Electrical Systems

The Andrew Electrical System is specifically tailored to your requirements. Andrew uses only standard, commercially available units for ultimate reliability and easy equipment connection. Your system is designed to meet all identified code specifications.

Basic Electrical Systems

The basic electrical system consists of either 100 amp or 200 amp single-phase service, or 100 amp or 200 amp three-phase service. Each standard system includes the following:

- *One AC power entrance elbow, 1-1/4 in (32 mm) to 3 in (76 mm) which rotates 360°*
- *Sixteen-circuit load center with a 100 ampere main breaker and eight circuit breakers or a thirty-circuit load center with a 200 ampere main breaker and eight circuit breakers*
- *One exterior light with a 125 volt/15 amp switch with a 100 watt incandescent bulb included*
- *Interior fluorescent light 4 ft (1.2 m) fixtures with two 40-watt bulbs and a 125 volt/15 ampere switch*
- *Duplex receptacles (120 volt/20 amp)*

Other electrical system options include, but are not limited to, generator receptacles, emergency lights, manual safety and transfer switches, surge arrestors and grounding systems.

Heating and Air Conditioning Systems

Air Conditioning

Andrew can install many standard, field-proven HVAC components, allowing you to customize your shelter's operating environment to manage the temperature and humidity needs of your equipment. All factory installed HVAC systems are fully tested and provide fast field commissioning and reliable operation.

Vertical Wall-Mounted Air Conditioners

The Vertical Wall-Mount air conditioners are specifically designed as energy efficient, space saving units ideally suited for telecommunications shelters. Each air conditioner offers optimal environmental control at a minimum cost without utilizing outside ground space or indoor working space.

Other HVAC options include, but are not limited to, alternate heating systems, ventilation systems and special controls. See our Shelter Planner, for a complete listing.

Cable Ladders and Wireways

Cable ladders and wireways offer flexibility and maximum labor efficiency for field-wired circuits. Cable ladders come in four widths with ceiling support brackets and NEC grounding. UL-Listed enclosed wireways conform to NEMA (National Electrical Manufacturers Association) Type 1 requirements and feature hinged covers and sides for lay-in installation.

Optional Systems

Customize your shelter for security and safety with remote alarms, fire suppression, or safety and first-aid systems. Andrew also will install and test standby or auxilliary power systems.

Transportation and Site Services

Shelter delivery, off-loading and setup services are available from Andrew shelter field service technicians. The shelter technicians operate with fully equipped service trucks to ensure your satisfaction with your Andrew shelters. They also provide warranty and maintenance services. The Andrew Shelter Field Service Department can be reached Toll-Free at 1-800-453-5874 for warranty, non-warranty repairs and maintenance services.

Wireless Communications

INDEX

Wireless Communications

Andrew Wireless Communications

Providing innovative products that serve diverse needs in the new and emerging wireless RF communications markets

BCA Series Broadband Communications Antennas for LMDS/LMCS

Antenna and System Products for the emerging broadband wireless communications networks at 28 GHz.

- *High Gain (15 dBi) Omnidirectional Antennas*
- *High Gain Sector Antennas*
- *Horizontal and vertical polarizations available for both omnidirectional and sector antennas*
- *Transmit/Receive Electronics*
- *Network Management*

Wireless Multi-Services Antenna System Products

The Andrew Wireless Multi-Service Hub provides a new and cost effective solution for wireless, in-building communications. Features include:

- *Combines multiple RF services into one hub*
- *RF Electronics is centrally located in an equipment closet*
- *Expandable to other services with a Wire-Once philosophy*
- *Comprehensive Network Management is integral to the hub*

Transportation Communications Products

Providing Spread Spectrum Radio Communications Systems for the emerging Communications-Based Train Control Market. Products and Services include:

- *Andrew Model 2400 Spread Spectrum Radio*
- *Bi-directional Distribution Amplifier*
- *RCW5 RADIAX® Cable*
- *Point Source and Mobile Antennas for 2.4 GHz*
- *System Engineering / Program Management*
- *Propagation Studies*
- *Installation and Test*

Andrew Preemptive Executive (APEX™) Embedded Operating System

APEX is an advanced real time operating system which is optimized for today's highly integrated microcontrollers. APEX provides programmers a simplier way to design and implement custom applications on embedded microcontrollers.

APEX™ Real-Time Operating System

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

Andrew BCA Series

Broadband Communications Antennas for LMDS/LMCS

Wireless Communications

Providing optimum, cost effective coverage for broadband communications at 28 GHz can be complex and difficult. Propagation characteristics, antenna height restrictions and limited antenna performance are all contributing factors in obtaining reliable results.

Andrew BCA series Antennas come in a wide range of pattern options, gains and performance characteristics to simplify the installation task. Antennas are provided in both omni and sector designs.

Features

- *High Gain Performance - (see gain table below)*
- *Equivalent pattern performance in both horizontal and vertical polarizations*
- *Pattern Enhancement - provides continuous coverage below the horizon*
- *Complete band coverage*
- *Azimuth coverage of 30, 45, 60, 90, 120, 180 and 360 degrees (other sizes available upon request)*
- *Adjustable beam tilt (Omni)*

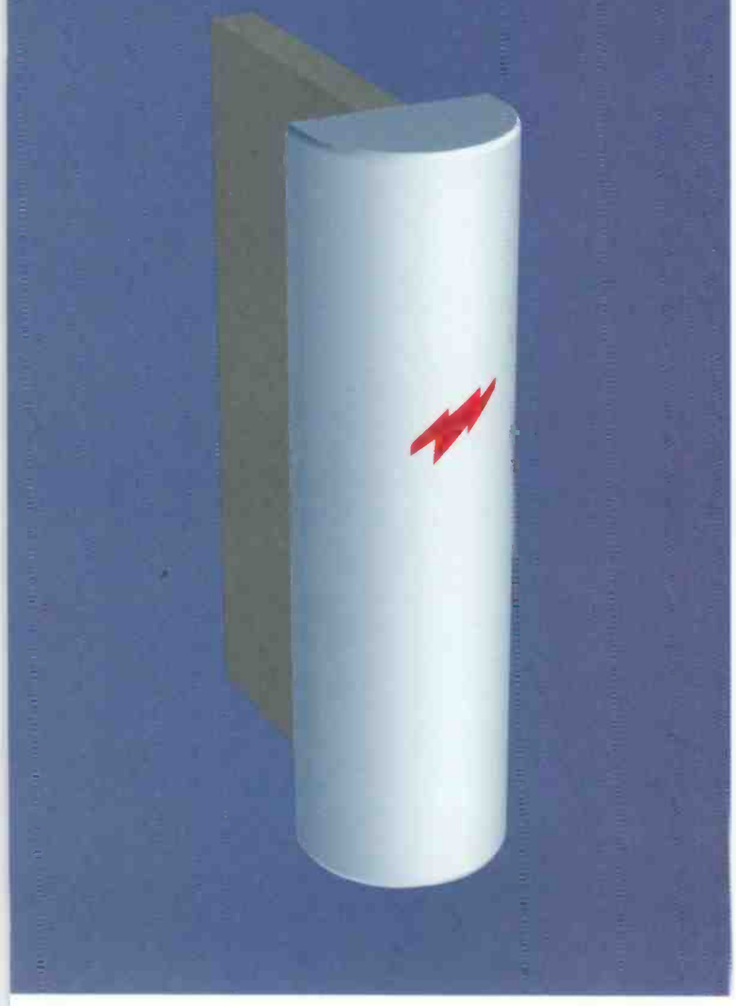
Specialized applications - Customized antenna patterns/performance tailored to meet specific system requirements will be quoted upon request.

Antenna Gain

Antenna Type Number	Azimuth Coverage Degrees	Gain, dBi Nominal
BC30-285-(*)	30	25.4
BC45-285-(*)	45	23.8
BC60-285-(*)	60	22.6
BC90-285-(*)	90	21.0
BC120-285-(*)	120	19.8
BC180-285-(*)	180	18.0
BC360-285-(*)	360	15.0

* Specify H for Horizontal Polarization or V for Vertical Polarization

Wireless Communications



Sector Antennas

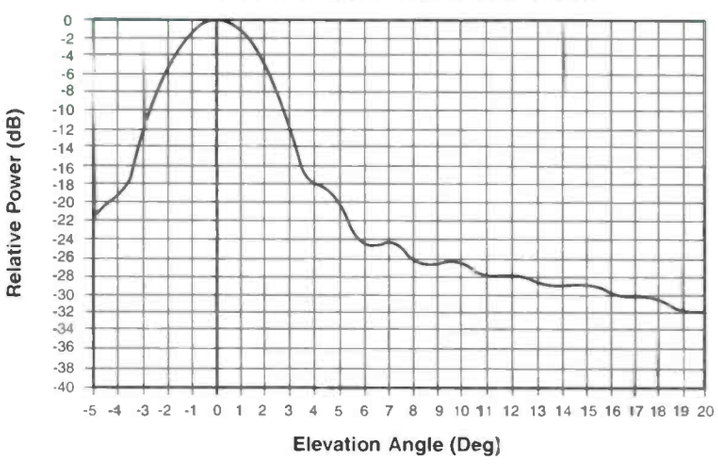
Andrew BCA Series Sector Antennas provide very high gain performance in an efficient size and weight. Available azimuth sector sizes include 30, 45, 60, 90, 120 and 180 degrees in either horizontal or vertical polarization. The elevation pattern of each sector antenna is contoured to provide a below the horizon coverage free of any nulls (see typical pattern below). The sector antennas are also available in an ultra high gain version. Contact Andrew for details.

Typical specifications for the standard 90° sector antenna include:

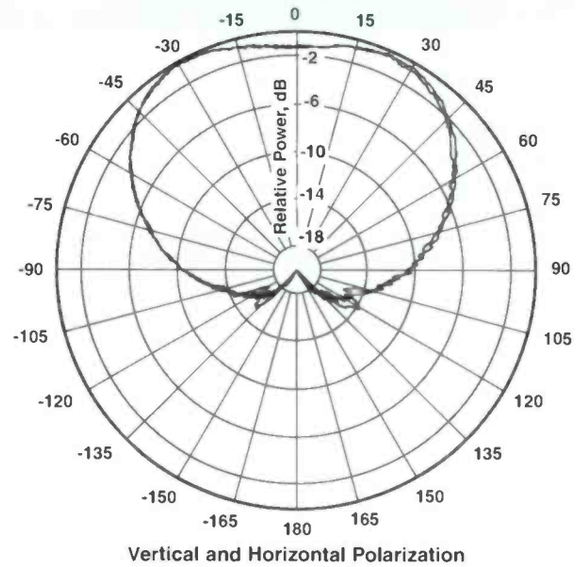
Electrical Specifications	
Frequency of Operation, GHz	27.35 - 29.5
Sector Size, degrees	90
Gain, nominal, dBi	21
Polarization	Horizontal or Vertical (specify at time or order)
Polarization Discrimination, dB	>20
Input Power Rating, Watts	50
VSWR max. (R.L., dB)	1.5:1 (14)
Input Connector	WR28 cover/gasket flange

Mechanical Specifications	
Survival Wind Velocity, mph (km/h)	100 (160)
Operating Temperature, °C (°F)	-40 to +60 (-40 to +140)
Size, approx. H x W x D, in (mm)	15 x 1 x 8 (381 x 25 x 203)
Color	Gray
Feed Pressurized, maximum, lb/in² (kPa)	0.5 (3.5)
Weight, lb (kg)	4 (1.8)

Standard Sector Antenna Elevation Pattern



90 Degree Sector Azimuth Pattern



Vertical and Horizontal Polarization

Omnidirectional Antennas

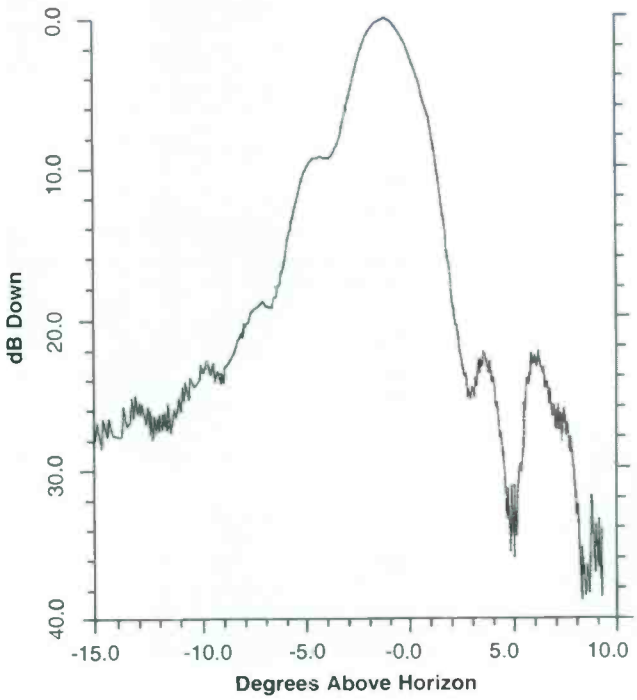
The Andrew BCA Series Omnidirectional Antennas provide very high gain performance in an efficient size and weight. The antennas are designed to be top mounted on a standard 4" (nominal) pipe.

Standard Features

- *Vertical or Horizontal polarization*
- *Mechanically adjustable electrical beam tilt in 0.75° increments, 0° to 3°, field adjustable*
- *High Gain Design of 15 dBi*
- *Contoured Pattern providing a "null free" below-the-horizon coverage*
- *Durable Design to withstand the harshest outdoor environments*
- *Electrical Anti-Icing available as an option*
- *Lightning protected*
- *Pressurizable feed*
- *Light weight: approximately 24 pounds*

Electrical Specifications	
Frequency of Operation, GHz	27.35 - 29.5
Gain, nominal, dBi	15
Polarization	Horizontal or Vertical (specify at time or order)
Polarization Discrimination, dB	>20
Input Power Rating, Watts	100
VSWR max. (R.L., dB)	1.5:1 (14)
Input Connector	WR28 cover/gasket flange

Mechanical Specifications	
Survival Wind Velocity, mph (km/h)	100 (160)
Operating Temperature, °C (°F)	-40 to +60 (-40 to +140)
Diameter of Radome, in (mm)	25 (635)
Overall Height, in (mm)	21 (533)
Diameter of Support pipe, in (mm)	4.5 (114)
Color	Gray
Feed Pressurized, maximum, lb/in² (kPa)	0.5 (3.5)
Weight, lb (kg)	24 (11)



Wireless Communications

NEW!

In-Building Wireless Multi-Service Antenna System (MAS™)

The MAS provides the latest in technology for a central point distribution of in-building wireless communications systems. MAS features proven Andrew RADIAX® coaxial cable to uniformly distribute the RF signals throughout the building. The wideband characteristics of the MAS design allow multiple devices and services to operate on a single antenna system.

Combined Multiple RF Services on a Single Antenna System

- *2.4 GHz Access Points for Wireless LAN (WLAN) applications*
- *900 MHz spread spectrum wireless data products*
- *900 MHz cordless telephone and wireless PBX*
- *Cellular*
- *PCS*

Installation Costs are less than the discrete wired access point approach

- *Eliminates multiple antenna systems*
- *Reduces number of WLAN Access Points*
- *Eliminates power runs in ceiling to WLAN Access Points*
- *Promotes "Wire-Once" Philosophy*

Andrew MAS™ Installation Kit. The Andrew MAS Installation kit provides an Andrew qualified installer with a standardized kit of materials. The kit consists of:

- *Two 68-foot lengths of Type RXP4-2 RADIAX cable with installed connectors*
- *One 10 - 2500 MHz power divider*
- *One cable hanger kit*
- *One coaxial connector for termination to hub*

MAS™ Hub

The Andrew Multi-Service Antenna System Hub provides an improved way to deploy voice and digital services in today's in-building environments.

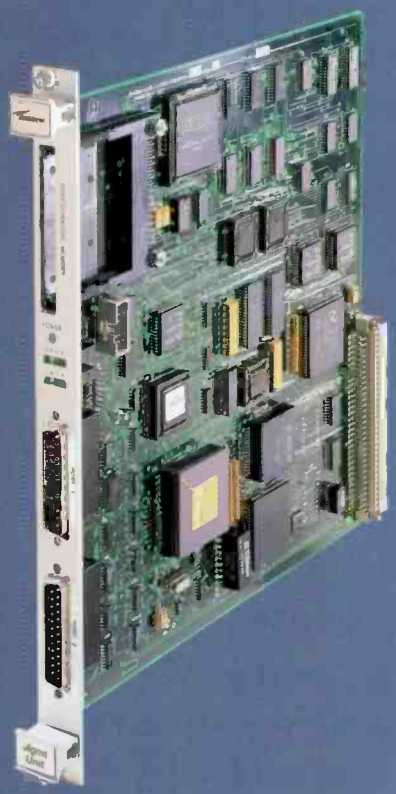
Features of the Hub

- *Equipment is Concentrated in a Closet/Hub Facility*
- *Each rack-mounted unit contains up to six Access Points*
- *All active electronics are centrally located and easily accessible - NO Active ceiling mounted electronics are required*
- *All maintenance is performed at the central hub location*
- *Accommodates Access Points from multiple vendors*
- *Allows for ease of expansion to multiple frequency operation*
- *Format is similar to other, closet-based wired solutions*
- *Integrates control and setup of Access Points into a single control point*
- *Provides information of RF connectivity*
- *Plugable modules provide for ease in replacement of failed access points*
- *Integrates RF interface with other wireless services*

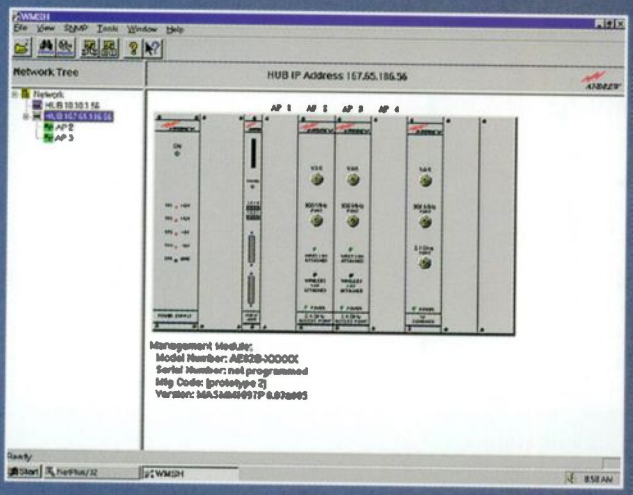
Available Modules:

- *Management Module with optional WAN Routing Capability*
- *Symbol 2400 Access Point*
- *900 MHz/2.4 GHz Intelligent Combiner*
- *Dual 900 MHz/2.4 GHz Intelligent Combiner*
- *1.9 GHz/2.4 GHz Intelligent Combiner*
- *Dual 1.9 GHz/2.4 GHz Intelligent Combiner*
- *900 MHz/1.9 GHz/2.4 GHz Intelligent Combiner*
- *Power Supply*

Additional Access Points can be integrated and added. Contact Andrew for further details.



Wireless Communications



Multi-Service Antenna System (MAS™) Network Manager

The Network Manager for the MAS is a graphical user interface (GUI) management system which provides for monitoring and control of the wireless network. This system is based on a 32-bit Windows platform, and may be run on Microsoft® Windows® 95 or Microsoft® Windows® NT. The Network Manager utilizes point-and-click pictorial images, easy-to-use menu options, and other state-of-the-art GUI style features to control the network.

MAS Network Manager Features:

- *Based on Windows 32-bit platform (Microsoft Windows 95 or NT)*
- *Configuration, Monitor and Control of Access Points*
- *Multiple HUB Configurations*
- *Monitoring of the HUBs*
- *Data Logging*
- *System Security*
- *Status Bar with Status Indicators*
- *SNMP Communication (MIB II)*
- *SNMP Manager Functionality (including "Auto-Discovery")*
- *Graphical Network Tree Visualization*
- *Database Functionality*

Comprehensive Communications For Automatic Train Control

The demand for increased passenger throughput on transit systems is reshaping the nature of train control. In the future, automatic train control systems will utilize contactless radio transmission links between vehicles and wayside. Combining proven Andrew Spread Spectrum Radios, strategically placed antennas, and patented RADIAX® cables, Andrew delivers the most reliable and cost-effective communication means for implementing automatic train control systems.

The Andrew Model 2400 Spread Spectrum Radio incorporates the most advanced radio design with proven spread spectrum modulation techniques to ensure reliable communications and safe operations.

Mass transit systems are typically composed of a combination of above-ground and in-tunnel installations. The Andrew system provides comprehensive and reliable radio frequency coverage to the entire subway or mass transit system, employing both strategically placed Andrew RADIAX® radiating cables and point source antennas. This technology makes it possible to achieve unprecedented performance in automatic train control, especially in a tunnel environment and in areas with high levels of interference.

Andrew is one of the world's largest producers of communications systems that allow RF signals to radiate within confined areas. Recognized the world over as an innovative company with a tradition of complete customer satisfaction, Andrew is known for providing solutions with the highest value at the lowest risk.

Wireless Communications

Spread Spectrum Radio

The new Andrew 2400 Spread Spectrum Radio incorporates the most advanced technology in spread spectrum communications radio design. It provides the ultimate in reliable data communications for the communications-based train control industry. The model 2400 comes in mobile and fixed (base station) configurations.

Features of the radio include:

- ***Ruggedized design***

  Designed to withstand the handling and severe conditions found in the metro environment.

- ***High Availability***

  High reliability of the 2400 design meets the rigorous availability demands of the mass transit industry and minimizes the cost of maintenance and repair.

- ***Ease of Repair***

  Fault isolation and reparability of each radio has been carefully considered to minimize labor and repair time.

- ***Wide-Band Direct Sequence Spreading***

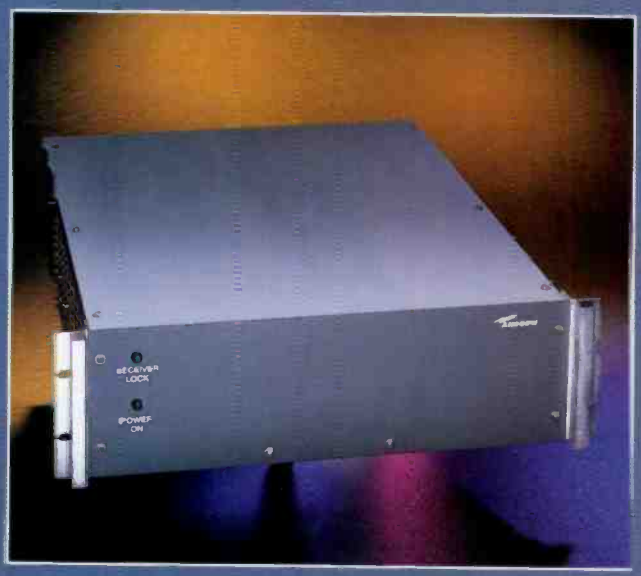
  Provides the most reliable and secure radio communications in a metro environment, thus ensuring the ultimate in safety for communications-based train control.

- ***Meets FCC Part 15 Rules***

  Does not require FCC licensing or frequency planning for installation.

- ***Mobile and Base Configurations***

  Same radio components are included in both the mobile and base configurations, thus reducing the cost of spares.



Top: Model 2400 mobile configuration
Bottom: Model 2400 base station configuration

The Model 2400 Radio

The Model 2400 Radio incorporates a full duplex communications channel to maximize access to all trains in the metro system. This technique provides for maximum data throughput and maintains the necessary system response requirements of the train control system.

The 2400 Mobile Configuration is designed specifically for the severe conditions that exist in the metro train environment. The unit is housed in a weatherproof NEMA-4 enclosure, ready for custom installation.

The 2400 Base Station Radio configuration incorporates the same electrical features as the mobile unit. Housed in a 19-inch rack mount enclosure or in a weatherproof NEMA-4 enclosure, it easily mounts on an outdoor pole or structure.

Complete Communications System

The Model 2400 is part of a complete line of communication system products developed by Andrew to meet the demanding requirements of the mass transit industry.

The 2400 Spread Spectrum Radio can be used with conventional antennas to cover large geographic areas or with Andrew RADIAX® cable for coverage in tunnels or other special applications.

Contact Andrew for additional information regarding the use of this radio and other products available for automatic train control systems.

Andrew Model 2400 Spread Spectrum Radio Specifications

Interface	Synchronous Data/Command	EIA RS-530 (Base station = 2, Mobile = 1)
	Synchronous Data Rate	128 Kbps (nominal) other rates available - contact Andrew
	Diagnostic	Asynchronous EIA RS-232 19.2 Kbps, N,8,1
	Asynchronous (Mobile only)	Asynchronous EIA RS-232 ≤ 19.2 Kbps,N,8,1 (Programmable)
Transceiver	Spread Rate	16.896 MHz
	Antenna Interface	50 ohms, Type N Female

	Mobile Radio	Base Radio
Transmitter		
Transmitter Frequency	2467.84 ± 13.5 MHz	2416.64 ± 13.5 MHz
Output Power	+28 dBm (+24 dBm linear)-adjustable	+28 dBm (+24 dBm linear)-adjustable
Transmitter Duty Cycle	up to 100% continuous operation	up to 100% continuous operation
Modulation	Gaussian Phase Shift Keying	Gaussian Phase Shift Keying
Receiver		
Receiver Frequency	2416.64 ± 13.5 MHz	2467.84 ± 13.5 MHz
Receiver Input Impedance	50 ohms	50 ohms
Receiver Noise Figure	≤7 dB	≤7 dB
Maximum Input	0 dBm	0 dBm
BER in AWGN	≤1*10E-05 for a -90 dBm input	≤1*10E-05 for a -90 dBm input
Power Supply		
Inputs	Selectable 18-32 or 21-56 Vdc	87 to 265 Vac, 47-63 Hz
Power Consumption	<50 watts	<50 watts
Transient Protection	Yes	Yes
Reverse Polarity Protection	Yes	NA
Environment		
Operating Temperature	-40°C to +70°C	-40°C to +70°C
Storage Temperature	-55°C to +85°C	-55°C to +85°C
Operating Humidity	0 to 95%	0 to 95%
Storage Humidity	0 to 95%	0 to 95%
Shock	3 g peak, 7-10 ms	NA
Vibration	0.4 g peak, 5-100 Hz	0.4 g peak, 5-100 Hz
Physical		
Size	16.5 x 13 x 5.5 in (419 x 330 x 140mm)	Indoor: 15 x 19 x 5.22 in (381 x 483 x 133 mm) Outdoor: 16.5 x 13 x 5.5 in (419 x 330 x 140 mm)
Weight	<50 pounds	<50 pounds
Enclosure	Weatherproof	Weatherproof (outdoor) standard 19" rack mount (indoor)
Regulatory		
FCC Part 15	Compliant	Compliant

Bidirectional Amplifiers for Spread Spectrum Communications

The Amplifiers are optimized to operate in conjunction with RADIAX® cable Type RCW5 and the Model 2400 spread spectrum radios. Bidirectional amplifiers compensate for attenuation losses in the cable. The amplifiers are designed to operate in a harsh mass transit system environment where reliability is crucial. Modular construction techniques are used throughout the design to facilitate ease of maintenance and repair.

Bidirectional Amplifier

Electrical Specifications	
Channels	2
Channel 1, MHz	2417 ± 13.5
Channel 2, MHz	2468 ± 13.5
Input Impedance, ohms	50
Gain, dB	30
Noise Figure, dB	8
Environmental Specifications	
Operating Temperature, °C	-40 to +70
Storage Temperature, °C	-55 to +85
Physical Specifications	
Power Requirements, Vac	87-132 (110 Vac Nominal) 170-265 (220 Vac Nominal) 47-63 Hz
Power Consumption, watts	50
Dimensions, in (mm)	20 (508) x 16 (406) x 7 (178)
Weight, lb (kg)	35 (16)

APEX™ Real-Time Operating System

New price/performance level for a Multitasking OS

Description

APEX is a real-time executive and operating environment which provides system designers with a fresh approach to real-time system design. APEX offers a high performance, multitasking environment which is designed to take advantage of the capabilities of today's highly integrated microcontrollers. APEX provides the user advanced features which are designed to reduce the life cycle costs normally associated with software maintenance.

Basic Features

- *Event-driven preemptive multitasking*
- *Modular, component based structure (system and user components)*
- *Device-independent file system*
- *Diagnostic tools built-in*
- *Protected mode operation*
- *Networking support*

Advanced Features

- *Named system object model*
- *Dynamic module loading and replacement. Unique transparent support for non-reentrant legacy code.*
- *Compressed firmware storage*
- *Highly integrated microcontroller orientation*

User Benefits

- *Modular, object-oriented structure improves code re-use*
- *Plug-and-Play flexibility reduces development time and life cycle costs*
- *System integrity checking reduces debug time*
- *File compression minimizes memory requirements*

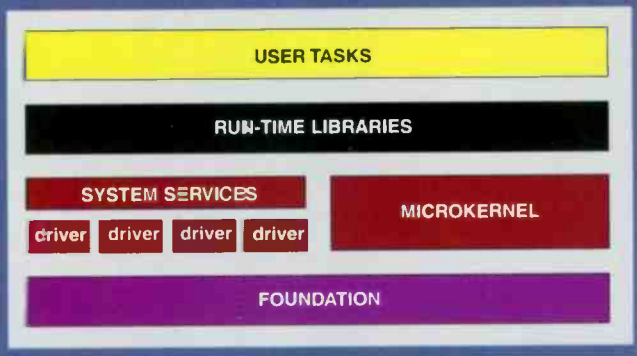
Targets Supported

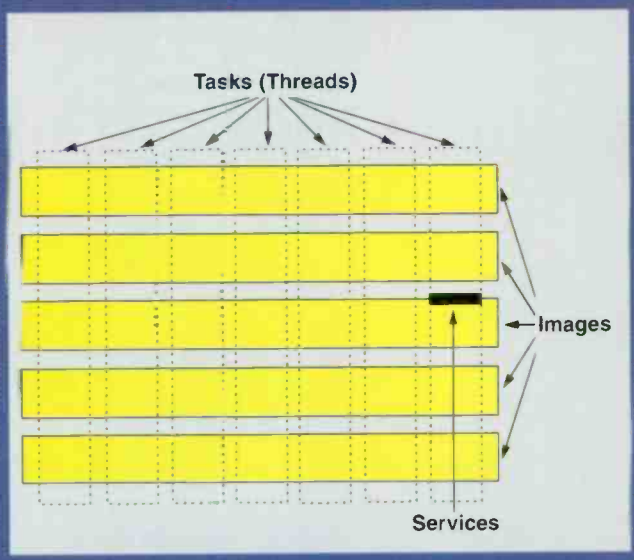
- *Motorola MPC 82x/860*
- *Motorola 68K family*
- *Others (inquire)*

The APEX Approach

APEX emphasizes modularity in system construction. Most of APEX is portable (kernel services, file system, networking) but APEX also includes a basic element, the Foundation, that is very carefully designed to take advantage of the target architecture. This approach is superior to the approach taken in conventional systems to emphasize portability at all costs because it allows performance to be optimized for each target architecture.

Wireless Communications





System Model

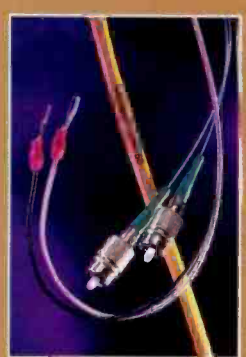
APEX uses a multiprogramming model that is different from the conventional approach. APEX appears to the user as a conventional layered real-time system, as shown above.

Internally, APEX uses a unique "layered virtual machines" system model in which execution context is divided into tasks and images. Tasks are the linear execution sequences familiar to programmers; Images are independently compiled objects with their own data and code sections. Transition (and communication) between tasks occurs conventionally, using the kernel and traditional services such as queues. Tasks may be embedded in any image. Transition between images is performed dynamically (using the system call instruction) to formally defined service points and managed by the virtual machine monitor embedded in the Foundation.

Wireless Distributed Communications

INDEX

Wireless Distributed Communications



Wireless Distributed Communications

Systems

For reliable delivery of wireless communications signals into difficult coverage areas - above ground nulls, building interiors, road and rail tunnels, mines, and ships.

Monitoring and Control Products

For remote determination of product and system "health" and setting of important parameters - Microprocessor based sensors and Windows based PC Graphic User Interface

Amplifier Products

For distortion free amplification of signal levels to increase coverage and overcome downlink and uplink losses - bidirectional and unidirectional, direct and heterodyne, band and channel selective.

Radiating Products

For last mile delivery of wireless signals to and from those who want to communicate - RADIAX® radiating cable and antennas.

Transmission Products

For efficient and low loss signal distribution over long distances - HELIAX® coaxial cable and composite optical fiber cable.

The SMART Approach to Customer Satisfaction

Customer Service Center - Call toll-free from: • U.S.A., Canada and Mexico 1-800-255-1479

Wireless Distributed Communications

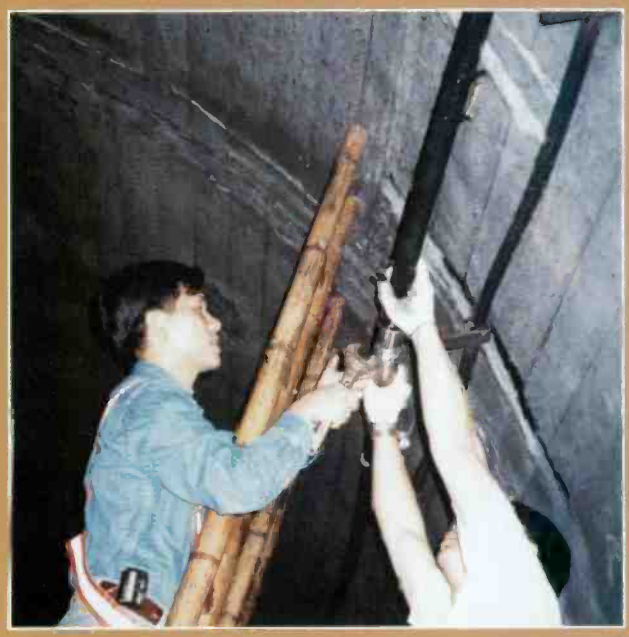
Introduction

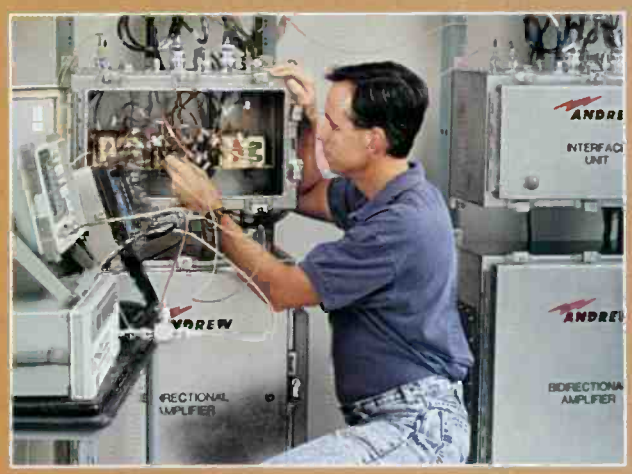
Through the use of distributed wireless communications technology, Andrew Corporation offers cost-effective Systems and Products designed to extend RF communications service access into areas where RF propagation does not naturally occur or is impeded. Solutions range from complete Andrew designed and supplied systems to the supply of Andrew products for customer designs. Andrew also offers installation, commissioning and maintenance, or any selection of those services that may be required by the Customer. The difficult coverage areas addressed include above-ground areas shadowed by physical obstructions, the interiors of buildings, underground areas such as road and rail tunnels, enclosed elevated transportation facilities, mines, and ships.

Andrew first applied distributed RF communications technology by extending land mobile radio service to difficult coverage areas for users involved in operations and public safety (Essential Services). As mobile radio technology evolves to digital formats, including TETRA (the new standard for Trans-European Trunked Radio), those Andrew applications continue on a global basis. Andrew Distributed Communications Systems now provide that same level of dependable difficult coverage area access to the users of the full range of Commercial wireless communications services. These Commercial services include Paging, Cellular, ESMR, and PCS, in the full spectrum of digital formats, including GSM and CDMA. Wireless Local Area Networks and Wide Area Networks also benefit from Andrew DCS solutions.

The increasing number of wireless communications services being offered to a dramatically growing number of users in a naturally limited radio frequency spectrum is challenging the technology. Addressing that capacity challenge has resulted in the development of new modulation techniques (requiring wider coherent bandwidths in which to operate) and higher carrier frequencies being licensed for Commercial use. Andrew Distributed Communications System and Product technologies are in a continuing state of development to keep pace with that technological evolution.

Andrew Distributed Communications Systems and Products now address requirements for wireless communications services requiring coherent bandwidths from 12.5 kHz through 200 kHz and 1.25 MHz, up to 12 MHz to 25 MHz and operating in the carrier frequency range of from under 100 MHz to over 2.4 GHz. Andrew Systems and Products supporting this range of wireless service characteristics are in place throughout the world.





Wireless Communications Services

What do they all have in common ?

A requirement for cost effective RF coverage for service users when and where they need to communicate !

Essential Services

Wireless services that involve operations and public safety are collectively referred to as Essential Services. Essential Services are generally provided by portable and mobile radio systems and, since life threatening situations may be involved, service access must be maintained even in the event of an accident or natural disaster. Since the early 1980's, Andrew Distributed Communications Systems and Products have provided that reliable access in the difficult RF coverage areas of buildings, airports, mass transit rail systems, road tunnels and rail tunnels throughout the world. In that process, Andrew has developed system architectures and products with both redundant and soft fail features that offer unparalleled availability and reliable service access for Essential Service users.

Commercial Services

Cellular, Paging, ESMR and PCS users have become accustomed to enjoying the use of wireless communications services as they roam freely within above-ground coverage areas. Increasing competition for subscribers has driven service providers to require the reliable extension of seamless service access to include underground and enclosed areas. Andrew fully supports those requirements through technical advances in both product and system design, including the marriage of optical fiber and radio frequency technologies. A growing number of cost effective Andrew systems for seamless extension of commercial wireless services to difficult coverage areas are in service throughout the world, to the benefit of satisfied subscribers, service providers, and system owners.

Cost Effectiveness

Andrew offers a full complement of alternative solutions. No one alternative is cost effective for all applications. To achieve cost-effective solutions, for RF coverage problems, Andrew uses a variety of techniques and a wide range of products. Product categories considered for each specific application include radiating products, transmission products, amplifier products, and monitoring and control products. To be cost effective, each system design makes use of product selections from these categories in a combination that makes best use of each of their attributes.

In-Building Systems

Providing uninterrupted wireless communications coverage in buildings is a necessity not only for essential services such as police and fire but is now demanded in the rapidly expanding commercial services market, including PCS. Andrew has a variety of products to extend coverage into hospitals, hotels, factories, convention centers, and other buildings. Andrew amplifiers provide the power and gain options required to overcome losses in distributed RF systems installed in facilities of all sizes.

RADIAX® radiating cables certified for installation in-buildings provides continuous radio coverage while remaining hidden from view.

Andrew can support your requirements from product applications support to full turnkey system designs.

Above Ground Systems

Dense urban environments, man-made structures, foliage, and varying terrain often work together to create holes or nulls in RF coverage areas above ground. Andrew Air Interface Amplifiers and Panel Antennas are ideally suited for extracting low level signals, amplifying them to a useable level, and retransmitting to cover null areas.

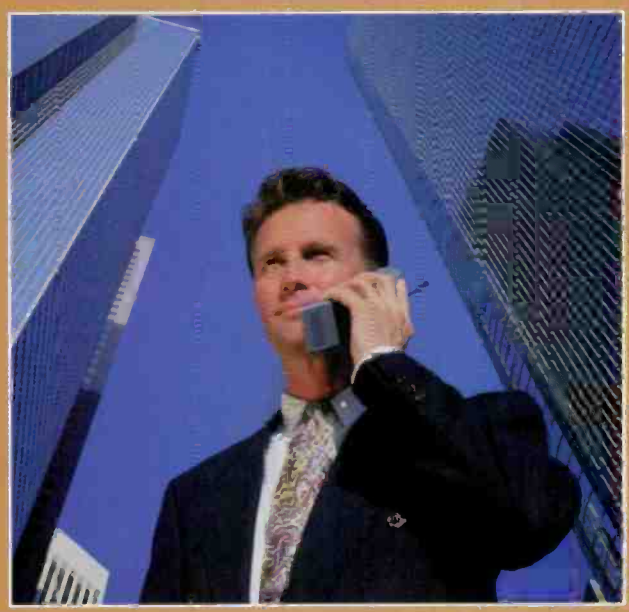
The air interface amplifier is designed using rugged materials and use a fanless cooling design to provide reliable operation under extreme environmental conditions.

The Panel Antenna is small, lightweight, with a high gain design to cover bidirectional services. Narrow azimuth beamwidth provides excellent isolation from unwanted donor sites while the wide elevation beamwidth minimizes alignment problems.

Tunnel Systems

Andrew amplifier and cable products may be found in applications which range from providing uninterrupted commercial services coverage through vehicular tunnels to providing essential services in large metro transportation systems. By using a combination of bidirectional amplifiers and RADIAX radiating cable, RF coverage limitations within road and rail tunnels are effectively eliminated and seamless handoffs at tunnel portals are provided.

Wireless Distributed Communications



Communications Products -

Amplifiers, System Monitoring, Supporting Products and Accessories

General

Andrew DCS Products consist of Band Selective and Channelized RF amplifiers, Heterodyne amplifiers and supporting products such as Remote Monitor and Control equipment and redundancy switching devices.

Series names for band selective amplifiers are: ACE, RADIAMP™ and the fiber optic-fed ACCESS. These units provide bandwidths ranging from 2 to 35 MHz and cover services allocated from 50 MHz through 2500 MHz.

The series name for channelized amplifiers is SELECTAmp. These units provide multiple channel bandwidth options and cover services allocated in the 800 MHz cellular, 900 MHz paging and 1900 MHz PCS frequency spectrums.

RF amplifiers are divided into two primary categories: Air Interface amplifiers and Distribution amplifiers. Within these two categories, the amplifiers are further distinguished by a higher or lower level of electrical integration. Products with lower levels of integration are less complex and more cost-effective for many systems solutions.

Products with higher levels of integration provide higher RF power capability, more extensive remote monitor and control option, and a variety of redundancy options.

Fiber Optic Amplifiers

ACCESS 1700 Series
PCS Services

Capitalize on unused site capacity with the ACCESS 1700 Series bidirectional amplifiers. Expand service areas by placing one to four RF amplifiers at remote locations away from the base station site using a fiber optic link. Page 678.

Air Interface Amplifiers

ACE 1500 and SelectAmp 1400 Series
PCS Services

This series of bidirectional amplifiers provides both band selective and channelized options for use in the 1800 - 2000 MHz PCS bands. Characterized by high gain, high power linear amplifiers and remote monitoring, this amplifier provides solutions for a variety of RF system applications. Pages 679-680.

ACE 1300 Series
US Cellular, GSM Cellular, 800 MHz or 900 MHz Trunked Radio

This line of air interface bidirectional amplifiers provides high gain and power output with remote monitor and control options. Feed forward error correction techniques are used in the ACE 1300 series for unsurpassed linearity to minimize system interference. Page 681.

SELECTAmp 1600 Series
900 MHz Paging

The SELECTAmp 1600 series unidirectional amplifier provides selective channel amplification of user specified frequencies in the 929 - 932 MHz paging band. Compatible with POCSAG and similar paging formats. Page 682.

Distribution Amplifiers

ACE 1100 Series
US Cellular, GSM Cellular, 800 MHz or 900 MHz Trunked Radio

The ACE 1100 series provides higher power output capabilities than the ACE 1000 series which allows for larger capacity systems or future expansion. Page 683.

ACE 1000 Series
US Cellular, GSM Cellular, 800 MHz or 900 MHz Trunked Radio

The lower power and medium gain characteristics of the ACE 1000 series amplifier makes it a cost-effective solution in smaller systems. Page 684.

RADIAMP 1200 Series
US Cellular, GSM Cellular, 800 MHz or 900 MHz Trunked Radio and UHF

RadiAmps are small, rugged bidirectional and unidirectional distribution amplifiers designed to operate in virtually any environment. The low-cost RadiAmp can be utilized with other Andrew RF amplifiers in tunnels and harsh environments. Page 686.

Heterodyne Amplifiers

For larger RF distribution systems with many RF channels where cascaded distortion can greatly effect system performance, Andrew offers its patented approach: The Heterodyne amplifier. Page 688.

Quick Index to DCS Amplifiers and Accessories

Amplifier Products

Supporting Products

System Monitoring, Accessories, and System Products

Andrew offers system designers a variety of products to complement the Amplifier Products described above.

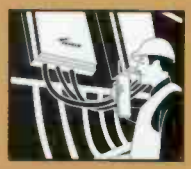
SMART. The SMART remote monitoring and control options provide hardware and software similar to, but more simplified than the GNS™. Like the GNS, the SMART interface to the user is Windows® based for ease of operation. The SMART system provides cost-effective remote monitoring and control for large or small systems that do not require the level of monitoring and control of the Graphical Network Sentinel.

Graphical Network Sentinel (GNS). The most sophisticated remote monitor and control equipment that Andrew offers is the GNS. It is intended to be utilized in larger systems where full system control from a remote site and detailed fault isolation are required. The user interface is a user-friendly Windows® based application operating on a standard PC.

Accessories. Andrew offers a comprehensive line of accessories to complete your RF system requirements.

Interface Switching Unit (ISU). This product, available with several system-related options, provides redundancy alternatives such as equipment redundancy (for use with an active and standby amplifier), reversing redundancy (for use when a back-up base station or head-end site is needed) and track-to-track redundancy (when parallel tunnels are present, the system can provide RF coverage from one tunnel to the other in the event of a cable break).

Base Station Interface (BSI). The BSI provides Radio Frequency to Intermediate Frequency down-conversion. This unit is part of the head-end equipment location and generates the IF necessary for operation of the Heterodyne Amplifiers.



Wireless Distributed Communications

ACCESS 1720 Series

Fiber Optic Interfaced Bidirectional Amplifier

The ACCESS 1720 series of fiber optic-fed amplifiers allows operators an opportunity to capitalize on unused site capacity and expand service areas by centrally locating costly base station equipment and placing less expensive fiber-fed amplifiers to distribute RF throughout the new coverage area. This allows operators to solve coverage issues at an affordable price.

A typical ACCESS1720 series fiber optic-fed amplifier system may consist of a single BTS Interface Unit at the donor site and up to four remote units.

An optional feature for the ACCESS1720 series fiber-optic fed amplifier includes SMART monitor and control. This provides real time health status of the BTS Interface, remote units and fiber optic links while allowing for remote configuration of the system gain. A standard monitor feature continually checks for fiber link connectivity.

Fiber Optic Amplifiers

Mechanical	
Power Supply:	
Remote Unit	115 Vac, 48-62 Hz
BTS Interface Unit	90-260 Vac, 47-63 Hz
Connectors, RF:	Type N Female
Connectors, Fiber:	FC-APC
Size:	
Remote Unit	24 x 20 x 8 in (610 x 510 x 203 mm)
BTS/SMART Interface Unit	10.5 x 19 x 14 in (267 x 483 x 356 mm)
Environmental Temperature:	
Remote Unit	-30 to 50°C
BTS Interface Unit	10 to 40°C

Remote Microcell Unit - Electrical, Typical	
Frequency Range:	1930 - 1945 MHz
	1850 - 1865 MHz, Band A
	1950 - 1965 MHz
	1870 - 1885 MHz, Band B
	1975 - 1990 MHz
	1895 - 1910 MHz, Band C
IS136 TDMA/PCS 1900 Output Power (-30 dBm Spurious):	
2 Carriers	22 dBm
4 Carriers	20 dBm
CDMA Output Power:	
Single Carrier:	2 Watts
Carrier to Noise:	
Power Output Per Carrier	100 mW (20 dBm)
30 kHz bandwidth	>60 dB
200 kHz bandwidth	>50 dB
1.25 MHz bandwidth	>45 dB
Noise Figure	≤14 dB
Dynamic Range, 4 Carriers:	
Power Output Per Carrier	100 mW (20 dBm)
CDMA	50 dBc
PCS 1900	55 dBc
IS-136 TDMA	60 dBc
Input Signal Level:	
CDMA	-112 to -52 dBm
PCS 1900	-92 to -52 dBm
IS-136 TDMA	-100 to -55 dBm

BTS/SMART Interface Unit - Electrical, Typical	
Frequency Range	1930 - 1990 MHz
	1850 - 1910 MHz
Max. Composite Input Power	30 dBm

Ordering Information

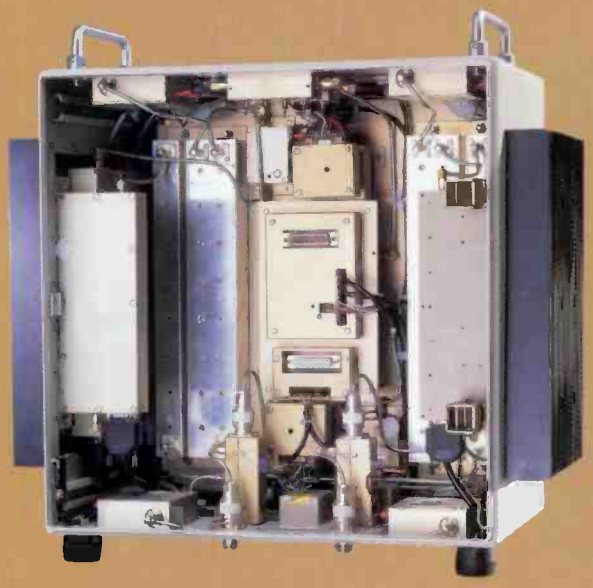
	Model Number
PCS MTA-A Band	**651721-5311-000**
PCS MTA-B Band	**651722-5311-000**
PCS MTA-C Band	**651723-5311-000**
PCS BTA-D Band	**651724-5311-000**
PCS BTA-E Band	**651725-5311-000**
PCS BTA-F Band	**651726-5311-000**
PCS BTS Interface Unit	**65FIBR-1720-000**
PCS BTS SMART Interface Unit	**65FIBR-1720-004**

For SMART options, substitute -001 for -000 in the model numbers above.

Wireless Distributed Communications

ACE 1500 Series

Band-Selective, Bidirectional Amplifier



The ACE1500 Series amplifier is a broadband bidirectional amplifier that provides signal level enhancement to the PCS spectrum. The amplifiers provide the broad gain range and high power output needed to sufficiently boost low-power RF signals to useable levels in a variety of cell extension and null-filling applications.

Each unit provides 50-80 dB gain in both uplink and downlink directions, automatic gain control in the uplink, and a linear, high-power amplifier stage. The unit may be remotely checked for health status and gain adjustment by ordering the SMART option. SMART is the Andrew remote monitoring and control system that allows complete real-time configuration for your application from a PC. For more information on SMARTsentry™ and SMARTpc™ please request bulletin 3590.

The amplifier housing is rugged for outdoor use and may be configured with battery backup by ordering the ac/dc converter accessory Type No. **65ACCE-1520-000**.

Mechanical	
Power Supply:	24 VDC ± 10% 300 Watts, Typical
Connectors, RF:	Type N Female
Connectors, dc:	Bulgin
Enclosure:	Nema type 4 (IP 65) - wall mount cabinet

Electrical - Typical	
Passband Gain:	50 - 80 dB in adjustable 3 dB steps
Passband Ripple:	3 dB pk-pk max.
Noise Figure:	6 dB at 80 dB gain
RF Port Impedance:	50 ohms nominal
1dB Compression:	> 42 dBm
3rd Order Intercept:	> 52 dBm
In-Band Spurious:	-30 dBm or better at 80 dB gain

Application Information

Request Application Brief AB-32-05

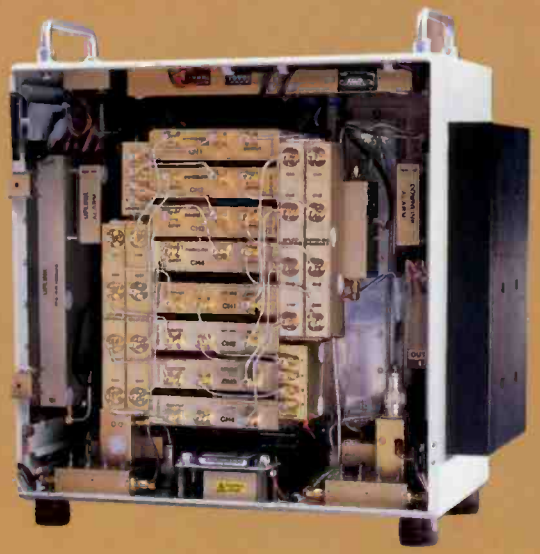
Ordering Information

	Model Number
PCS MTA-A Band	**651521-6868-000**
PCS MTA-B Band	**651522-6868-000**
PCS MTA-C Band	**651523-6868-000**
PCS BTA-D Band	**651524-6868-000**
PCS BTA-E Band	**651525-6868-000**
PCS BTA-F Band	**651526-6868-000**

Options/Accessories:

SMART Option With Hayes Compatible Modem
Substitute -001 for -000
AC/DC Converter With Battery Backup Capability:
Model No. **65ACCE-1520-000**

Wireless Distributed Communications



Mechanical	
Power Supply:	24 VDC ± 10% 335 Watts, Typical
Connectors, RF:	Type N Female
Connectors, DC:	Bulgin
Enclosure:	Nema type 4 (IP 65) - wall mount cabinet

Electrical - Typical	
Passband Gain:	50 - 80 dB adjustable in 3 dB steps
Passband Ripple:	3 dB pk-pk max.
Noise Figure:	< 6 dB at 80 dB gain
RF Port Impedance:	50 ohms nominal
Channel Bandwidths:	30 kHz or 200 kHz
1dB Compression:	> 42 dBm
3rd Order Intercept:	> 52 dBm

SELECTAmp 1400 Series

Channelized Bidirectional Amplifier

The SELECTAmp 1400 Series amplifier is a channelized bidirectional amplifier that provides signal level enhancement to the PCS spectrum. The amplifiers provide the broad gain range and high power output needed to sufficiently boost low-power RF signals to useable levels in a variety of cell extension and null-filling applications.

Each unit provides 50-80 dB gain in both uplink and downlink directions, automatic gain control in the channelizer cards to equalize signals going into the power amplifier section and linear high-power amplifier stages. The unit comes with a single channel which is field upgradeable to four by adding optional channel modules. Programming of the channel frequency and gain is accomplished by using an RS-232 interface.

The amplifier housing is rugged for outdoor use and may be configured with battery backup by ordering the ac/dc converter accessory Type No. **65ACCE-1520-000**.

Application Information

Request Application Brief AB-32-05

Ordering Information

	Model Number
PCS MTA-A Band	**651421-6868-00A**
PCS MTA-B Band	**651422-6868-00A**
PCS MTA-C Band	**651423-6868-00A**
PCS BTA-D Band	**651424-6868-00A**
PCS BTA-E Band	**651425-6868-00A**
PCS BTA-F Band	**651426-6868-00A**

Substitute For -A When Selecting Options:

A = Channel Bandwidth
0 = 30 kHz 1 = 200 kHz

Options and Accessories

AC/DC Converter With Battery Backup Capability: Model No. **65ACCE-1520-000**

Channel Modules:
651400-0000-030 - 30 KHz
651400-0000-200 - 200 KHz

Wireless or Wireline Remote Connection:
Contact Andrew

Wireless Distributed Communications

ACE 1300 Series

Band Selective Bidirectional Ampifier

The ACE 1300 series amplifiers are broadband bidirectional amplifiers that provide sufficient gain to overcome free space losses experienced by RF signals. These units provide high RF output power capabilities. The units are housed in rugged NEMA 4X enclosures for use in harsh outdoor environments.

Each unit provides 60 to 80 dB of gain and adjustment for each path is independently controlled. Automatic Gain Control allows the unit to be easily used in systems requiring dynamic levels. Passband filters accommodate the standard AMPS US Cellular, GSM Cellular, 800 MHz Mobile Radio and 900 MHz Mobile Radio Bands.

The unit is equipped with visual indicators for local diagnostics and fault isolation. Remote monitoring and control is achieved with the SMART interface. Communication with the SMART interface is via two wire connection or the optional cellular automatic dial-up modem.

Mechanical	
Enclosure Type	NEMA 4X
Height, in (mm)	24 (610)
Width, In (mm)	20 (508)
Depth, In (mm)	12 (305)
Weight, lb (kg)	70 (38) max
Operating Temperature, °C	50 (max) -30 (min)
RF Connectors	Type N 7/16 DIN (option)
Power Input	110 Vac 220 Vac (option)

Application Information

Request Application Brief AB-32-06

Ordering Information

	Model Number
800 MHz Cellular	
A Band	651314-5858-000
B Band	651315-5858-000
800 MHz Trunked Radio	651312-5858-000
900 MHz GSM Cellular/Trunked Radio	651316-5858-000
SMART Option With Hayes Compatible Modem: Substitute -001 For -000	

Electrical Specifications - Typical

	US Cellular, 800 MHz Mobile Radio		900 MHz Mobile Radio, GSM Cellular	
	Downlink	Uplink	Downlink	Uplink
Gain (dB)	60 - 80 dB (potentiometer adjust) with AGC		60 - 80 dB (potentiometer adjust) with AGC	
3rd Order Intercept Point, dBm	≥52	≥52	≥50	≥50
1 dB Compression Point, dBm	≥38	≥38	≥38	≥38
Pass Band Ripple, dB	≤4	≤4	≤4	≤4
Noise Figure, dB	≤9	≤9	≤9	≤9
Input/Output VSWR	≤2:1	≤2:1	≤2:1	≤2:1
Power Dissipation, W	≤150	≤150	≤150	≤150

Wireless Distributed Communications

SELECTAmp 1600 Series

Channelized Unidirectional Amplifier

The SELECTAmp 1600 series Unidirectional Amplifier gives paging service providers the ability to extend coverage into areas previously shielded to RF penetration. The amplifier is channelized for high selectivity which allows for rejection of any other paging services in the area.

The SELECTAmp 1600 has selective channel amplification of frequencies in the 929 - 932 MHz paging band. The unit will pass up to four frequencies selected by the operator. It comes configured for single channel operation. An individual gain adjustment for each channel allows for continuous control through the 60 - 100 dB gain range. A single, 9-pin, D-subminiature connector is provided for the operator to input the desired channels. This input requires the use of an RS-232C interface and factory provided software.

Internal active circuitry is continuously monitored for health status. An external volts free contact closure provides the interface connection point to the users monitor system.

Ordering Information

	Model Number
SELECTAmp, Single Channel	651618-40UU-000
Additional Channel Modules	651618-40UU-001

Mechanical	
Size, HxWxD, in (mm)	14 x 10 x 15 (350 x 250 x 380)
Installation Weight, lb (kg)	34 (15)
Cooling	Natural Convection
RF Connectors, Input/Output	Type N Female
Other Connectors	One 9-Pin, D-Subminiature for Frequency Select
Power	3 Wire, 90 - 260 Vac @ 1 Ampere
Status	Alarm LED, and dry relay contacts on front panel.
Standard Configuration	1 Channel
LED off and contacts open = Fault	
Temperature, Operating, °C	0 - 50
Humidity, Operating	Up to 90% non-condensing

Electrical - Typical	
Frequency Range	929 MHz - 932 MHz in 12.5 kHz steps
Noise Figure	10 dB, maximum
Maximum Input Signal without damage	-25 dBm
Power Gain, each channel, dB	60 -100, continuously adjustable
Power Output	1 Watt, composite power

Wireless Distributed Communications

ACE 1100 Series

Band Selective Bidirectional Amplifier

The ACE 1100 series Band Selective Bidirectional Amplifier features a rugged design like the ACE 1000 series but provides more power output. The higher output capability is designed for use in larger in-building type distribution systems with many carriers or for smaller systems that may eventually grow in size due to increased user demand.

The ACE 1100 features a 20 watt linear power amplifier in the downlink and a 1/2 watt of linear output power in the uplink. A front panel provides access to switched attenuator contols that are used to independently adjust gain in each path over the 10 - 40 dB range. Due to the dynamic nature of uplink transmissions, Automatic Gain Control is offered to avoid system interference from high level inputs. The amplifier enclosure is rugged and features fanless cooling for high reliability. The power input connector is an IEC standard for universal ac input.

Internal active circuitry is continuously monitored for health status with the summary status displayed at the front panel LED grid. An external form C contact closure provides the interface connection point to the user's monitor system or Andrew's remote monitor and control, SMARTpc™ and SMARTSentry™ system, can interface with the amplifier to provide pager call up notification.

Ordering Information

	Model Number
800 MHz Cellular A&B Band	**651113-5434-000**
800 MHz Trunked Radio	**651112-5434-000**
GSM/900 MHz Trunked Radio	**651116-5434-000**

For SMART options, substitute -001 for -000 in the model numbers above

Electrical Specifications - Typical

Description	AMPS Cellular Downlink	AMPS Cellular Uplink	800 MHz Trunked Radio Downlink	800 MHz Trunked Radio Uplink	900 MHz Trunked Radio/GSM Downlink	900 MHz Trunked Radio/GSM Uplink
Frequency of Operation, MHz	869 - 894	824 - 849	851 - 869	806 - 24	935 - 960	890 - 915
Gain, dB	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40
3rd Order Intercept, dBm	50	37	50	37	50	37
Output at 1 dB Compression, dBm	40	27	40	27	40	27
Pass Band Ripple, dB	4	4	4	4	4	4
Noise Figure, dB	8	8	11	9	8	8
VSWR	2:1	2:1	2:1	2:1	2:1	2:1
Input Voltage, VAC, 47 - 70 Hz	90 - 260	90 - 260	90 - 260	90 - 260	90 - 260	90 - 260
Power Consumption, Watts	160	160	160	160	160	160
Enclosure Type	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)
Size, in (mm)	16 x 16 x 8.5 (406 x 406 216)	16 x 16 x 8.5 (406 x 406 216)	16 x 16 x 8.5 (406 x 406 216)	16 x 16 x 8.5 (406 x 406 216)	16 x 16 x 8.5 (406 x 406 216)	16 x 16 x 8.5 (406 x 406 216)
AC Power Inlet	IEC	IEC	IEC	IEC	IEC	IEC
RF Connectors	Type N Female	Type N Female	Type N Female	Type N Female	Type N Female	Type N Female
Operating Temperature Range, °C	-20 to 50	-20 to 50	-20 to 50	-20 to 50	-20 to 50	-20 to 50

Wireless Distributed Communications

ACE 1000 Series

Band Selective Bidirectional Amplifier

The ACE 1000 Series amplifier is a bidirectional amplifier designed specifically for in-building RF coverage extension for cellular or two-way trunked radio services. The small package can mount almost anywhere within a building. Each ACE amplifier provides 30 - 40 dB of gain in each direction. An ACE pair can be used in off-air interface or a single ACE in distribution applications, along with RADIAX® or HELIAX® cables.

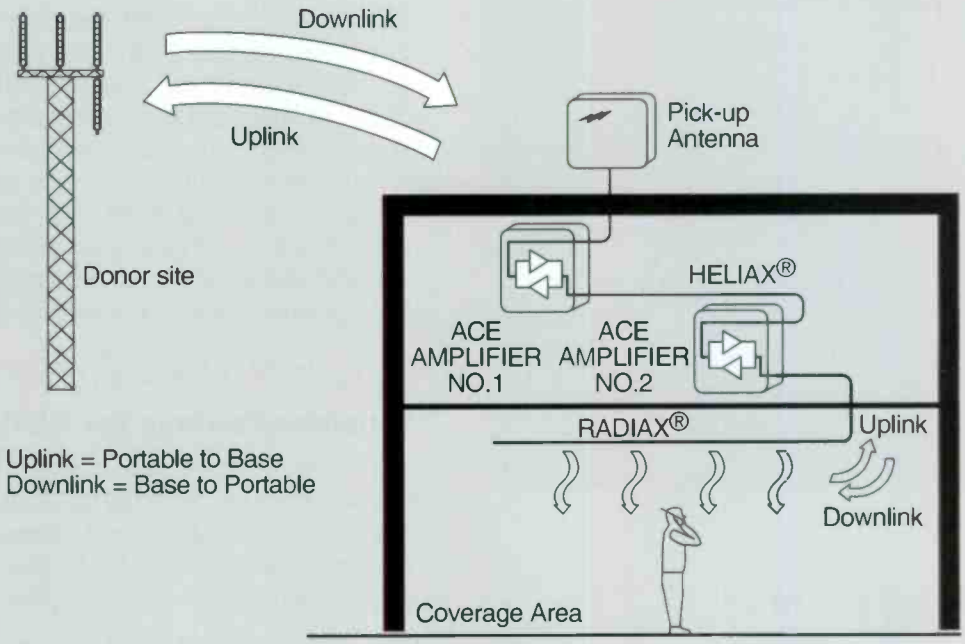
Ordering Information

	Amplifier No. 1	Amplifier No. 2
800 MHz Trunked Radio		
Basic Amplifier	**651012-1444-100**	**651012-4414-200**
With AGC Only	**651012-1444-101**	**651012-4414-201**
With SMART Only	**651012-1444-102**	**651012-4414-202**
With SMART/AGC	**651012-1444-103**	**651012-4414-203**
800 MHz Cellular A&B Bands		
Basic Amplifier	**651013-1444-100**	**651013-4414-200**
With AGC Only	**651013-1444-101**	**651013-4414-201**
With SMART Only	**651013-1444-102**	**651013-4414-202**
With SMART/AGC	**651013-1444-103**	**651013-4414-203**
GSM/900 MHz Trunked Radio		
Basic Amplifier	**651016-1444-100**	**651016-4414-200**
With AGC Only	**651016-1444-101**	**651016-4414-201**
With SMART Only	**651016-1444-102**	**651016-4414-202**
With SMART/AGC	**651016-1444-103**	**651016-4414-203**

Electrical Specifications - Typical

Description	AMPS Cellular Downlink	AMPS Cellular Uplink	800 MHz Trunked Radio Downlink	800 MHz Trunked Radio Uplink	900 MHz Trunked Radio/GSM Downlink	900 MHz Trunked Radio/GSM Uplink
Frequency of Operation, MHz	869 - 894	824 - 849	851 - 869	806 - 824	935 - 960	890 - 915
Gain, dB	30 - 40	30 - 40	30 - 40	30 - 40	30 - 40	30 - 40
3rd Order Intercept, Amp No. 1, dBm	+27	+40	+27	+40	+27	+40
1 dB Compression Point, Amp No. 1, dBm	+17	+30	+17	+30	+17	+30
3rd Order Intercept Point, Amp No. 2, dBm	+40	+27	+40	+27	+40	+27
1 dB Compression Point, Amp No. 2, dBm	+30	+17	+30	+17	+30	+17
Pass Band Ripple, dB	<4	<4	<4	<4	<4	<4
Noise Figure, Amp No. 1, dB	10	10	11	9	–	–
Noise Figure, Amp No. 2, dB	–	–	9	11	10	10
VSWR	2:1	2:1	2:1	2:1	2:1	2:1
Input Voltage, Vac, 47 - 70 Hz	90 - 260	90 - 260	90 - 260	90 - 260	90 - 260	90 - 260
Power Consumption, Watts	50	50	50	50	50	50
Enclosure Type	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)	NEMA4 (IP66)
Size, in (mm)	13 x 9.9 x 4.8 (330 x 251x 122)	13 x 9.9 x 4.8 (330 x 251x 122)	13 x 9.9 x 4.8 (330 x 251x 122)	13 x 9.9 x 4.8 (330 x 251x 122)	13 x 9.9 x 4.8 (330 x 251x 122)	13 x 9.9 x 4.8 (330 x 251x 122)
AC Power Inlet	Turck RSF30	Turck RSF30	Turck RSF30	Turck RSF30	Turck RSF30	Turck RSF30
RF Connectors	Type N Female	Type N Female	Type N Female	Type N Female	Type N Female	Type N Female
Operating Temperature Range, °C	-20 to 50	-20 to 50	-20 to 50	-20 to 50	-20 to 50	-20 to 50

Wireless Distributed Communications



The ACE Off-Air Extension system

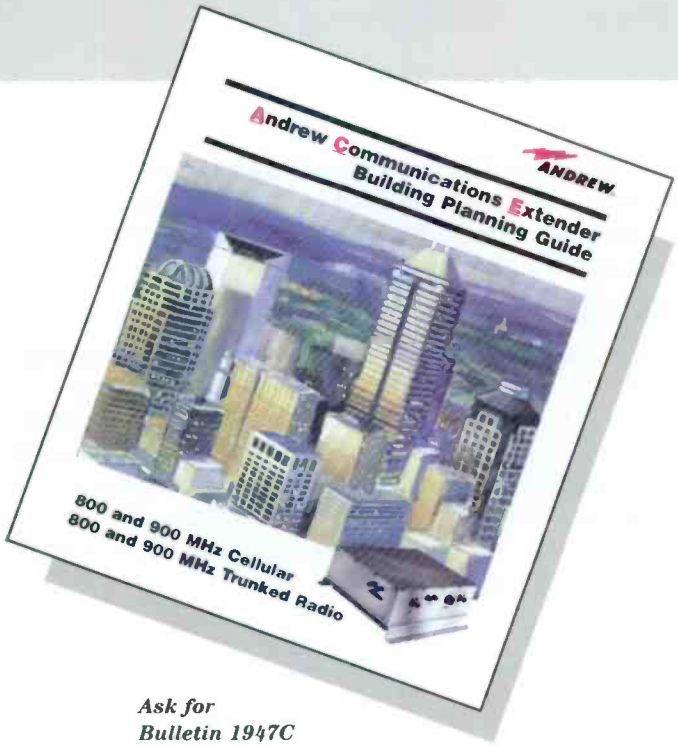
Application Information

ACE Amplifiers can be used as off-air interface or as line distribution amplifiers. When used as off-air, two ACE amplifiers in tandem can be used to provide 60-80 dB of gain. In the downlink path, ACE No. 1 provides pre-amplification and ACE No. 2 provides power amplification. In the uplink path, the opposite occurs, with ACE No. 2 providing pre-amplification and ACE No. 1 providing power amplification.

ACE No. 2 can also be used as a line distribution amplifier to continue coverage along a length of HELIAX® or RADIAX® as an alternative to RADIAMP™ when additional gain (> 20 dB) or output power is required over that of the RADIAMP.™

The ACE amplifier can be provided with a variety of options, including Automatic Gain Control, Remote Monitoring, and NEMA Enclosures for outdoor environments.

Details on how to install your own ACE in-building system are provided in the Andrew Building Planning Guide. This guide provides system designers the information necessary to design, install, and operate an in-building system.



Ask for Bulletin 1947C

Wireless Distributed Communications

RADIAMP™ 1200 Series

Band-Selective, Bidirectional Amplifier

General

The RADIAMP 1200 series is a Broadband RF Distribution Amplifier designed to be small, rugged and easily utilized by system designers. It is suitable for use with In-Building and Tunnel environments.

RADIAMP 1210 Paging Amplifier

The 1210 Series RADIAMP is a 10-20 dB gain unidirectional unit operating in the 172 or 280 MHz paging bands. The 1210 Series can be used as a line amplifier to overcome HELIAX® cable attenuation losses for small RF Distribution Systems or as a booster amplifier to maintain signal coverage for small sections of a larger system utilizing RADIAX® radiating cable or point-source antennas.

RADIAMP 1212, 1213, and 1216

The 1212, 1213 and 1216 Series RADIAMPS are bidirectional Band-Specific Distribution Amplifiers with variable gain from 10 to 20 dB. Specific bands of operation include AMPS Cellular, GSM Cellular and 800/900 MHz Mobile Radio. Uses include line amplification to overcome attenuation losses in HELIAX cable and as a booster amplifier to improve RF signal levels in RF Distribution Systems utilizing RADIAX or point source antennas. The unit is available with an option for Automatic Gain Control, which limits output RF power at a customer-specified level.

Application Information

Supplying Power to the RADIAMP 1200 Series

DC Power can be supplied to the RADIAMP by one of two ways: via the external dc input connector or via the RF cable. If the external connector is used, the unit must be supplied with 1 AMP (max) @ +15 Vdc by using a power supply such as the Andrew ac-dc Power Supply.

The alternative is to apply dc power to coaxial cable such as RADIAX or HELIAX. The RADIAMP will then draw its needed dc power from the RF connector. In this case, the following points must be addressed by the user:

1. *The coaxial cable center conductor is dc positive (between +16 and +20 Vdc).*
2. *Typically, three RADIAMP Series units can be cascaded in any one direction.*
3. *The user must determine the dc voltage drop along the coaxial cable to ensure that proper dc input voltages exist at the RF port of each RADIAMP.*
4. *The user can use devices such as the Andrew Bias-Tee and dc block to apply and terminate dc current flow on the coaxial cable.*

Mounting the RADIAMP with RADIAMP Hangers

Although several options for mounting RADIAMP exist, many users find the Andrew RADIAMP mounting hanger (a variety of our self-locking hanger) ideal to provide reliable and easy installation of the amplifiers. Two RADIAMP mounting hangers, when properly mounted, secure a single RADIAMP to concrete, drywall or wood. Each RADIAMP mounting hanger requires two 1/4", 5/16" or 3/8" lag bolts and four flat washers for mounting. Anchors should be used when securing the hangers to concrete, masonry or drywall.

RADIAMP™ 1200 Series Typical Electrical Specifications and Ordering Information

	Band 1	Band 2
Unidirectional Amplifiers - 1210 Paging Amplifiers		
Frequency of Operation, MHz	171 - 173	279 - 281
Model No., Basic Amplifier	651210-32UU-001	651210-32UU-002
Model No., With AGC	651210-32UU-003	651210-32UU-004
Gain, dB	10 - 20	10 - 20
3rd Order Intercept Point, dBm	≥37	≥37
1 dB Compression Point, dBm	≥27	≥27
Noise Figure, dB	≤ 9	≤ 9
Power, Watts	< 10 @ +15 Vdc	< 10 @ +15 Vdc

Bidirectional Amplifiers - 1212, 1213, and 1216, Typical Specifications

Description	AMPS Cellular Downlink	AMPS Cellular Uplink	800 MHz Trunked Radio Downlink	800 MHz Trunked Radio Uplink	900 MHz Trunked Radio/GSM Downlink	900 MHz Trunked Radio/GSM Uplink
Frequency of Operation, MHz	869 - 894	824 - 849	851 - 869	806 - 824	935 - 960	890 - 910
Model No., Basic Amplifier	651212-3212-000	–	651213-3212-000	–	651216-3212-000	–
Model No., With AGC	651212-3212-001	–	651213-3212-001	–	651216-3212-001	–
Gain, dB	10 - 20	10 - 20	10-20	10 - 20	10 - 20	10 - 20
3rd Order Intercept Point, dBm	≥35	≥26	≥35	≥26	≥35	≥26
1 dB Compression Point, dBm	≥27	≥17	≥27	≥17	≥27	≥17
Noise Figure, dB	≤ 12	≤ 8	≤ 12	≤ 9	≤ 12	≤ 8
Power, Watts	< 15	< 15	< 15	< 15	< 15	< 15

RADIAMP Mechanical Specifications

Description	1210 Paging Amplifier	1212, 1213 and 1216 Amplifiers
Enclosure Type	NEMA 4 (IP66)	NEMA 4 (IP66)
Length, in (mm)	6 (152)	12 (305)
Diameter, in (mm)	3.5 (90)	3.5 (90)
Weight, lb (kg)	2.5 (1.1)	5.4 (2.5)
Max. Operating Temperature, °C	50 (122)	50 (122)
Min. Operating Temperature, °C	-20 (-4)	-20 (-4)
RF Connectors	Type N Female	
DC Input Connector	Switchcraft 712A Series, center pin ground or Type N connector, center pin positive	
Input Voltage, Vdc	+15 Vdc, center pin ground using 712A connector +16 Vdc to +21 Vdc, center pin positive using coax connector	

Accessories

Description	Type Number
Power Supplies,	
Desk Top, 90 - 265 Vac, IEC receptacle	**EPWSP-00018**
Wall Mount, 120 Vac	**EPWSP-00019**
Desk Top, 90 - 265 Vac, with integral power cord	**EPWSP-00023**
Connector, dc Power, pack of five	**EJKPW-50004**
Bias Tee, Type N, female connectors	**EBAST-10001**
Hanger, Self-Locking, RADIAMP mounting	**ECLMP-70032**

Wireless Distributed Communications

Heterodyne Tunnel Distribution Amplifiers

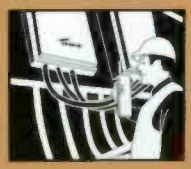
The Heterodyne Amplifier is part of the Andrew patented solution to overcoming severe cascaded distortion in larger Distributed Communications Systems with many active RF channels. When standard broadband amplifiers are used in such systems, distortion cascaded through the system can exceed power levels that violate system carrier-to-distortion performance. The Andrew Heterodyne Amplifier reduces this problem by eliminating cascaded RF signals entirely. Instead, a low frequency, low power signal is created at the head-end or base station, and this signal is cascaded throughout the system, greatly reducing the intermodulation distortion experienced with higher power, higher frequency RF signals. In each Heterodyne Amplifier, the low frequency signal is up-converted to its original RF form, amplified, and fed to RADIAX® radiating cable to provide RF signal coverage.

The Heterodyne Amplifier is housed in the same rugged NEMA 4X enclosure as the Andrew Distribution Amplifiers. Because of the special nature of this product, and its intended use for large systems, it is treated as a semi-custom product. Currently, Heterodyne Amplifiers are available in the UHF and VHF frequencies. Customer-specific passbands are utilized in order to optimize filter and down-converted frequency selection.

Ordering Information

Contact Andrew for ordering information.

Wireless Distributed Communications

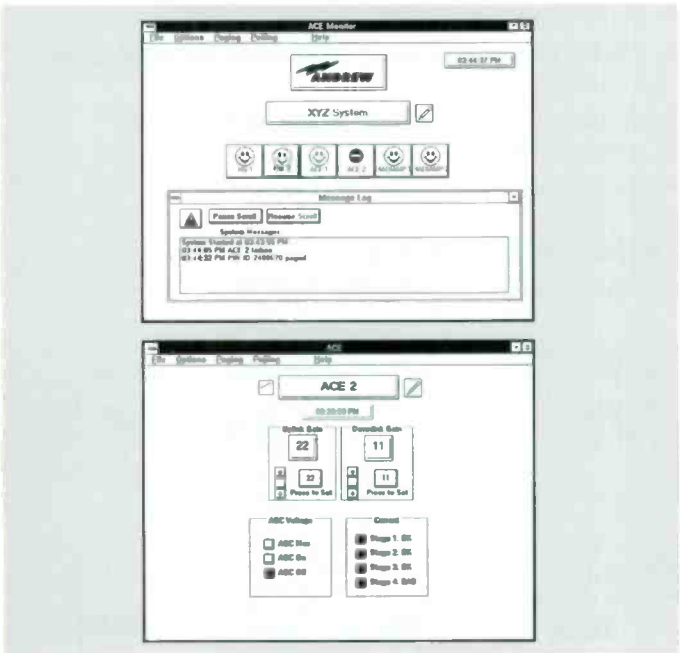


System Monitoring and Remote Tuning SMART

The Ultimate in Low-cost Flexibility

Description

SMART is the Andrew low-cost integrated solution to all your monitoring and control needs. It consists of SMARTpc control software that runs on any IBM-compatible PC capable of running Windows 3.1 or subsequent upgrades, and a SMARTsentry in each monitored device. The SMARTsentry can be mounted internally or externally. It is easy to add to the ACE, RADIAMP™, and air interface families of boosters, as well as other devices.



IBM is a registered trademark of International Business Machines Corporation.
Windows is a registered trademark of Microsoft Corporation.

Summary of Features

- *Can be fully configured and customized by user*
- *Uses standard telephone lines for status and control*
- *Automatic call-in from SMARTsentry upon fault occurrence*
- *Programmable call-out interval from SMARTpc*
- *SMARTpc automatically sends text paging messages to support personnel*
- *User-definable auxiliary monitoring points for entry alarm, room temperature, etc.*
- *Supports RADIAMP, ACE, Air Interface and other devices*

System Requirements

- *SMARTpc: any IBM®-compatible PC capable of running Windows® 3.1 or subsequent upgrades. A Hayes-compatible modem*
- *SMARTsentry: 17.5 - 25 Vdc (supplied by all Andrew RF equipment) and ground. RJ-11 phone jack*

SMARTsentry Interfaces

- *Digital: 16 inputs, 8 outputs (TTL)*
- *4 user-definable digital inputs (TTL)*
- *Analog: 4 inputs, 4 outputs (0-13V)*
- *RJ-11 modular connector for modem*
- *Optional RS-232/RS-422 interface*
- *RJ-45 modular connector for local connection*

Summary Status Display

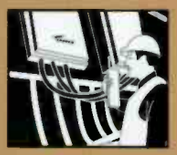
- *Customized top-level status of all monitored devices or sites*
- *Automatically arranged from text configuration file*
- *User-definable intervals between outbound status phone calls*
- *User-initiated phone calls on demand for status or command initiation*

Detail Status Display

- *Displays all readable and set parameters in the device*
- *User ID and password protection for all changes to equipment*

Ordering Information

	Model Number
SMARTsentry™	385615-8001-021
SMARTpc™ Software	385615-9001-001



Wireless Distributed Communications

Graphical Network Sentinel™ GNS™

Full-Featured Distributed Monitoring and Control

Description

The GNS is the Andrew full-featured monitoring and control system for distributed communications systems requiring autonomous local and remote control. It consists of Windows® based Network Management Terminal (NMT) and Network Interface Unit (NIU) software and a Alarm and Control Unit (ACU) embedded in each monitored device.

Windows is a registered trademark of Microsoft Corporation.

Summary of Features

- *Status information of the RF system presented in three levels of detail*
- *Automatic fault isolation and reporting to the LRU level*
- *Uses twisted wire pair and multidrop MSK signaling to link NMT to ACUs*
- *Local amplifier redundancy control provided by ACUs in RF equipment*
- *Remote monitoring, tuning and redundancy controlled by NMT*
- *Detailed state change and event messages generated by ACUs are stored in database and printed at the NIU*
- *NMT can be operated remotely from any PC via network backbone or dialup line*
- *NIU can control external alarms, and SCADA systems (optional)*
- *Logging of customer specific system information (optional)*
- *Automated textual paging of support personnel (optional)*

Network Management Terminal (NMT)

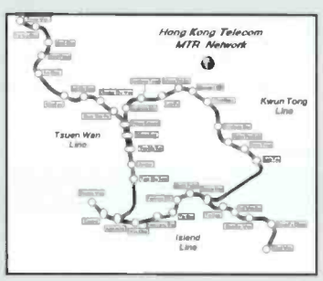
- *Provides view of entire control network*
- *Real-time status display and event logs*

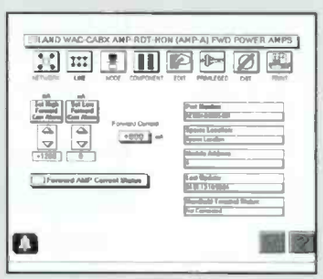
Network Interface Unit (NIU)

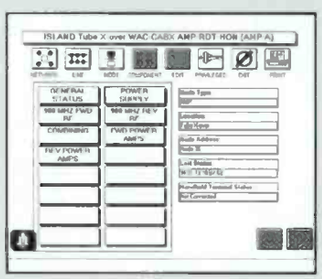
- *Provides gateway for NMT users via network backbone, dialup line or direct connection*
- *Supports multiple NMT sessions concurrently*
- *Automated fault isolation to LRU level*
- *Reporting to SCADA, pagers, alarms*
- *Autonomous operation*
- *State change and event messages stored in database and also printed*
- *Graphical user interface allows easy system configuration*
- *Extensible with custom plug-ins*

Ordering Information

Contact Andrew for ordering information.







Accessories

Antennas

Panel Antenna. The panel antenna is a highly directive roof-top antenna with 12 dB of gain that operates from 805 - 960 MHz. The unit offers a cost-effective solution for off-air applications .....Type **EANTT-00004**

Radiating Termination. This broadband stub antenna provides an omnidirectional radiation pattern in the 804 - 946 MHz range and is used in RADIAX® or HELIAX® applications to provide a launch for the signal from the end of the cable or through a RADIAX tap.

.....Type **EANTT-00003**

RADIAMP™ Power Supply

These small, cost-effective ac-dc power supplies accept a wide range of ac voltage inputs and provide suitable regulated dc power for RADIAMP™ amplifiers. The power supplies have a 6 ft dc power cord.

Desk Top Power Supply, 120/220 Vac, IEC receptacle (no cord) .....Type **EPWSP-00018**

Desk Top Power Supply, 120/220 Vac, integral 110 (VAC cord) .....Type **EPWSP-00023**

Wall Mount Power Supply, 120 Vac .....Type **EPWSP-00019**

RADIAMP Mounting Hangers

Two of these self-locking hangers securely mount a RADIAMP to walls and ceilings. Easily attached to concrete, drywall or wood using lag bolts (and anchors for concrete or drywall). Each package contains one pair of hangers.

Pair Self-Locking Hangers .....Type **ECLMP-70032**

RADIAMP dc Input Connectors

For use with 1200 Series RADIAMP amplifiers. These dc connectors are sold in packages of five.

.....Type **EJKPW-500004**

Wireless Distributed Communications

Bias-Tee

Used to add dc power to any coaxial cable. Ideal for use with RADIAMP™ to take advantage of using a single dc power supply to power several amplifiers. Has two RF connectors and one circular dc power connector. dc passes between the dc connector and one RF connector while the other RF connector is isolated from the dc. The mating dc cable connector is supplied with this product. Operates from 200 MHz to 1 GHz.

BIAS-TEE, 200 MHz-1 GHz, 7-16 DIN Connectors .....Type **EBAST-10000**

BIAS-TEE, 200 MHz-1 GHz, Type N Connectors .....Type **EBAST-10001**

BIAS-TEE, 1700-2000 MHz, Type N Connectors .....Type **65BIAS-T000-000**

DC Block

A high pass-filter that prevents the flow of dc on a coaxial cable. Operates from 200 MHz to 2 GHz.

DC Block, 200 MHz-2 GHz, Type N Connectors .....Type **EBLOK-00002**

DC Block, 200 MHz-2 GHz, 7/16 Din Connectors .....Type **EBLOK-00003**

Handheld Terminal

Light weight, rugged keypad unit that controls and communicates diagnostic information from Andrew amplifiers, ISUs, and BSIs that contain a Status/Control unit (SMARTcard). The Handheld Terminal comes with a 6 ft connectorized cord. Comes with or without password protection. (Note: password protection only available in systems employing the Andrew Graphical Network Sentinel).

Handheld Terminal, with password protection .....Type **ETRMH-10000**

Handheld Terminal, without password protection .....Type **ETRMH-10001**

Wireless Distributed Communications

System Products

General

The products in this section include specialty products such as the Base Station Interface (BSI) for use with the Heterodyne Amplifiers, and the Interface Switching Unit (ISU) to provide system redundancy.

Base Station Interface (BSI)

The Base Station Interface (BSI) is a rack-mounted unit that provides head-end interface to a system utilizing Heterodyne Amplifiers. The Base Station Interface samples RF signals at the head-end and generates the requisite low frequency down-converted duplicate of the RF signals. The Base Station Interface also generates a system reference Pilot Signal that provides phase lock for the up-converters within the Heterodyne Amplifiers. The unit is powered by 110 or 220 Vac and can accommodate either SMART or GNS™ remote monitor/control connection.

Interface Switching Unit (ISU)

The Andrew Interface Switching Unit is designed to work with Andrew Distribution or Air Interface Amplifiers to provide a variety of levels of equipment and system redundancy. Equipment redundancy is achieved with the ISU connected to two RF amplifiers; one amplifier operates in active mode and one in hot (powered) standby. System redundancy consists of two types: reversing redundancy and track-to-track redundancy. ISUs for these two types of system redundancy are available with and without equipment redundancy switching.

Reversing redundancy allows a system to operate through one of two head-end equipment locations. One head-end operates in normally active mode, with a second head-end location operating as a hot standby. If a system failure occurs, the ISU essentially "reverses" system operation up to the point of failure, allowing system operation in the failed part of the system via the standby head-end location.

Track-to-track redundancy is useful in systems with parallel twin tunnels. Should a failure occur in one tunnel, the ISU in that tunnel and its companion ISU in the other tunnel switch into a mode that allows the two ISUs to operate via the same RF path to the head-end equipment. If a cable failure has occurred in the middle of a tunnel section, the ISU track-to-track feature allows RF signals to be "back-fed", or reversed, up to the point of failure.

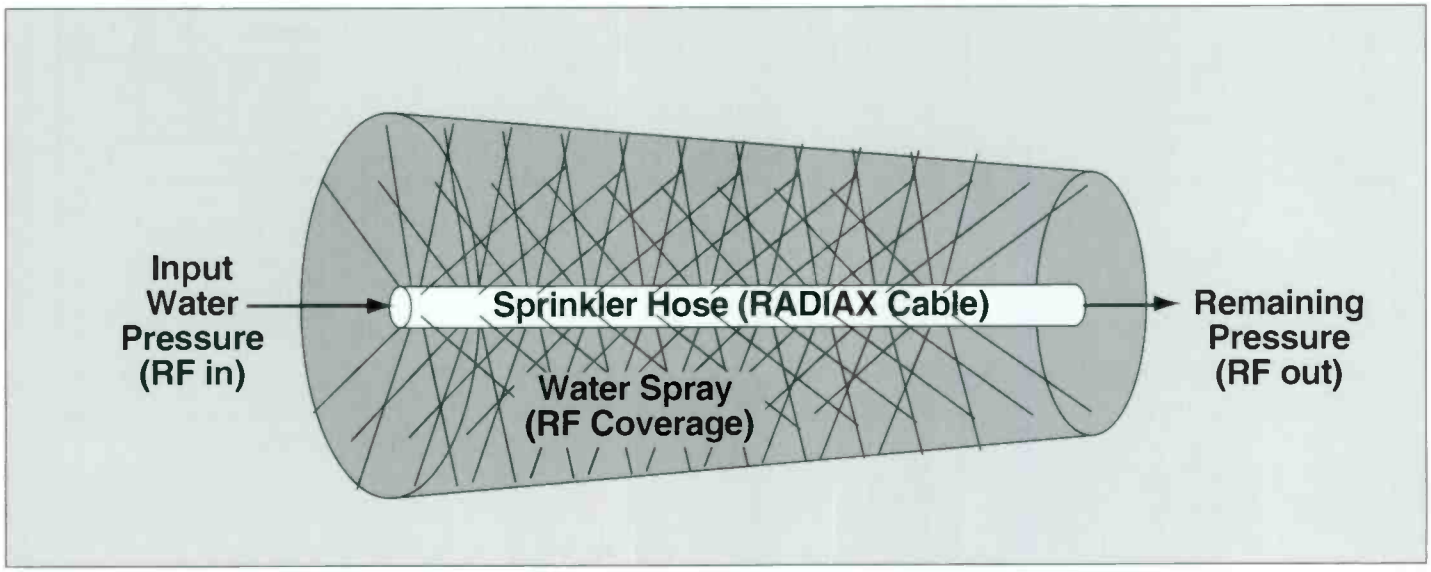
Ordering Information

Contact Andrew for ordering information.

RADIAX® Radiating Cable

Table of Contents

RADIAX® – Sprinkler Hose Analogy



RADIAX® Radiating Cable

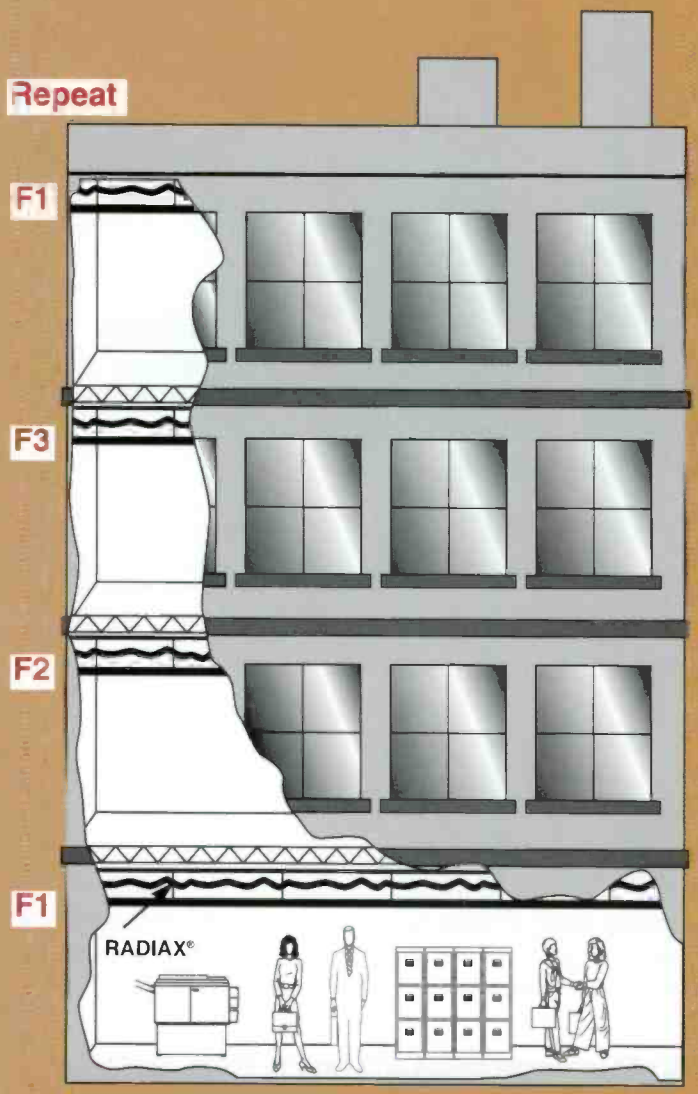
Wireless Solutions

RADIAX radiating cables solve wireless communication problems in confined areas, such as buildings and tunnels, functioning as a continuous distributed antenna. RADIAX is a coaxial cable with carefully controlled slots in the outer conductor which allows RF signals to be coupled from and into the cable uniformly along the entire length of the cable.

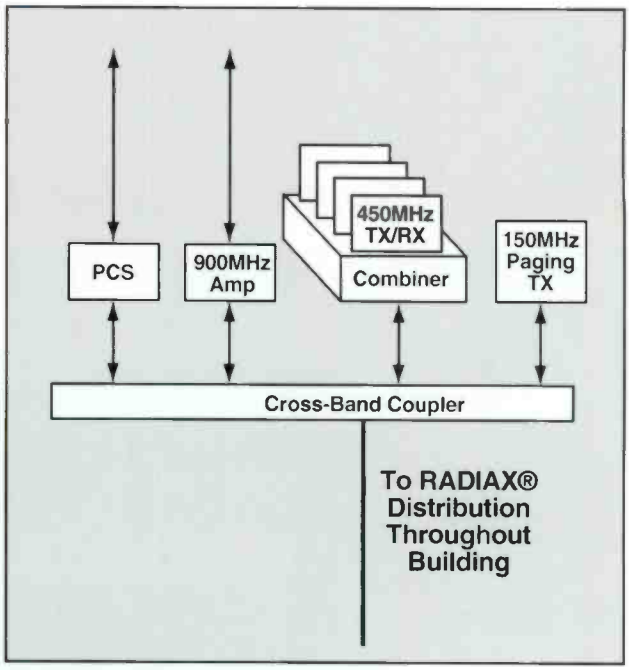
RF coverage using RADIAX is analogous to water coverage using a "sprinkler" hose in a garden. Coverage is even and continous with no over-saturation (hot spots) or dry areas (shadows) in the places where the hose (cable) is located.

RADIAX is simple to use and easy to install. Simply mount it wherever coverage is required.

Wireless Distributed Communications



Frequency re-use scheme with RADIAX®



Multiple Service Distribution

RADIAX® Cable Benefits

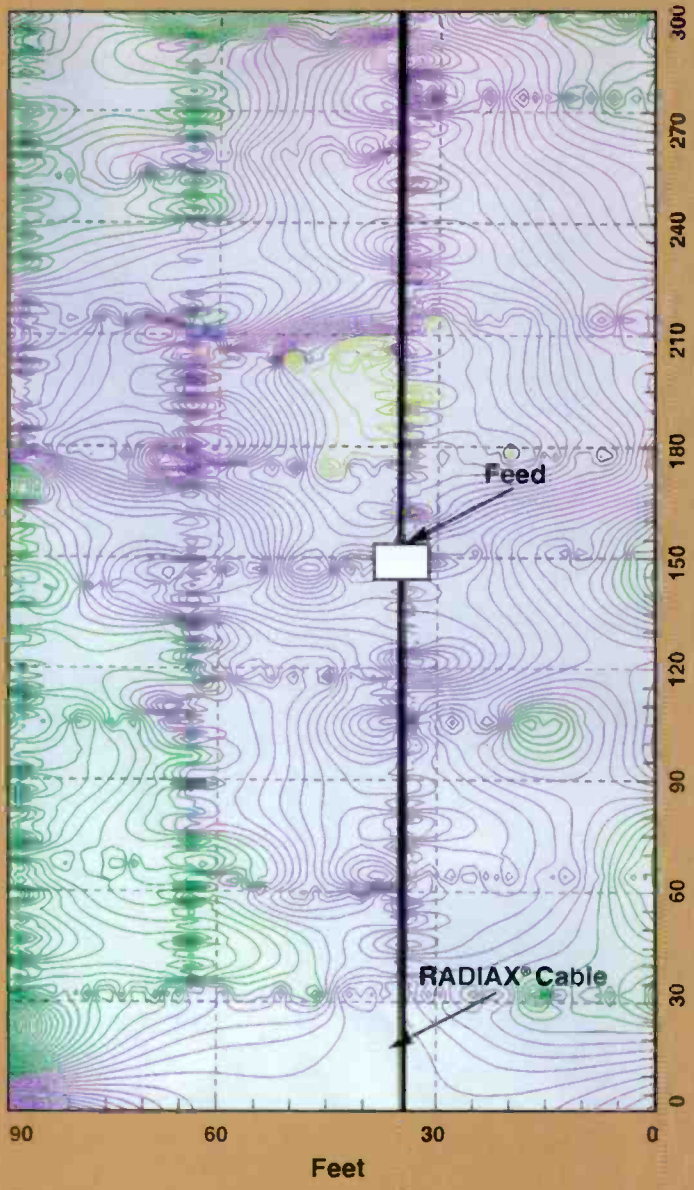
Uniform Coverage

RADIAX cable gives the radio systems engineer the ability to distribute the available signal power uniformly throughout the area to be covered, eliminating the hot-spots caused by antennas. A good analogy is the difference between a fluorescent light bulb and a spot light. The fluorescent bulb (RADIAX cable) evenly distributes the available candlepower along its length while the spot-light (antenna) radiates the same candle-power from a point source.

Multiple Services

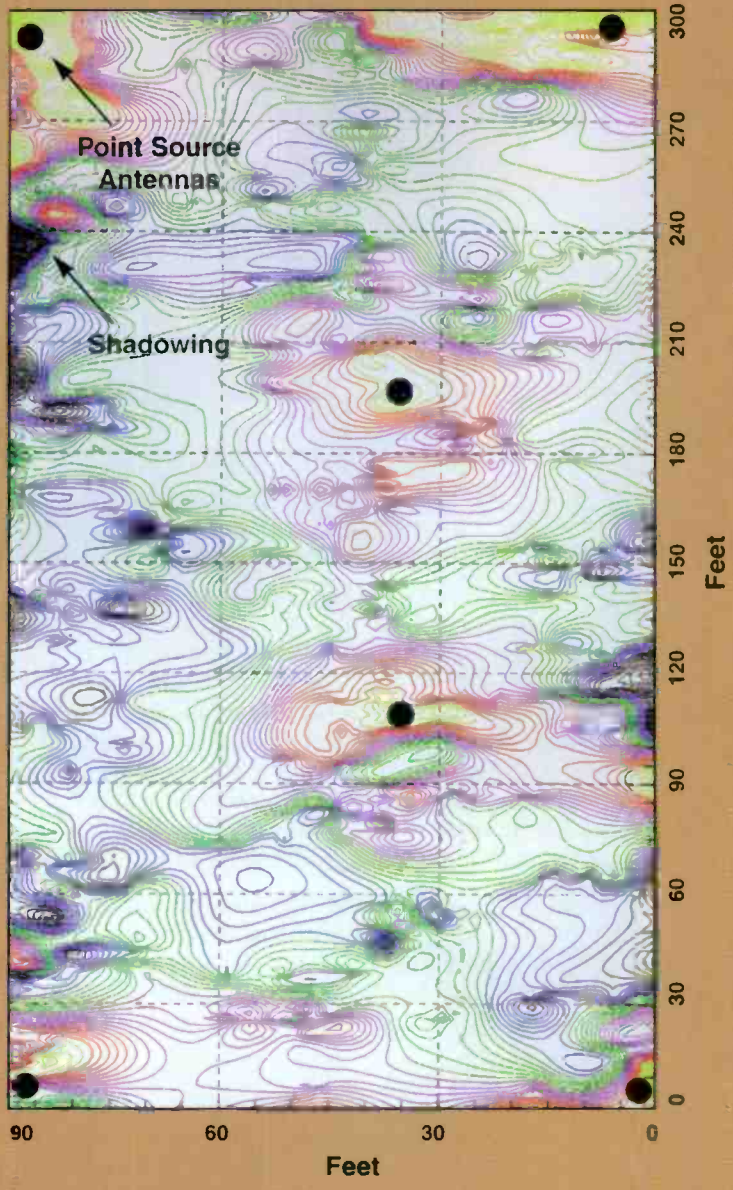
RADIAX cables are broadband by design which enables them to operate from AM (500 kHz) to Cellular to Wireless LAN (2.4 GHz) and beyond. Multiple services can be employed on a single RADIAX cable system, eliminating the need for individual cables and antennas for each required frequency band. Examples of systems employing multiple services include the MTRC in Hong Kong (200/800/900 MHz) and the Ville Marie Road Tunnel in Montreal, Canada (450/800 MHz).

In-Building Measurements -
1/2" RADIAX® Cable. 900 MHz



Note: • Continuous
• No Shadows or Hot Spots

In-Building Measurements -
Point Source Antennas. 900 MHz

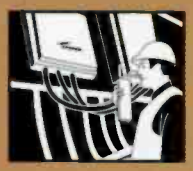


Note: • Shadows
• Hot Spots
• Signal Variations

Signal Containment

The RF spectrum is shrinking as dramatically as the number of cellular, PCN/PCS and other wireless users is increasing, placing considerable pressure on systems designers to find ways to re-use frequencies and deliver uniform coverage, while at the same time, lowering the installed cost of the system.

Within this restrictive RF environment, it is no longer feasible to simply increase transmitter power. Spectrum constraints require frequency re-use, a feature not best accommodated with multiple point source antennas that cannot deliver uniform coverage without creating hot-spots which interfere with frequency re-use schemes.



Wireless Distributed Communications

RADIAX® Cable and In-Building Systems

General

RADIAX cable is an excellent tool for communications in buildings where the potential for RF blockage of point-source antennas due to obstructions is high and where multiple services such as cellular, PCS, paging, and safety/emergency communications are required. RADIAX cable has been tested and proven effective in building environments for all current modulation schemes, from narrow-band FM to digital GSM to CDMA.

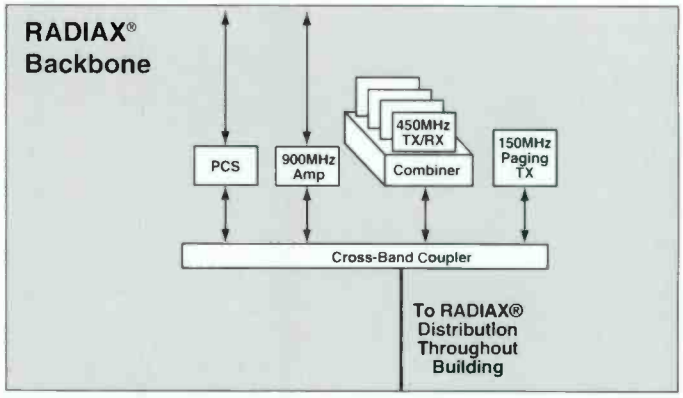
Small cables that meet stringent fire safety codes and are flexible enough to bend around corners and over walls, such as the RXP4 and RXL4-1RNT1 series are generally used in these environments. Methods of using RADIAX are outlined below.

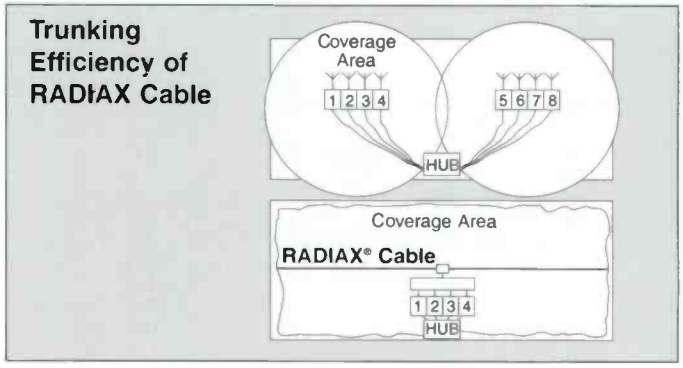
RADIAX Backbone

Since RADIAX cable can be a distributed antenna for multiple frequency bands, its use as a backbone solution for multiple services can be very enticing. For example, consider a building under construction, where a RADIAX antenna system is installed throughout. Attached to this, either in the center or at one end, is a combining network consisting of cross-band couplers, as shown in the following diagram.

What has been created is a multi-service highway for wireless services, allowing their distribution throughout the building. Filtering in the combining network prevents interference from one service to another.

It is feasible that a system could carry, for example, 150 MHz paging, 450 MHz emergency services (fire, police etc), 800 MHz AMPS cellular and even 900 MHz ISM Wireless LAN services all over the same backbone RADIAX antenna. Of course, care must be exercized when combining multiple carrier/multiple band services to prevent the generation of unwanted intermodulation distortion. But there are systems of this kind, using RADIAX cable, in reliable service today.





Trunking Efficiencies

Many wireless telephone systems use multiple base stations with discrete antenna connections to provide RF coverage. Typically, these base stations can accommodate one-to-four channels and have a limited radius of coverage. Thus, to accommodate multiple areas of coverage and traffic flow (e.g., lunchtime at the cafeteria), an excess number of base stations may be required at significant additional expense. RADIAX eliminates the need for additional base stations by combining all base stations at one location and allowing the cable to provide full coverage.

RADIAX® Cable and Wireless LANs

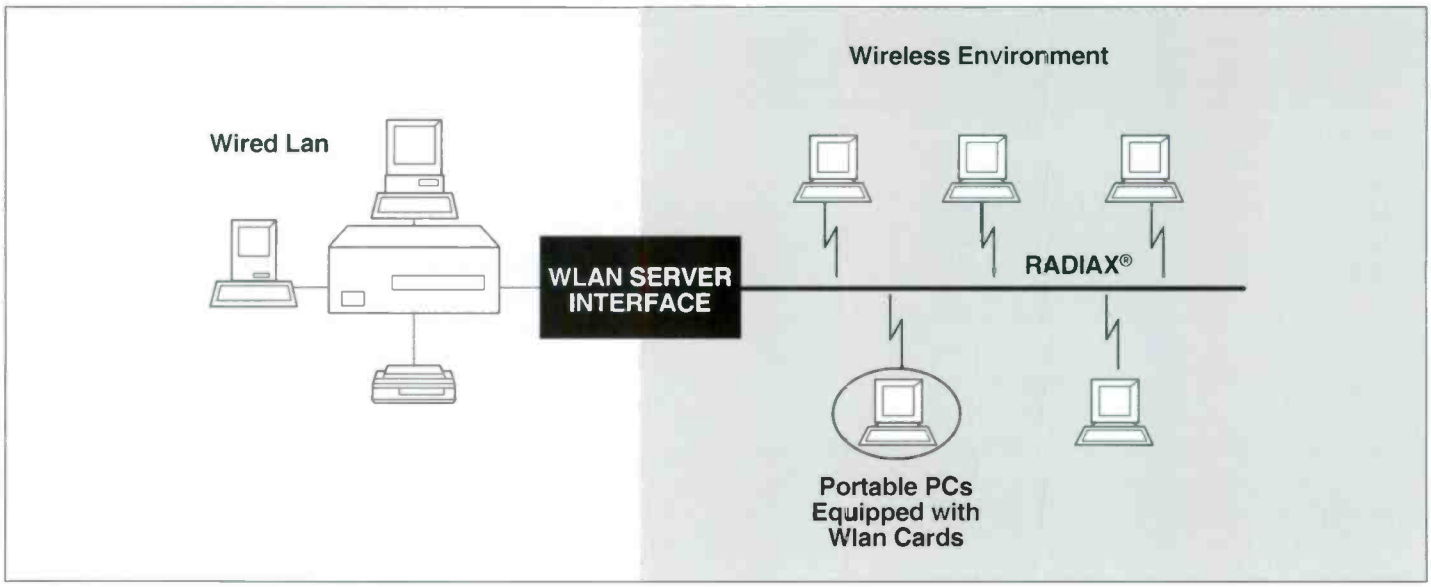
Some of the inherent benefits of RADIAX cable particularly for Containment and Uniform Coverage, lend themselves well to the architecture required for Wireless Local Area Networks. LANs are usually arranged in sub-nets, smaller groups of users that are formed within the total user environment, all ultimately connected to the same network. This topology improves the efficiency of data transfer times as opposed to every user operating from the same network server. This is illustrated below.

RADIAX cable provides a convenient means of segregating these groups, by customizing the coverage. This is demonstrated below, in a simple WLAN/RADIAX scheme.

Because the RADIAX cable coverage is tailored to the specific area, interference between sub-nets and other WLAN networks is minimized. A multiple point-source antenna configuration would suffer the same hot-spots described previously, increasing the chances for interference.

Wireless LAN applications in hospitals use RADIAX to transmit patient information to laptop computers via 900MHz and 2.4GHz unlicensed bands. Nurses record and store information on the LAN directly via the wireless network, eliminating the need for multiple chart records.

The continous coverage and insensitivity to shadowing/blockage make RADIAX an excellent choice for RF distribution in warehouses that use wireless data terminals for stock control, where changes in stock levels and shelving configurations can have a dramatic effect on the placement of point source antennas.



Wireless Distributed Communications

RADIAX®
Cable and Underground Systems

- *Tunnels*
- *Subways*
- *Mines*

RADIAX cable was developed with tunnels in mind. Long, narrow corridors require the continous coverage RADIAX provides.

The world's metros have long used RADIAX cables for communications to fill the need for efficient RF coverage with emergency services. As commercial services become more prevalent, the desire to extend cellular, paging, and PCS into metros becomes a challenge due to the minimal amount of space available to expand within the tunnels. The wideband nature of RADIAX solves this problem by permitting multiple services to be provided over a single or dual cable system. This approach has been successfully demonstrated in a multitude of road and rail systems such as the Metro Transit Railway in Hong Kong and in the Vienna, Austria Metro.

RADIAX® Cable Types

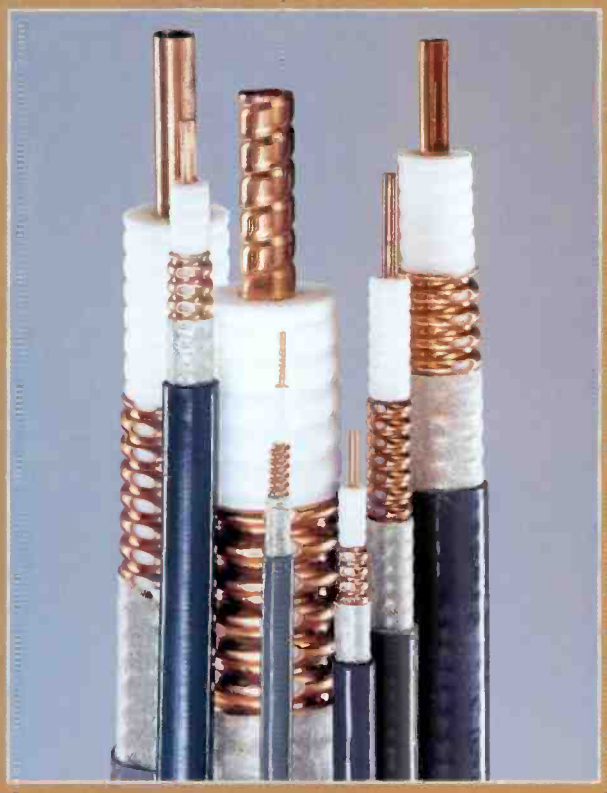
Because of the wide diversity of customer requirements and applications, Andrew provides five versions of RADIAX cables with different types of construction.

Premium Series

Based on the familiar HELIAX® coaxial cable, Premium RADIAX cable is made from a corrugated, welded copper outer conductor over a low-density-foam covering the inner conductor. Holes milled in the corrugation peaks of the outer conductor produce the radiating cable. This cable is designed for installation in harsh tunnel and metro environments, providing the end user with long term reliability under the most dynamic conditions. It is also successfully used in buildings and enclosed spaces.

Applications

- *Multiband systems*
- *Tunnels, buildings*
- *Harsh environments*
- *Outdoors*
- *AM to WLAN bands*



Plenum Series

Based on the familiar HELIAX coaxial cable, Plenum RADIAX cable is made from a corrugated, welded copper outer conductor with holes milled in its peaks to produce the radiating cable. In order to meet the strict Steiner Tunnel test (UL 910), high temperature materials, called Fluoro Ethyl Polymers (FEPs), are required. To keep cost at a minimum, Andrew Plenum cables utilize a tubular FEP spacer to support the outer conductor about the inner. This improves the electrical performance and minimizes the use of CFC producing materials during manufacturing. This cable is designed specifically for in-building applications where fire codes mandate plenum-rated, fire-retardant cables.

Applications

- *Multiband systems*
- *In buildings*
- *AM to WLAN bands*

Wireless Distributed Communications

Standard Series

Aluminum Series

High Performance Series

Standard Series

To supplement the Premium RADIAX series of cables, this series of Standard RADIAX cables offers similar RF performance at a lower cost. The cable has a thinner, non-corrugated, copper outer conductor, and the seam has been overlapped rather than welded. This cable is successfully used in buildings, enclosed spaces, tunnels, and metros. Standard RADIAX cables provide you the ability to be cost-competitive while maintaining the high quality synonymous with the Andrew name.

Applications

- *Multiband systems*
- *Tunnels*
- *AM to WLAN bands*

Aluminum Series

To supplement the Premium RADIAX series of cables, this series of Aluminum RADIAX cables offers similar mechanical performance at a lower cost. The cable has a corrugated aluminum outer conductor and has been designed for use in buildings, enclosed spaces, tunnels and metros. Aluminum RADIAX cables provide you the ability to be competitive while maintaining the high quality synonymous with the Andrew name.

Applications

- *Multiband systems*
- *Tunnels, buildings*
- *AM to WLAN bands*

High Performance Series

The new RCW radiating cable is specifically suited for PCS, DCS-1800, and other applications in the 800-2500 MHz frequency range. It offers improved RF link performance compared to conventional wideband radiating cables. Improved link performance is achieved through low variations in coupling in the optimized bands, which results in a more uniform signal distribution. The benefits of RCW cable include its ability to pass broadband channels (CDMA, video, high rate data) and its requirement for lower margins for high probability communications. This cable is successfully used in tunnels, metros, and outdoor environments.

Applications

- *Single or dual-band systems*
- *Tunnels*
- *Cellular and PCS compatible*

Levels of Fire Retardancy

Six cable versions with five levels of fire retardant properties

Buriable Series, A Suffix (Not Fire Retardant). This is the standard version of RADIAX radiating cable to be used when the cable will be buried and fire retardant properties are not required.

Outdoor Series, AX Suffix (Not Fire Retardant). This is also the standard version of RADIAX radiating cable but it is used when the cable will be installed outdoors (not buried) and fire retardant properties are not required.

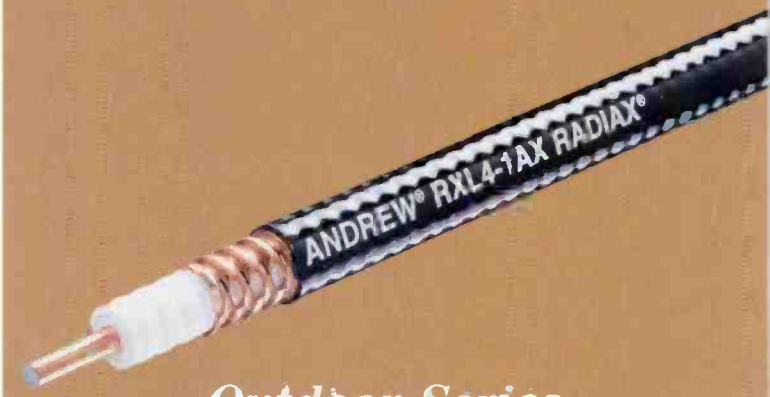
Fire Retardant, RNT1 Suffix. These cables meet fire retardancy requirements of UL, NEC , IEC, and IEEE. They also meet Naval Engineering Standards (NES) requirements for low smoke and low toxicity levels, and have a non-halogenated jacket.

Fire Retardant, RNT Suffix. These cables also meet fire retardancy requirements of UL, NEC, IEC, and IEEE but pass the more stringent qualifications. They also meet NES requirements for low smoke and low toxicity levels, and have a non-halogenated jacket.

Fire Retardant, RN Suffix. These cables meet less stringent fire retardancy requirements than the RNT1 or RNT series above but meet NES requirements for low smoke and low toxicity levels, and have a non-halogenated jacket.

Plenum Rated RXP Series. These cables meet the highest level of fire retardancy in the National Electric Code and are used where fire codes require a plenum rated cable.

Buriable Series
A Suffix



Outdoor Series
AX Suffix

Buriable Series
(not fire retardant), A Suffix

The Buriable series is used in applications where the cable will be buried and fire retardant properties are not required.

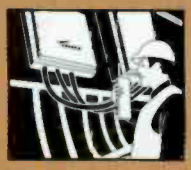
Flooding Compound is a petroleum based gel applied to the outer conductor of the cable. It keeps moisture from entering through the slots if the jacket is punctured during or after burial.

Jacket. The cable is protected by a polyethylene jacket that is black in color.

Outdoor Series
(not fire retardant), AX Suffix

The outdoor series is used in outdoor applications where the cable will not be buried (outdoor series does not include flooding compound) and fire retardant properties are not required.

Jacket. The cable is protected by a polyethylene jacket that is black in color.



Wireless Distributed Communications

Fire Retardant
RNT1 Suffix

Fire Retardant
RNT Suffix

Fire Retardant,
RNT1 Suffix

The RNT1 series have been tested and meet fire retardancy requirements of UL, NEC, IEC, and IEEE shown below.

Test / NEC Category	Description
IEC 332-3C	Vertical Bunched Cable Test
IEC 332-1	Vertical Single Cable Test
UL 1581 / CATV	Vertical Tray Flame Test
IEEE 383	Vertical Tray Flame Test
UL VW1 / CATVX	Vertical Wire Flame Test

Non-Halogenated Fire retardant Jacket. The non-halogenated jacket is made of a non-halogenated formulation which meets the fire retardancy requirements described above and is gray in color for easy identification. It also meets the following requirements of Naval Engineering Standards for low smoke and low toxicity levels.

Standard	Description	Level
NES 711	Smoke Index Test	50-55
NES 713	Toxicity Index Test	0.5

Barrier Tape. RNT1 suffix cables include a single mica barrier tape under the jacketing. The tape is an inert material that does not burn or melt. In the event of a fire, the tape prevents molten dielectric material from flowing out of the slots and igniting.

Fire Retardant,
RNT Suffix

The RNT series have been tested and meet fire retardancy requirements of UL, NEC, IEC, and IEEE shown below.

Test / NEC Category	Description
IEC 332-3C	Vertical Bunched Cable Test
IEC 332-1	Vertical Single Cable Test
UL 1666 / CATVR	Riser Cable Test
UL 1581 / CATV	Vertical Tray Flame Test
IEEE 383	Vertical Tray Flame Test
UL VW1 / CATVX	Vertical Wire Flame Test

Non-Halogenated Fire Retardant Jacket. The non-halogenated jacket is made of a non-halogenated formulation which meets the fire retardancy requirements described above and is gray in color for easy identification. It also meets the following requirements of Naval Engineering Standards for low smoke and low toxicity levels.

Standard	Description	Level
NES 711	Smoke Index Test	50-55
NES 713	Toxicity Index Test	0.5

Barrier Tape. RNT suffix cables include a double mica barrier tape under the jacketing. This gives additional protection over the RNT1 suffix type cables. The tape is an inert material that does not burn or melt. In the event of a fire, the tape prevents molten dielectric material from flowing out of the slots and igniting.

Fire Retardant,
RN Suffix

The RN suffix RADIAX radiating cables make use of the fire retardant non-halogenated jacket. They are similar in construction to the RNT1 and RNT series cables but do not include the mica barrier tape and do not meet the most stringent NEC or UL fire retardancy requirements. Shown below are the fire retardant codes that RN suffix cables do meet.

Test / NEC Category	Description
IEC 332-1	Vertical Single Cable Test
UL VW1 / CATVX	Vertical Wire Flame Test

Non-Halogenated Fire retardant Jacket. Like the RNT1 and RNT cables, the non-halogenated jacket is made of a non-halogenated formulation which meets the fire retardancy requirements described above and is gray in color for easy identification. It also meets the following requirements of Naval Engineering Standards for low smoke and low toxicity levels.

Standard	Description	Level
NES 711	Smoke Index Test	50-55
NES 713	Toxicity Index Test	0.5

Plenum Rated,
RXP Series

RADIAX radiating cables are used in applications where fire codes require plenum rated fire retardant cables. They have been tested and meet the following requirements of the Underwriters' Laboratories, Inc. (UL) and the National Electric Code (NEC).

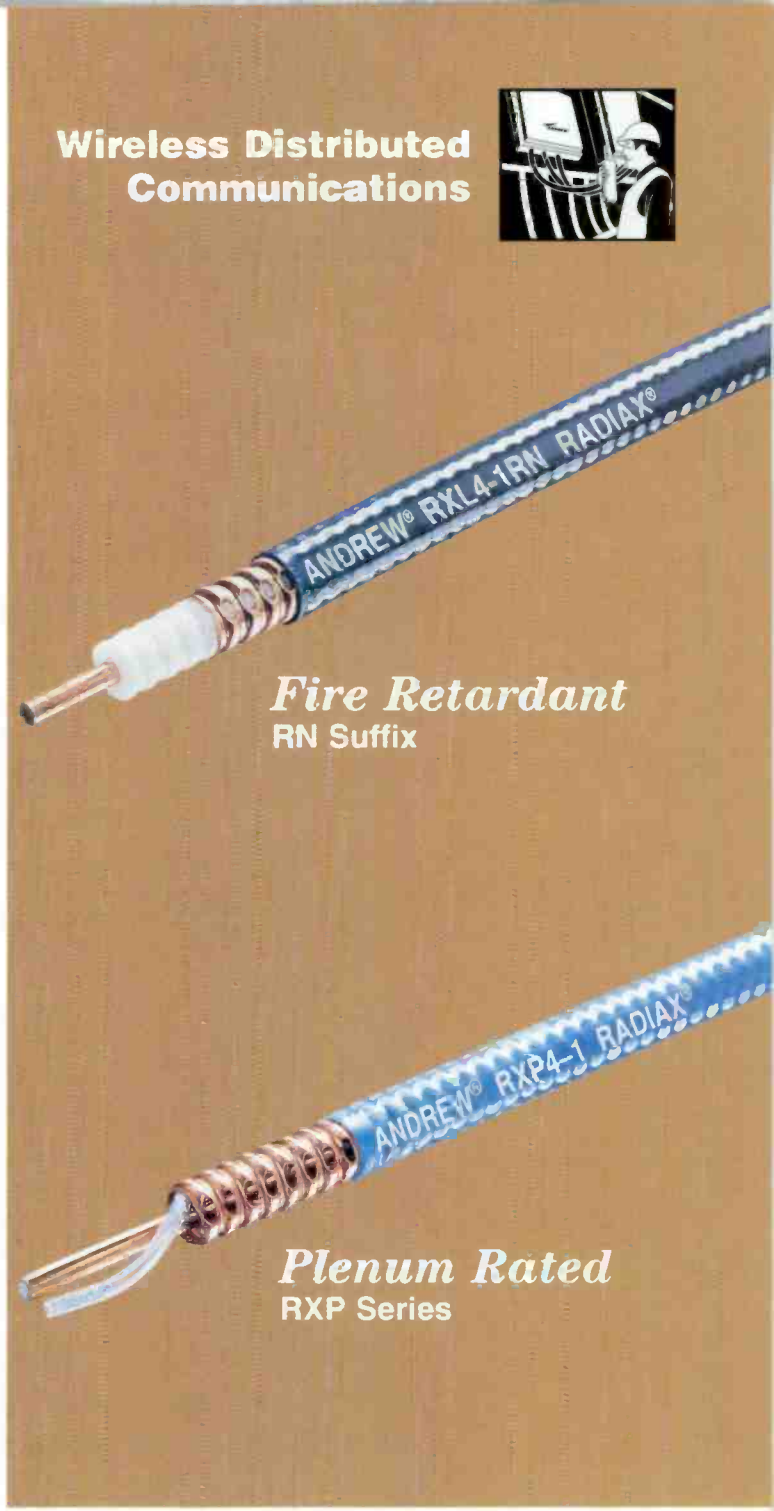
Test / NEC Category	Description
UL 910 / CATVP	Steiner Tunnel Test

The Steiner Tunnel Test is the highest level of fire retardancy in the National Electric Code. Therefore, cables meeting this requirement can also be used in the following lower level categories.

Test I NEC Category	Description
UL 1666 / CATVR	Riser Cable Test
UL 1581 / CATV	Vertical Tray Flame Test
UL VW1 / CATVX	Vertical Wire Flame Test

RXP cables also meet the fire retardancy requirements of the International Electrical Code - IEC-332-2 and the Institute Of Electrical and Electronic Engineers - IEEE 383.

High Temperature Materials are utilized for both the air dielectric section and the jacket. For the air dielectric section, it is a high temperature fluorocarbon material with a melting point in excess of 200°C (392°F). For the jacket, a fluoropolymer material suitable for temperatures up to 150°C (302°F) is used. Together, they provide the capability to meet the fire retardancy and low level smoke requirements of the Steiner Tunnel Test.



Both the fluorocarbon air dielectric section and the fluoropolymer jacket use halogenated formulations. While these formulations exhibit higher toxicity levels than non-halogenated formulations, the halogenated formulation is needed in order to meet the fire retardancy and low smoke requirements of the Steiner Tunnel Test. These cables are easily identifiable by their blue color.

Exposure to Sunlight. While the fire retardant jackets have a UV stabilizer added to the jacketing material, it is not recommended that these cables be stored or installed where they will be exposed to direct sunlight for an extended period of time.

Alpha-Numeric Type Number Identification

RADIAX® cables are identified by an alpha-numeric type numbering system. This is described below for the Premium series cables.

Example: **RXL 6 - 1 RNT**

RNT **Indicates the level of fire retardancy**

Options:

A	Buriable with no fire retardant properties
AX	For outdoor installations with no fire retardant properties
RN	Fire retardant, Low Smoke and Fume (LSF), halogen free
RNT1	Fire retardant, Low Smoke and Fume (LSF), halogen free with single mica tape
RNT	Fire retardant, Low Smoke and Fume (LSF), halogen free with double mica tape

NOTE: See pages 704-705 for details regarding the various fire retardant jackets.

1 **Indicates radiated signal level**

Options:

1	Standard coupling loss and attenuation
2	Stronger coupling loss and higher attenuation
3	Strongest coupling loss and highest attenuation

NOTE: Not all cable types are available as -2 or -3

Cables of a certain size can be designed to radiate higher or lower levels by changing the dimension of the slots in the outer conductor. 1/2" RXL4 cables are available in -1, -2, or -3 grades; the -1 has the smallest slots and therefore couples less while the -3 has the biggest slots. When designing systems using radiating cables, it is important to note that while the cables with the larger slots couple a higher amount of energy, their attenuation is also higher.

6 **Indicates cable nominal size, excluding the jacket**

Size Indicator:

1	1/4" (6.4mm)
2	3/8" (9.5mm)
4	1/2" (12.7mm)
5	7/8" (22.2mm)
6	1-1/4" (31.8mm)
7	1-5/8" (41.3mm)

RXL **Indicates the type of RADIAX cable**

Options include:

RXL	Premium Series
RXP	Plenum Rates Series
RCM	Standard Series
RAL	Aluminum Series
RCW	High Performance Series

1/4" Premium Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables	
Buriable	**RXL1-1A**
Outdoor Installation, above ground	**RXL1-1AX**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RXL1-1RN**
Double Mica Tape (see p. 704 for fire retardant ratings)	**RXL1-1RNT**

Characteristics

Description	
Nominal Size	1/4"
Outer Conductor	Copper
Inner Conductor	Cu-Clad AL
Diameter over Jacket, max., in (mm)	
A, AX	0.33 (8.4)
RN	0.35 (8.9)
RNT	0.39 (9.9)
Mechanical	
Cable Weight, lb/ft (kg/m)	
A, AX	0.05 (0.08)
RN	0.07 (0.1)
RNT	0.08 (0.12)
Tensile Strength, lb (kg)	150 (68)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)
Minimum Bending Radius, in (mm)	1 (25)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	
A, AX	-40/+60
RN, RNT	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	84
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	2.4 (7.9)
Inner	3 (9.8)
Capacitance, nominal, pF/ft (m)	24.2 (79.4)
Inductance, nominal, µH/ft (m)	0.061 (0.2)
dc Breakdown, volts	1600
Jacket Spark, volts, RMS	5000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.7 (8.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	58
Average Power, kW	0.56
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	5.1 (16.7)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	62
Average Power, kW	0.32
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	7.1 (23.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	69
Average Power, kW	0.22
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	9.7 (31.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	71
Average Power, kW	0.15

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	**F1PNM-H**
N Female	**F1PNF-BH**
7-16 DIN Male	**F1PDM**
7-16 DIN Female	**F1PDF**
UHF Male	**41SP**
UHF Female	**41U**
BNC Male	**F1PBM**

Cable Types

Non-Fire-Retardant Cables	
Buriable	RXL2-2A
Outdoor Installation, above ground	RXL2-2AX
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RXL2-2RN
Double Mica Tape (see p. 704 for fire retardant ratings)	RXL2-2RNT

Characteristics

Description	
Nominal Size	3/8"
Outer Conductor	Copper
Inner Conductor	Cu-Clad AL
Diameter over Jacket, max., in (mm)	
A, AX	0.46 (12)
RN	0.46 (12)
RNT	0.52 (13)
Mechanical	
Cable Weight, lb/ft (kg/m)	
A, AX	0.09 (0.13)
RN	0.10 (0.15)
RNT	0.11 (0.17)
Tensile Strength, lb (kg)	250 (113)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (2)
Minimum Bending Radius, in (mm)	3.8 (95)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	
A, AX	-40/+60
RN, RNT	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	1.0 (3.3)
Inner	1.06 (3.48)
Capacitance, nominal, pF/ft (m)	23 (75.5)
Inductance, nominal, µH/ft (m)	0.058 (0.19)
dc Breakdown, volts	2500
Jacket Spark, volts, RMS	5000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

3/8" Premium Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.5 (4.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	56
Average Power, kW	0.92
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.6 (8.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	61
Average Power, kW	0.51
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	3.7 (12.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68
Average Power, kW	0.35
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	5.3 (17.4)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	74
Average Power, kW	0.24

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	L2PNM
N Female	L2PNF
7-16 DIN Male	L2PDM-C
7-16 DIN Female	L2PDF-C
UHF Male	L42P
UHF Female	L42U

1/2" Premium Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables			
Buriable	RXL4-1A	RXL4-2A	RXL4-3A
Outdoor Installation, above ground	RXL4-1AX	RXL4-2AX	RXL4-3AX
Fire Retardant, low smoke and fume, halogen free cables			
Smoke Index 50-55 Single Mica Tape (see p. 704 for fire retardant ratings)	RXL4-1RN	RXL4-2RN	RXL4-3RN
	RXL4-1RNT1		
Double Mica Tape (see p. 704 for fire retardant ratings)	RXL4-1RNT	RXL4-2RNT	RXL4-3RNT

Characteristics

Description			
Nominal Size	1/2"	1/2"	1/2"
Outer Conductor	Copper	Copper	Copper
Inner Conductor	Cu-Clad AL	Cu-Clad AL	Copper Tube
Diameter over Jacket, max., in (mm)			
A, AX	0.65 (16)	0.65 (16)	0.65 (16)
RN	0.65 (16)	0.65 (16)	0.65 (16)
RNT1	0.73 (19)		
RNT	0.73 (19)	0.73 (19)	0.73 (19)
Mechanical			
Cable Weight, lb/ft (kg/m)			
A, AX	0.16 (0.23)	0.16 (0.23)	0.16 (0.23)
RN	0.18 (0.26)	0.18 (0.26)	0.18 (0.26)
RNT1	0.20 (0.3)		
RNT	0.22 (0.33)	0.22 (0.33)	0.22 (0.33)
Tensile Strength, lb (kg)	250 (113)	250 (113)	250 (113)
Flat Plate Crush Strength, lb/in (kg/mm)	110 (2)	110 (2)	110 (2)
Minimum Bending Radius, in (mm)	5 (125)	5 (125)	5 (125)
Temperature Rating, storage, min/max (°C)	-70/+80	-70/+80	-70/+80
Temperature Rating, installation, min/max (°C)			
A, AX	-40/+60	-40/+60	-40/+60
RN, RNT1, RNT	-30/+60	-30/+60	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80	-40/+80	-40/+80
Electrical			
Impedance, ohms	50	50	50
Velocity, %	88	88	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %			
Outer	0.67 (2.2)	0.70 (2.3)	0.75 (2.5)
Inner	0.45 (1.48)	0.45 (1.48)	0.45 (1.48)
Capacitance, nominal, pF/ft (m)	23.1 (75.8)	23.1 (75.8)	23.1 (75.8)
Inductance, nominal, µH/ft (m)	0.058 (0.19)	0.058 (0.19)	0.058 (0.19)
dc Breakdown, volts	4000	4000	4000
Jacket Spark, volts, RMS	8000	8000	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000	100000	100000
Typical VSWR	1.3	1.3	1.3

Electrical Characteristics at Frequency*

	RXL4-1	RXL4-2	RXL4-3
150 MHz			
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.0 (3.3)	1.1 (3.6)	1.7 (5.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	58	52	46
Average Power, kW	1.5	1.5	1.5
450 MHz			
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.0 (6.6)	2.5 (8.2)	4.1 (13.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63	57	50
Average Power, kW	0.85	0.85	0.85
900 MHz			
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.9 (9.5)	3.6 (11.8)	5.5 (18.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68	63	62
Average Power, kW	0.58	0.58	0.58
1700 MHz			
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	4.0 (13.1)	4.9 (16.1)	6.8 (22.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73	69	66
Average Power, kW	0.4	0.4	0.4
2400 MHz			
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	4.8 (15.7)	5.8 (19.0)	7.5 (24.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73	69	66
Average Power, kW	0.33	0.33	0.33

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Connectors Interface	Type Number
N Male	L4PNM
N Female	L4PNF
7-16 DIN Male	L4PDM
7-16 DIN Female	L4PDF
UHF Male	L44P
UHF Female	L44U
Splice	L44Z

Cable Types

Non-Fire-Retardant Cables	
Buriable	RXL5-1A
Outdoor Installation, above ground	RXL5-1AX
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RXL5-1RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RXL5-1RNT1
Double Mica Tape (see p. 704 for fire retardant ratings)	RXL5-1RNT

Characteristics

Description	
Nominal Size	7/8"
Outer Conductor	Copper
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	
A, AX	1.11 (28)
RN	1.11 (28)
RNT1	1.15 (29)
RNT	1.15 (29)
Mechanical	
Cable Weight, lb/ft (kg/m)	
A, AX	0.35 (0.52)
RN	0.39 (0.59)
RNT1	0.40 (0.60)
RNT	0.41 (0.61)
Tensile Strength, lb (kg)	325 (147)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)
Minimum Bending Radius, in (mm)	10 (254)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	
A, AX	-40/+60
RN, RNT1, RNT	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.36 (1.2)
Inner	0.32 (1.05)
Capacitance, nominal, pF/ft (m)	22.8 (75)
Inductance, nominal, µH/ft (m)	0.057 (0.187)
dc Breakdown, volts	6000
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

7/8" Premium Series RADIAX® Radiating Cable

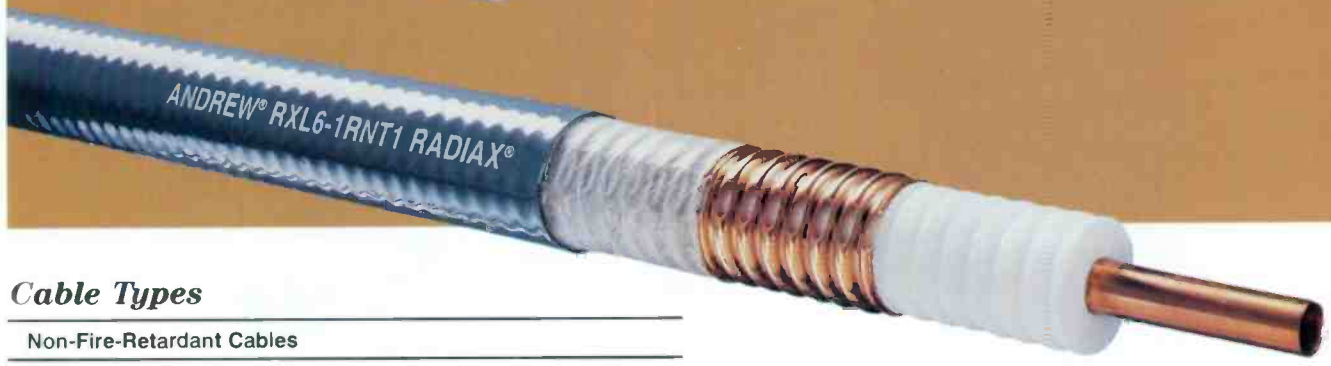
Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.54 (1.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	58
Average Power, kW	4.30
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.10 (3.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63
Average Power, kW	2.40
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.6 (5.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	69
Average Power, kW	1.60
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.3 (7.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	1.1
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.8 (9.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	76
Average Power, kW	0.90

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	L5PNM
N Female	L5PNF
7-16 DIN Male	L5PDM
7-16 DIN Female	L5PDF
UHF Male	L45P
UHF Female	L45U
Splice	L45Z



Cable Types

Non-Fire-Retardant Cables		
Buriable	RXL6-1A	RXL6-3A
Outdoor Installation, above ground	RXL6-1AX	RXL6-3AX
Fire Retardant, low smoke and fume, halogen free cables		
Smoke Index 50-55	RXL6-1RN	RXL6-3RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RXL6-1RNT1	RXL6-3RNT1
Double Mica Tape (see p. 704 for fire retardant ratings)	RXL6-1RNT	RXL6-3RNT

Characteristics

Description		
Nominal Size	1-1/4"	1-1/4"
Outer Conductor	Copper	Copper
Inner Conductor	Copper Tube	Copper Tube
Diameter over Jacket, max., in (mm)		
A, AX	1.58 (40)	1.58 (40)
RN	1.58 (40)	1.58 (40)
RNT1	1.59 (40.5)	1.59 (40.5)
RNT	1.60 (41)	1.60 (41)
Mechanical		
Cable Weight, lb/ft (kg/m)		
A, AX	0.64 (0.95)	0.64 (0.95)
RN	0.74 (1.11)	0.74 (1.11)
RNT1	0.73 (1.09)	0.73 (1.09)
RNT	0.71 (1.06)	0.71 (1.06)
Tensile Strength, lb (kg)	1500 (678)	1500 (678)
Flat Plate Crush Strength, lb/in (kg/mm)	138 (2.4)	138 (2.4)
Minimum Bending Radius, in (mm)	15 (380)	15 (380)
Temperature Rating, storage, min/max (°C)	-70/+80	-70/+80
Temperature Rating, installation, min/max (°C)		
A, AX	-40/+60	-40/+60
RN, RNT1, RNT	-30/+60	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80	-40/+80
Electrical		
Impedance, ohms	50	50
Velocity, %	89	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %		
Outer	0.17 (0.56)	0.17 (0.56)
Inner	0.22 (0.72)	0.22 (0.72)
Capacitance, nominal, pF/ft (m)	22.9 (75.1)	22.9 (75.1)
Inductance, nominal, µH/ft (m)	0.056 (0.184)	0.056 (0.184)
dc Breakdown, volts	9000	9000
Jacket Spark, volts, RMS	10000	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000	100000
Typical VSWR	1.3	1.3

1-1/4" Premium Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

	RXL6-1	RXL6-3
150 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.39 (1.3)	0.80 (2.62)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	59	49
Average Power, kW	7.5	7.5
450 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.85 (2.8)	2.4 (7.87)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	66	53
Average Power, kW	4.1	4.1
900 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.3 (4.3)	3.2 (10.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	71	55
Average Power, kW	2.8	2.8
1700 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.8 (5.9)	4.3 (14.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73	62
Average Power, kW	1.9	1.9
2400 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.1 (6.9)	5.4 (17.7)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	76	63
Average Power, kW	1.6	1.6

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	L6PNM
N Female	L6PNF
7-16 DIN Male	L6PDM
7-16 DIN Female	L6PDF
Splice	L46Z

1-5/8" Premium Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables		
Buriable	RXL7-1A	RXL7-3A
Outdoor Installation, above ground	RXL7-1AX	RXL7-3AX
Fire Retardant, low smoke and fume, halogen free cables		
Smoke Index 50-55	RXL7-1RN	RXL7-3RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RXL7-1RNT1	RXL7-3RNT1
Double Mica Tape (see p. 704 for fire retardant ratings)	RXL7-1RNT	RXL7-3RNT

Characteristics

Description		
Nominal Size	1-5/8"	1-5/8"
Outer Conductor	Copper	Copper
Inner Conductor	Copper Tube	Copper Tube
Diameter over Jacket, max., in (mm)		
A, AX	2.02 (51)	2.02 (51)
RN	2.02 (51)	2.02 (51)
RNT1	2.02 (51)	2.02 (51)
RNT	2.02 (51)	2.02 (51)
Mechanical		
Cable Weight, lb/ft (kg/m)		
A, AX	0.91 (1.35)	0.91 (1.35)
RN	1.07 (1.59)	1.07 (1.59)
RNT1	1.00 (1.49)	1.00 (1.49)
RNT	1.02 (1.52)	1.02 (1.52)
Tensile Strength, lb (kg)	1000 (455)	1000 (455)
Flat Plate Crush Strength, lb/in (kg/mm)	150 (2.7)	150 (2.7)
Minimum Bending Radius, in (mm)	20 (508)	20 (508)
Temperature Rating, storage, min/max (°C)	-70/+80	-70/+80
Temperature Rating, installation, min/max (°C)		
A, AX	-40/+60	-40/+60
RN, RNT1, RNT	-30/+60	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80	-40/+80
Electrical		
Impedance, ohms	50	50
Velocity, %	88	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %		
Outer	0.11 (0.36)	0.11 (0.36)
Inner	0.21 (0.69)	0.21 (0.69)
Capacitance, nominal, pF/ft (m)	23.1 (75.8)	23.1 (75.8)
Inductance, nominal, µH/ft (m)	0.058 (0.19)	0.058 (0.19)
dc Breakdown, volts	11000	11000
Jacket Spark, volts, RMS	10000	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000	100000
Typical VSWR	1.3	1.3

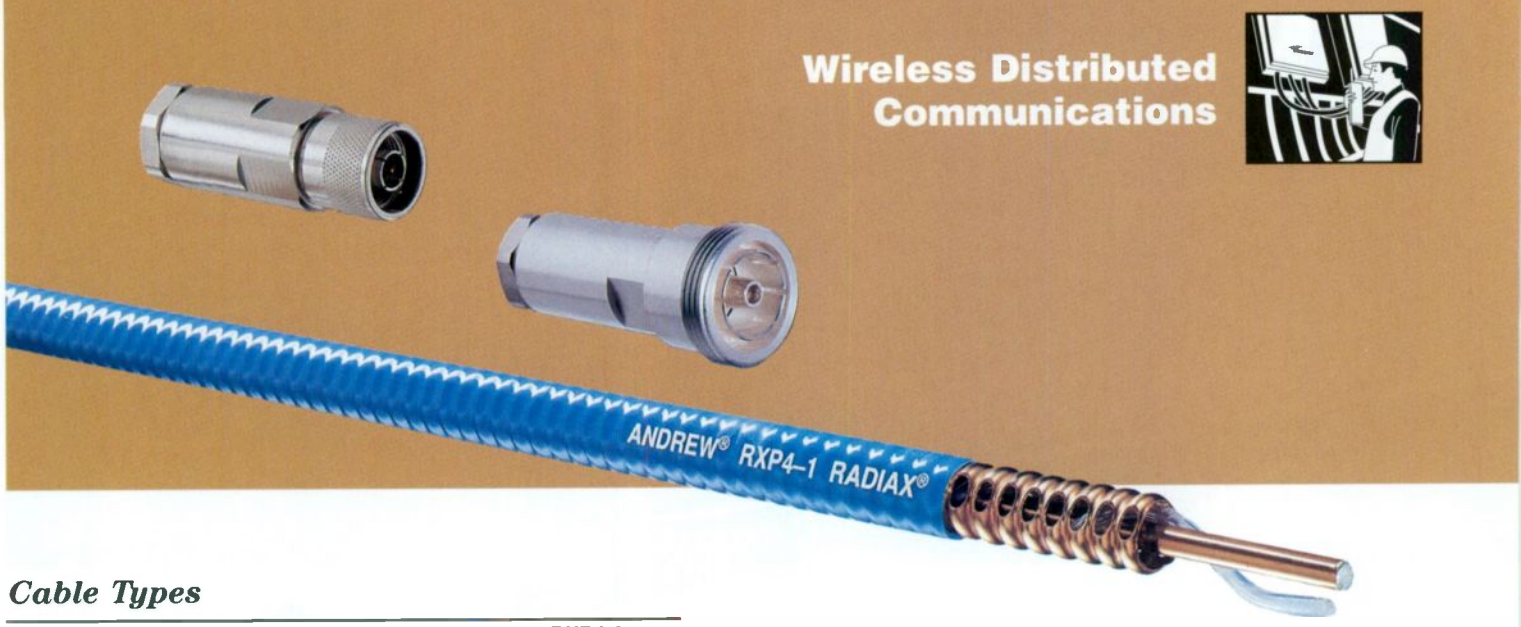
Electrical Characteristics at Frequency*

	RXL7-1	RXL7-3
150 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.33 (1.1)	0.39 (1.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	61	54
Average Power, kW	10.8	10.8
450 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.60 (2.0)	0.92 (3.02)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68	59
Average Power, kW	5.9	5.9
900 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.0 (3.3)	1.45 (4.76)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72	61
Average Power, kW	3.9	3.9
1700 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.4 (4.6)	1.8 (5.91)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	77	67
Average Power, kW	2.7	2.7
2400 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.7 (5.6)	2.4 (7.87)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	80	69
Average Power, kW	2.2	2.2

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	L7PNM
N Female	L7PNF
7-16 DIN Male	L7PDM
7-16 DIN Female	L7PDF
Splice	L47Z



Cable Types

Plenum-Rated, Fire-Retardant Cables	RXP4-1	RXP4-2

Characteristics

Description		
Nominal Size	1/2"	1/2"
Outer Conductor	Copper	Copper
Inner Conductor	Cu-Clad AL	Cu-Clad AL
Diameter over Jacket, max., in (mm)	0.62 (16)	0.62 (16)
Mechanical		
Cable Weight, lb/ft (kg/m)	0.16 (0.23)	0.16 (0.23)
Tensile Strength, lb (kg)	250 (113)	250 (113)
Flat Plate Crush Strength, lb/in (kg/mm)	100 (1.8)	100 (1.8)
Minimum Bending Radius, in (mm)	5 (125)	5 (125)
Temperature Rating, storage, min/max (°C)	-20/+80	-20/+80
Temperature Rating, installation, min/max (°C)	-20/+60	-20/+60
Temperature Rating, operating, min/max (°C)	-40/+80	-40/+80
Electrical		
Impedance, ohms	50	50
Velocity, %	94	94
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %		
Outer	0.67 (2.2)	0.70 (2.3)
Inner	0.45 (1.48)	0.45 (1.48)
Capacitance, nominal, pF/ft (m)	20.1 (66)	20.1 (66)
Inductance, nominal, µH/ft (m)	0.058 (0.19)	0.058 (0.19)
dc Breakdown, volts	1500	1500
Jacket Spark, volts, RMS	3000	3000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000	100000
Typical VSWR	1.3	1.3

1/2" Plenum Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

	RXP4-1	RXP4-2
150 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.1 (3.6)	1.4 (4.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	56	50
Average Power, kW	1.6	1.6
450 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.6 (8.5)	4.1 (13.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63	52
Average Power, kW	0.85	0.85
900 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	4.6 (15.1)	7.2 (23.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	66	56
Average Power, kW	0.58	0.58
1700 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	7.3 (24)	11.0 (36.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68	60
Average Power, kW	0.41	0.41
2400 MHz		
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	9.4 (30.8)	13.8 (44.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	70	64
Average Power, kW	0.35	0.35

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	**L4PNM**
N Female	**L4PNF**
7-16 DIN Male	**L4PDM**
7-16 DIN Female	**L4PDF**
UHF Male	**L44P**
UHF Female	**L44U**
Splice	**L44Z**

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RCM4-1RN
Single Mica Tape	
(see p. 704 for fire retardant ratings)	RCM4-1RNT1

Characteristics

Description	
Nominal Size	1/2"
Outer Conductor	Copper Foil
Inner Conductor	Cu-Clad AL
Diameter over Jacket, max., in (mm)	0.63 (16)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.15 (0.22)
Tensile Strength, lb (kg)	100 (45)
Flat Plate Crush Strength, lb/in (kg/mm)	40 (0.71)
Minimum Bending Radius, in (mm)	5 (125)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	1.73 (5.68)
Inner	0.45 (1.48)
Capacitance, nominal, pF/ft (m)	23.2 (76.1)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	4000
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

1/2" Standard Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.1 (3.4)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	58
Average Power, kW	1.5
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.1 (6.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63
Average Power, kW	0.85
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	3.0 (10.0)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68
Average Power, kW	0.58
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	4.2 (13.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	0.4
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	5.0 (16.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	0.33

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	SR4PNM
N Female	SR4PNF

7/8" Standard Series RADIAX® Radiating Cable

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RCM5-1RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RCM5-1RNT1

Characteristics

Description	
Nominal Size	7/8"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.07 (27.2)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.41 (0.61)
Tensile Strength, lb (kg)	355 (160)
Flat Plate Crush Strength, lb/in (kg/mm)	45 (0.8)
Minimum Bending Radius, In (mm)	10 (254)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	1.05 (3.45)
Inner	0.32 (1.05)
Capacitance, nominal, pF/ft (m)	23.3 (76.4)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	6000
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

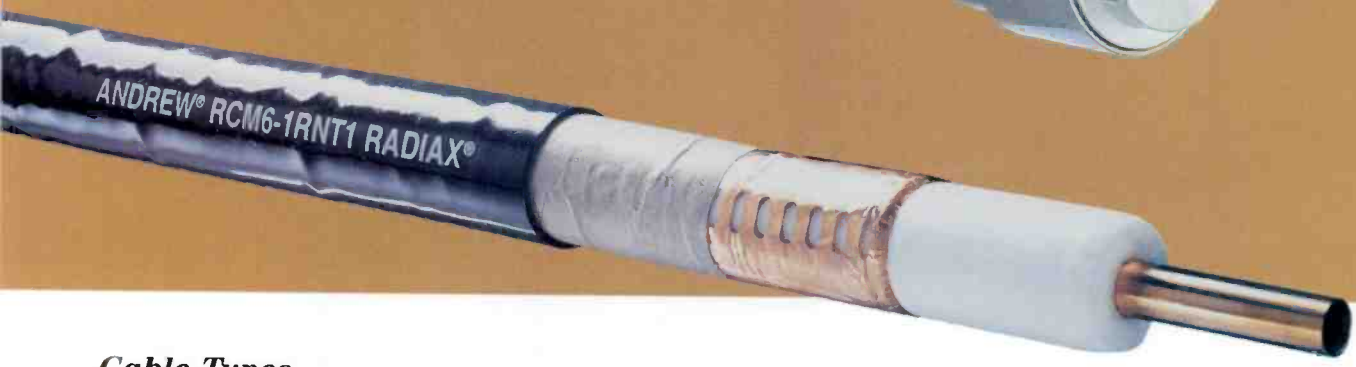
Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.058 (0.19)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	58
Average Power, kW	4.3
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.2 (3.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63
Average Power, kW	2.4
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.7 (5.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	69
Average Power, kW	1.6
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.4 (7.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	1.1
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.9 (9.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	75
Average Power, kW	0.9

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	SR5PNM
N Female	SR5PNF



1-1/4" Standard Series RADIAX® Radiating Cable

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RCM6-1RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RCM6-1RNT1

Characteristics

Description	
Nominal Size	1-1/4"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.54 (39.1)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.53 (0.79)
Tensile Strength, lb (kg)	350 (160)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)
Minimum Bending Radius, in (mm)	15 (380)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.90 (2.95)
Inner	0.22 (0.72)
Capacitance, nominal, pF/ft (m)	23.4 (76.8)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	9000
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.41 (1.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	59
Average Power, kW	7.50
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.89 (2.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	66
Average Power, kW	4.10
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.4 (4.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	71
Average Power, kW	2.80
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.9 (6.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	1.9
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 In (50 mm) standoff	2.2 (7.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	76
Average Power, kW	1.6

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Female	SR6PNF

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RCM7-1RN
Single Mica Tape (see p. 704 for fire retardant ratings)	RCM7-1RNT1

Characteristics

Description	
Nominal Size	1-5/8"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.9 (48.3)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.88 (1.31)
Tensile Strength, lb (kg)	200 (91)
Flat Plate Crush Strength, lb/in (kg/mm)	90 (1.6)
Minimum Bending Radius, in (mm)	20 (508)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, Installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.60 (1.96)
Inner	0.21 (0.69)
Capacitance, nominal, pF/ft (m)	23.4 (76.8)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	11000
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

1-5/8" Standard Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.35 (1.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	61
Average Power, kW	10.8
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.63 (2.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	68
Average Power, kW	5.9
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.1 (3.4)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	3.9
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.5 (4.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	77
Average Power, kW	2.7
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.8 (5.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	80
Average Power, kW	2.2

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Female	SR7PNF

7/8" Aluminum Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables	
Outdoor Installation, above ground	**RAL5-1AX**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RAL5-1RN**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RAL5-1RNT1**

Characteristics

Description	
Nominal Size	7/8"
Outer Conductor	Aluminum
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.12 (28.4)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.35 (0.52)
Tensile Strength, lb (kg)	320 (145)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)
Minimum Bending Radius, in (mm)	10 (250)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.41 (1.35)
Inner	0.32 (1.05)
Capacitance, nominal, pF/ft (m)	23.0 (75.5)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	6000
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.60 (2.0)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	59
Average Power, kW	3.9
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.2 (3.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	64
Average Power, kW	2.2
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.7 (5.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	69
Average Power, kW	1.4
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.5 (8.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	1.0
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	3.1 (10.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	75
Average Power, kW	0.8

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	**L5CPNM**
N Female	**L5CPNF**
Splice	**L5CPZ**

Cable Types

Non-Fire-Retardant Cables	
Outdoor Installation, above ground	**RAL5-1AX-75**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RAL5-1RN-75**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RAL5-1RNT1-75**

Characteristics

Description	
Nominal Size	7/8"
Outer Conductor	Aluminum
Inner Conductor	Cu-Clad AL
Diameter over Jacket, max., in (mm)	1.12 (28.4)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.30 (0.45)
Tensile Strength, lb (kg)	400 (180)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)
Minimum Bending Radius, in (mm)	10 (250)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	75
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.41 (1.35)
Inner	0.34 (1.12)
Capacitance, nominal, pF/ft (m)	15.2 (49.9)
Inductance, nominal, µH/ft (m)	0.086 (0.282)
dc Breakdown, volts	6500
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

7/8" Aluminum Series RADIAX® Radiating Cable

(75-ohm)

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.55 (1.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	61
Average Power, kW	3.2
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.1 (3.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	65
Average Power, kW	1.8
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.6 (5.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	70
Average Power, kW	1.2
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.5 (8.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	0.8
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	3.2 (10.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	75
Average Power, kW	0.6

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	**L5CPNM-7570**
N Female	**L5CPNF-7570**

1-1/4" Aluminum Series RADIAX® Radiating Cable

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RAL6-1RN**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RAL6-1RNT1**

Characteristics

Description	
Nominal Size	1-1/4"
Outer Conductor	Aluminum
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.58 (40.0)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.74 (1.11)
Tensile Strength, lb (kg)	1500 (678)
Flat Plate Crush Strength, lb/in (kg/mm)	138 (2.4)
Minimum Bending Radius, in (mm)	15 (380)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.21 (0.65)
Inner	0.22 (0.72)
Capacitance, nominal, pF/ft (m)	22.9 (75.2)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	8500
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.44 (1.44)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	60
Average Power, kW	6.8
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.92 (3.0)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	66
Average Power, kW	3.7
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.4 (4.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	71
Average Power, kW	2.5
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.9 (6.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	1.7
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.4 (7.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	76
Average Power, kW	1.4

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Female	**L6CPNF**

Cable Types

Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	RAL6-1RN-75
Single Mica Tape (see p. 704 for fire retardant ratings)	RAL6-1RNT1-75

Characteristics

Description	
Nominal Size	1-1/4"
Outer Conductor	Aluminum
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.58 (40.0)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.74 (1.11)
Tensile Strength, lb (kg)	1500 (678)
Flat Plate Crush Strength, lb/in (kg/mm)	138 (2.4)
Minimum Bending Radius, in (mm)	15 (380)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	75
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.21 (0.65)
Inner	0.36 (1.16)
Capacitance, nominal, pF/ft (m)	15.5 (50.8)
Inductance, nominal, µH/ft (m)	0.086 (0.283)
dc Breakdown, volts	8500
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

1-1/4" Aluminum Series RADIAX® Radiating Cable

75-ohm

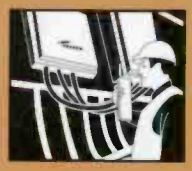
Electrical Characteristics at Frequency*

150 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.40 (1.31)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	63
Average Power, kW	5.5
450 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.83 (2.72)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	67
Average Power, kW	3.0
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.3 (4.3)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	2.0
1700 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.9 (6.2)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	74
Average Power, kW	1.4
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.4 (7.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	77
Average Power, kW	1.2

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Female	L6CPNF-7570



Wireless Distributed Communications

Cable Types

Non-Fire-Retardant Cables	
Outdoor Installation, above ground	**RCW5-1AX**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RCW5-1RN**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RCW5-1RNT1**

Characteristics

Description	
Nominal Size	7/8"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	
AX	1.03 (26.2)
RN, RNT1	1.07 (27.2)
Mechanical	
Cable Weight, lb/ft (kg/m)	
AX	0.26 (0.39)
RN, RNT1	0.32 (0.48)
Tensile Strength, lb (kg)	355 (160)
Flat Plate Crush Strength, lb/in (kg/mm)	45 (0.8)
Minimum Bending Radius, in (mm)	10 (254)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	1.05 (3.45)
Inner	0.32 (1.05)
Capacitance, nominal, pF/ft (m)	23.3 (76.4)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	6000
Jacket Spark, volts, RMS	8000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

7/8" High Performance, Wideband Series RADIAX® Radiating Cable

Electrical Characteristics at Frequency*

900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.4 (4.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	82
Average Power, kW	1.6
1800 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.1 (6.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	1.0
2400 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.7 (8.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	0.9

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Male	**SR5PNM**
N Female	**SR5PNF**

1-1/4" High Performance, Wideband Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables	
Outdoor Installation, above ground	**RCW6-1AX**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RCW6-1RN**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RCW6-1RNT1**

Characteristics

Description	
Nominal Size	1-1/4"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.54 (39.1)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.53 (0.79)
Tensile Strength, lb (kg)	350 (159)
Flat Plate Crush Strength, lb/in (kg/mm)	80 (1.4)
Minimum Bending Radius, in (mm)	15 (380)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	89
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.90 (2.95)
Inner	0.22 (0.72)
Capacitance, nominal, pF/ft (m)	23.4 (76.8)
Inductance, nominal, µH/ft (m)	0.057 (0.188)
dc Breakdown, volts	9000
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

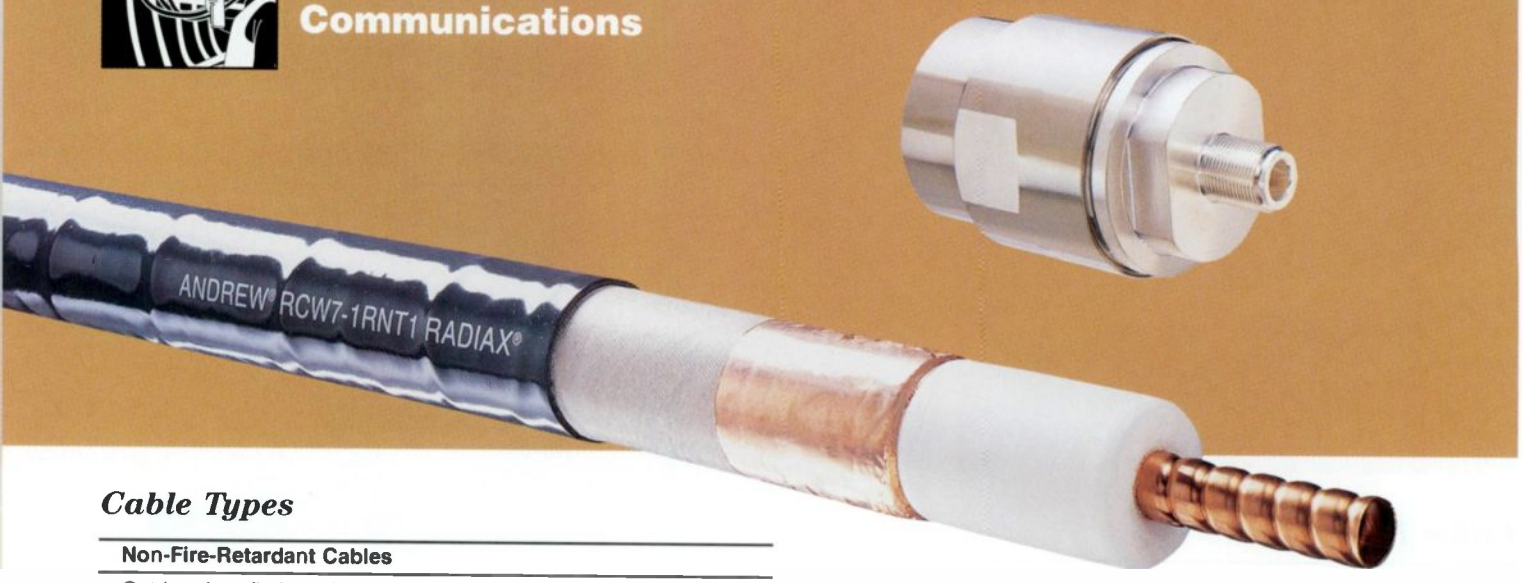
Electrical Characteristics at Frequency*

800 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.1 (3.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	82
Average Power, kW	3.0
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.2 (3.9)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	82
Average Power, kW	2.8
1800 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.6 (5.5)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	1.9
1900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.7 (5.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	1.8
2200 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	2.0 (6.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	1.7

* Refer to page 730 for explanation of coupling loss specification.

Connectors

Interface	Type Number
N Female	**SR6PNF**



1-5/8" High Performance, Wideband Series RADIAX® Radiating Cable

Cable Types

Non-Fire-Retardant Cables	
Outdoor Installation, above ground	**RCW7-1AX**
Fire Retardant, low smoke and fume, halogen free cables	
Smoke Index 50-55	**RCW7-1RN**
Single Mica Tape (see p. 704 for fire retardant ratings)	**RCW7-1RNT1**

Characteristics

Description	
Nominal Size	1-5/8"
Outer Conductor	Copper Foil
Inner Conductor	Copper Tube
Diameter over Jacket, max., in (mm)	1.90 (48.3)
Mechanical	
Cable Weight, lb/ft (kg/m)	0.83 (1.24)
Tensile Strength, lb (kg)	270 (123)
Flat Plate Crush Strength, lb/in (kg/mm)	33 (0.6)
Minimum Bending Radius, in (mm)	20 (508)
Temperature Rating, storage, min/max (°C)	-70/+80
Temperature Rating, installation, min/max (°C)	-30/+60
Temperature Rating, operating, min/max (°C)	-40/+80
Electrical	
Impedance, ohms	50
Velocity, %	88
dc Resistance, ohms/1000 ft (ohms/1000 m), ± 10 %	
Outer	0.52 (1.71)
Inner	0.21 (0.69)
Capacitance, nominal, pF/ft (m)	22.5 (73.9)
Inductance, nominal, µH/ft (m)	0.059 (0.195)
dc Breakdown, volts	11000
Jacket Spark, volts, RMS	10000
Insulation Resistance, Megohms, min lengths to 2000 ft (600 m)	100000
Typical VSWR	1.3

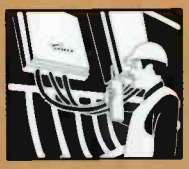
Electrical Characteristics at Frequency*

800 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.82 (2.7)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	82
Average Power, kW	4.2
900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	0.85 (2.8)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	82
Average Power, kW	3.9
1800 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.5 (5.0)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	73
Average Power, kW	2.6
1900 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.6 (5.1)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	72
Average Power, kW	2.5
2200 MHz	
Attenuation, dB/100 ft (dB/100 m) with 2 in (50 mm) standoff	1.7 (5.6)
Coupling Loss at 20 ft (6 m), dB ± 10 dB	71
Average Power, kW	2.3

* Refer to page 730 for explanation of coupling loss specification.

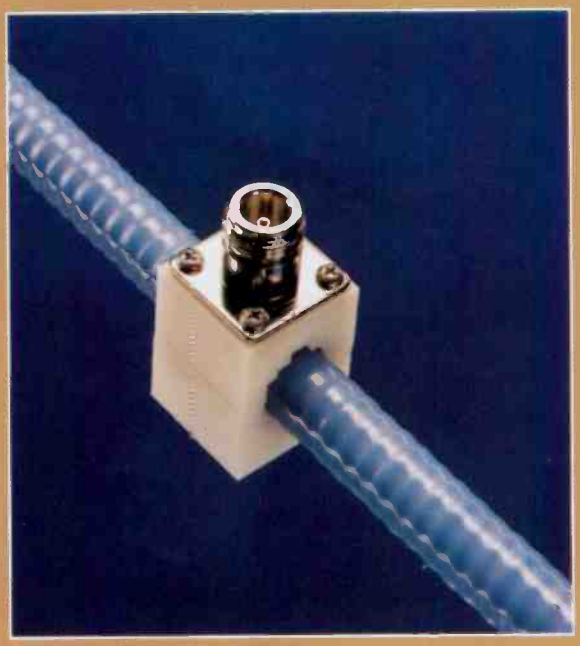
Connectors

Interface	Type Number
N Female	**SR7PNF**



RADIAX® Accessories

RADIAX Cable Taps



Extend RF Communications in Existing Systems

- *Installs in minutes*
- *Attaches anywhere along the cable*
- *Cost effectively increases coverage*
- *Provides 10 dB coupling*

RADIAX cable taps provide design engineers a means to quickly and easily extend the coverage capabilities of in-building RF systems. The tap can be attached anywhere along the length of your main feeder to facilitate installation of a new run of cable to provide service for additional coverage areas. The tap also can be used to add transmission line service for HELIAX® cable systems.

RADIAX cable taps install in minutes simply by drilling a single hole into the main cable's outer conductor. A spring-loaded probe serves as the interface between the inner conductor and the tap's integral Type N female connector. The tap is secured to the cable with two self-tapping screws.

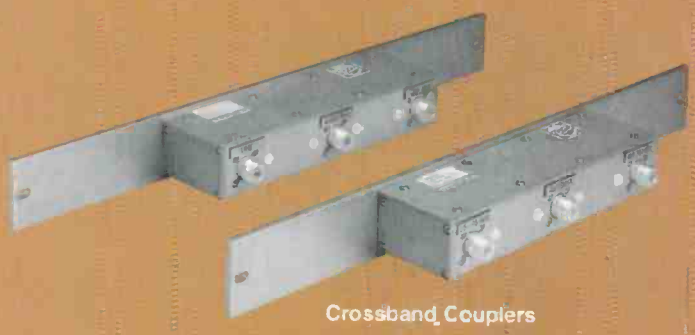
The cable tap provides design engineers a cost-effective and easy-to-install tool to add to existing RF systems. The main cable trunk does not have to be cut to install power splitters or additional connectors and the tap can be redeployed simply by reattaching it at a new point along the feeder.

The tap is designed to operate in the specific frequency band, indicated by the detail number, with a nominal 10 dB coupling loss in the tapped path and a nominal 1 dB insertion loss in the cable's main path.

Ordering Information

Frequency Band, MHz	Coupled Port Loss, dB	Insertion Loss, dB	Maximum Power, W	Connector Interface	Dimensions in (mm)	Type Number
For 1/2" Cable Types RXL4, RXP4, LDF4, and HL4RP						
100-200	10.5 ± 1.5	<1.2	10	N Female	1.25 x 1.25 x 1.4 (32 x 32 x 36)	241235-4
300-600	10.5 ± 1.5	<1.2	10	N Female	1.25 x 1.25 x 1.4 (32 x 32 x 36)	241235-1
700-1000	10.5 ± 1.5	<1.2	10	N Female	1.25 x 1.25 x 1.4 (32 x 32 x 36)	241235-2
1800-2000	10.5 ± 1.7	<1.5	10	N Female	1.25 x 1.25 x 1.4 (32 x 32 x 36)	241235-3
For 7/8" Cable Types RXL5 and LDF5						
100-200	10.5 ± 1.5	<1.2	10	N Female	1.85 x 1.75 x 1.4 (46 x 44 x 36)	241235-104
300-600	10.5 ± 1.5	<1.2	10	N Female	1.85 x 1.75 x 1.4 (46 x 44 x 36)	241235-101
700-1000	10.5 ± 1.5	<1.2	10	N Female	1.85 x 1.75 x 1.4 (46 x 44 x 36)	241235-102
1800-2000	11.0 ± 1.7	<1.5	10	N Female	1.85 x 1.75 x 1.4 (46 x 44 x 36)	241235-103

Isolation: dc coupled, but not intended for center conductor powering devices via tapped port



Crossband Couplers

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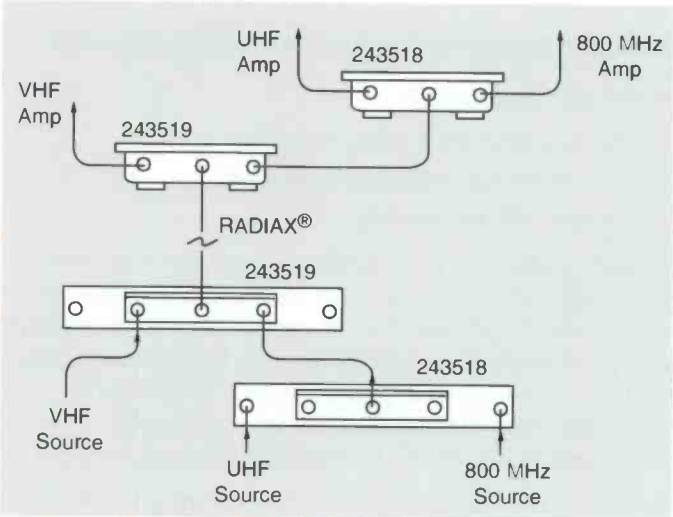
Crossband Couplers

Crossband couplers combine multiple frequency bands from sources such as microcells, base stations, or bidirectional amplifiers onto a single RADIAX cable run, which then acts as a multi-band antenna throughout the coverage area. The couplers can also be used to separate the services for reamplification or individual distribution.

Ordering Information

Frequency Bands, MHz	Typical Loss, dB	Isolation dB	Power Rating Watts	Type Number
400-512	0.20	40	750	**243518**
800-960	0.20		500	
5-175	0.25	40	250	**243519**
400-960	0.25		350	



Loads and Antennas –

50-ohm Loads

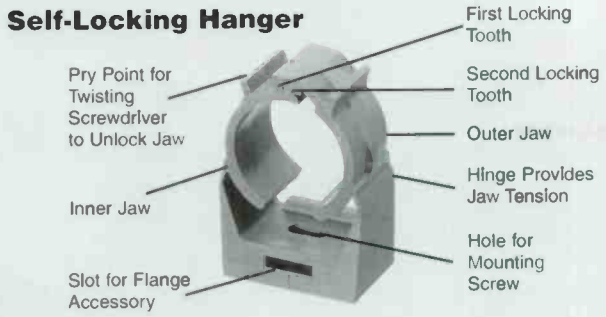
Reference	Power Watts	Input	Type No.
A	25	N Plug	**32299-6**
B	10	N Jack	**32299-5**
C	2	UHF Plug	**42416**

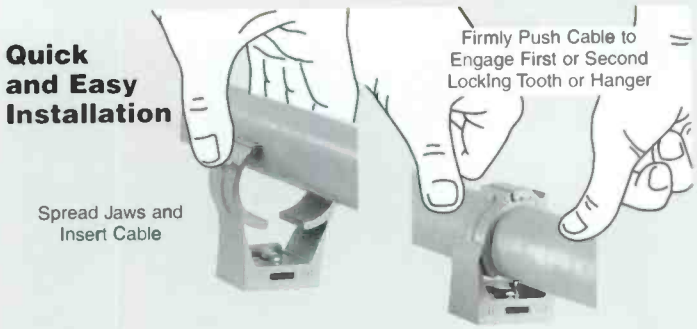
D 150 or 450 MHz Whip Antenna. For coverage outside building or large inside area. UHF plug (male) input. 17.4 in (442 mm) .....Type **42419**

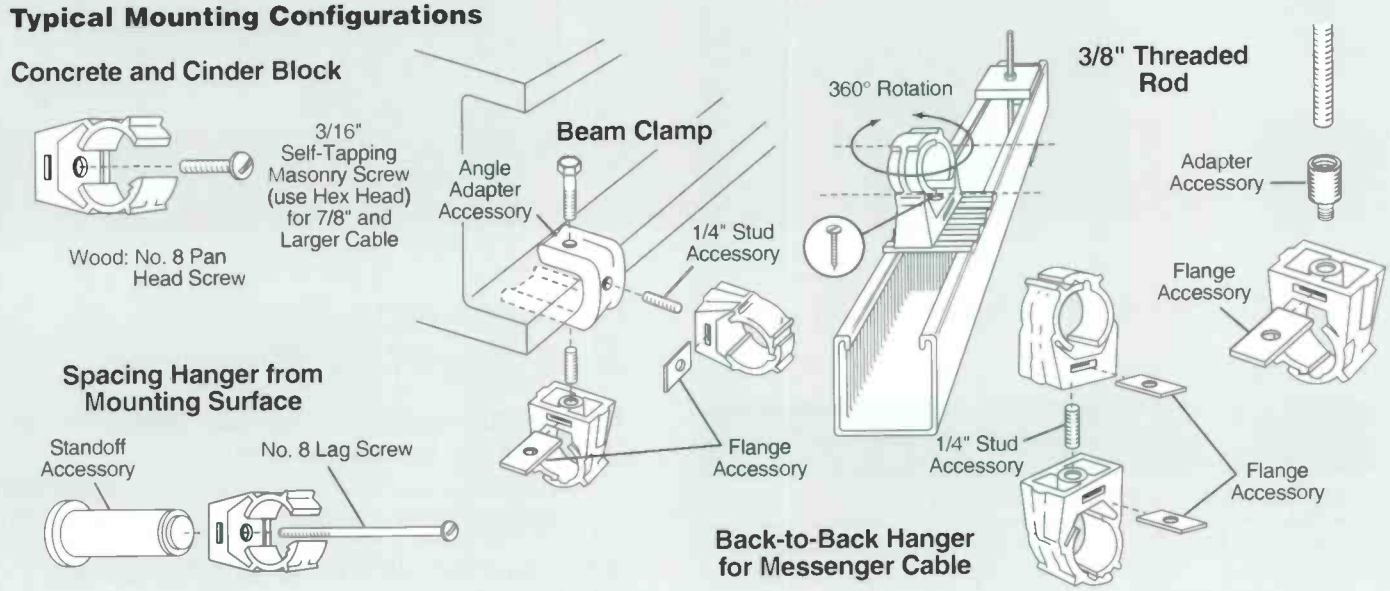
Power Splitters

The units listed below include 50-ohm impedance transformers. 30 MHz splitters are mounted in 10 x 12 x 3 in (254 x 305 x 76 mm) aluminum cabinets.

Ref.	Frequency Band, MHz	2-Way	3-Way	4-Way	Input Type	Output Type
E	22-30	**42155**	**42156**	**42157**	UHF Jack	UHF Jack
F	140-180	**42192**	**42193A**	**42194**	UHF Plug	UHF Jack
G	250-750	**42152**	**42153**	**42154**	N Plug	N Jack
G	500-1500	**44612**	**44613**	**44614**	N Plug	N Jack
G	400-1200	**243520**	**243521**	**243522**	N Plug	N Jack
G	700-2100	**243523**	**243524**	**243525**	N Plug	N Jack
Splitter Loss, typical		3.5 dB	5.5 dB	7 dB		







Mounting

Several alternative mounting methods are available for RADIAX® slotted coaxial cable. The choice depends on mounting surface, environmental considerations, cable size and cost.

- *Self-Locking Hangers for quick and easy cable attachment*
- *Metal Hangers for environmental extremes*
- *Messenger Cable Straps*
- *Nylon Cable Ties*

Available Hanger Types by Cable Size

Self-Cable Size	Locking Hangers	Metal Hangers Stainless	Metal Hangers Plated	Messenger Cable Strap	Nylon Cable Ties
1/4"	X			X	X
3/8"	X			X	X
1/2"	X	X	X	X	X
7/8"	X	X	X	X	X
1-1/4"	X	X		X	
1-5/8"	X	X		X	

Self-Locking Hangers

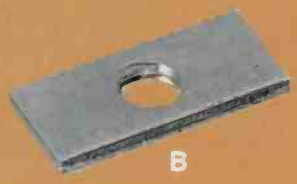
- *One-Piece automatic locking design reduces installation time...no clamp hardware*
- *Made from Nylon 12 for strength and corrosion resistance*
- *Mount to a wide variety of surfaces. Many hanging configurations possible using available accessories*
- *Electrical gray color*
- *Provide 1/2" (13 mm) standoff*
- *Made from non-halogenated material*

Self-Locking Hanger Kit of 10. Select hanger from table based on cable size and jacket type. Surface mounting hardware is not included. See illustrations below for recommended mounting hardware and accessories.

Temperature Range:

Continuous Operation, -40 to 82°C (-40 to 180°F)
Installation, -21 to 82°C (-5 to 180°F)


A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Self-Locking Hanger Kits

Photo Reference **A**

Cable Size	Type Number Kit of 10	Type Number Kit of 500	Clamping Range Diameter, in (mm)
For Buriable, RXT and RN Series Jacketing			
1/4"	209800-8	–	0.290-0.374 (7.37-9.50)
3/8"	209800-10	–	0.374-0.465 (9.50-11.81)
1/2"	209800-15	–	0.563-0.661 (14.30-16.79)
7/8"	209800-25	209800-25-IP	0.969-1.094 (24.61-27.79)
1-1/4"	209800-36	209800-36-IP	1.398-1.555 (35.51-39.50)
1-5/8"	209800-47	209800-47-IP	1.813-1.988 (46.05-50.50)
For RNT and RNT1 Series Jacketing			
1/4"	209800-10	–	0.374-0.465 (9.50-11.81)
3/8"	209800-12	–	0.465-0.563 (11.81-14.30)
1/2"	209800-17	–	0.661-0.768 (16.79-19.51)
7/8"	209800-28	209800-28-IP	1.094-1.228 (27.79-31.19)
1-1/4"	209800-40	209800-40-IP	1.555-1.713 (39.5-43.5)
1-5/8"	209800-47	209800-47-IP	1.813-1.988 (46.05-50.50)

Accessories for Self-Locking Hangers

B Flange Kit. Inserts into hanger slot. Tapped 1/4"- 20. Use with 1/4" threaded rod or stud.
Kit of 10 .....Type **209797**
Installer Pax Kit of 500 .....Type **209797-IP**

C 1/4" Stud Kit. 1/4"-20 x 1/2" long. For mounting hanger. Attaches to flange (item B).
Kit of 10 .....Type **209799**
Installer Pax Kit of 500 .....Type **209799-IP**

D Angle Adapter Kit of 10. 1/4"- 20 hardware. For mounting hanger to angle member. Use with 1/4" stud (item C) and flange (item B) .....Type **209821**

E Adapter Kit of 10. 1/4"- 20 male and 3/8"- 16 female threads. Use to mount hanger with 3/8" threaded rod. Attaches to flange (item B) .....Type **209798**

F Standoff Kit. Provides 2" (50 mm) standoff. Includes 3 in long No. 8 lag screw.
Kit of 10 .....Type **209795**
Installer Pax Kit of 500 .....Type **209795-IP**


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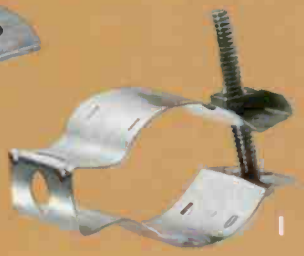
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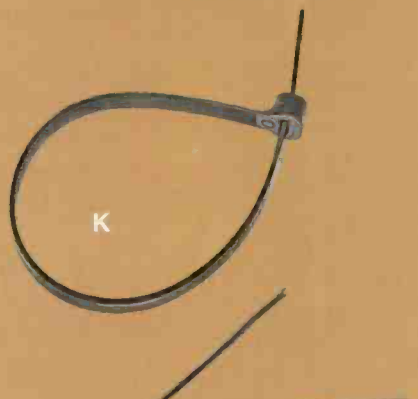
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Other Mounting Accessories

G Strut Adaptor Kit of 10. For attaching Type **209800-17** through - 47 self-locking hangers to strut sizes:
12 gauge, 1-5/8" x 1-5/8" (41.3 x 41.3 mm)
12 gauge, 1" x 1-5/8" (25.4 x 41.3 mm)
12 gauge, 13/16" x 1-5/8" (20.6 x 41.3 mm)
14 gauge, 13/16" x 1-5/8" (20.6 x 41.3 mm)
Includes ten #10 stainless steel screws.
.....Type **223160**

Metal Hanger Kits of 10, plated steel or stainless steel, surface mounting hardware not included.

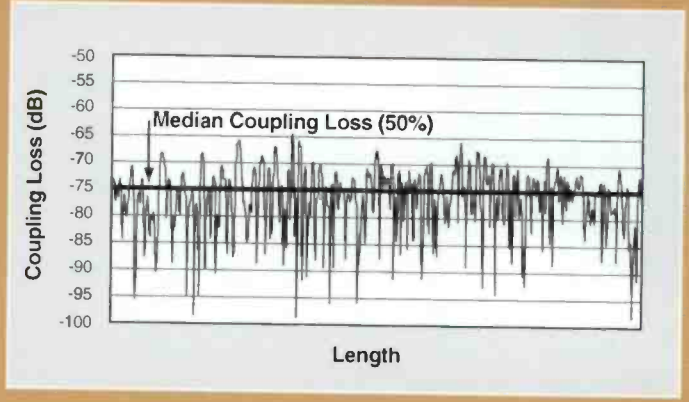
Cable Size	Photo Ref.	Mounting Hardware	Plated Type No.	Stainless Steel Type N
1/2"	H	1/4"	40954	40954-2
7/8"	H	1/4"	40785-1	40785-2
1-1/4"	I	3/8"	–	42396A-1
1-5/8"	I	3/8"	–	42396A-2

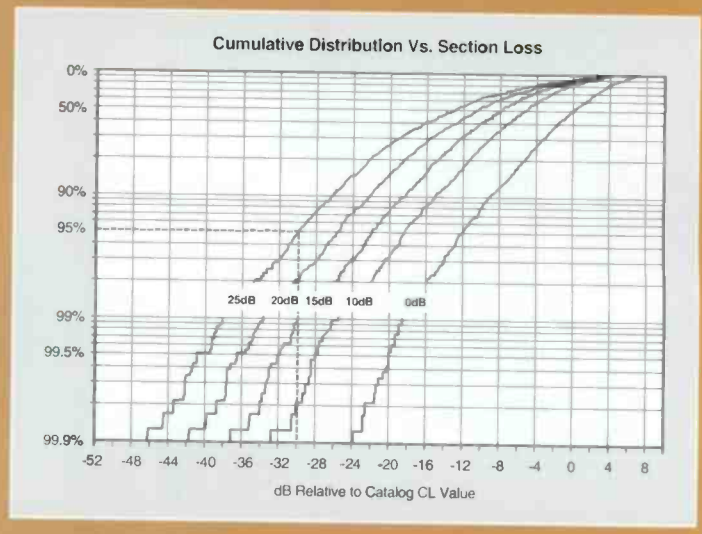
J Messenger Cable Strap Kit of 10 for mounting all sizes of RADIAX cable, except Type RXL4-3, to 1/4"- 5/16" messenger cable. Insulated. Easy installation.....Type **209820**

Note: To mount Type RXL4-3 cable to messenger cable, use two self-locking hangers back to back. Use Types 209800-15 or 209800-17 for attachment to the RADIAX cable and Type 209800-8 for attachment to the messenger cable.

K Nylon Cable Tie Kit of 50 for mounting 1/4", 3/8", 1/2", and 7/8" cable .....Type **40417**

L Jacketed Cable Tie Kit of 20 for mounting 1/4", 3/8", and 1/2" cable .....Type **27290A**





RADIAX® System Design Considerations

When designing a system, it is important to consider certain concepts.

Link Budget

A link budget is simply the sum of all system gains and losses between a transmitter and a receiver. The surplus is called system margin, which allows for unforseen losses and/or equipment degradation.

Important Parameters

Cable Attenuation

Attenuation (longitudinal loss) is primarily a function of I^2R (heat) losses, with radiation loss comprising roughly 20-30% of the total. Due to the quality of the materials used in the construction of RADIAX radiating cable, I2R losses are minimized, resulting in an efficient transmission line.

RADIAX cable attenuation is specified in dB/100 ft (100 m) measured at 2 in (50 mm) from a concrete surface. Because attenuation is influenced by proximity to materials, such as concrete or metal, this is the recommended standoff.

Coupling Loss

The most important feature of RADIAX cable is the amount of RF power that is radiated along its length. Coupling loss is a measure of the "leakage" effects of the slots in the cable's outer conductor. It is defined as the difference between the median power level received by a 1/2 wave dipole moving along the cable at a parallel distance of 20 ft (6.1 m) and the power inside the cable's coaxial mode.

Coupling Loss Specifications

Coupling Loss is measured by mounting RADIAX cable 2 or more inches (50 mm +) from a wall and recording data using a test antenna travelling parallel to and 20 feet (6.1 m) from the cable. Wall mounts are used to simulate a typical system application in a building or tunnel. Other standards exist where cable is tested at closer distances (1 to 2 meters from the cable) and in a free space environment. These standards may provide the appearance of better coupling loss performance due to the closer proximity and may not accurately reflect installed environment performance.

This relationship is reciprocal, i.e. the RADIAX could be the receiving or transmitting antenna. The statistical median is the true 50% value of coupling and is determined to be a value where there are an equal number of data points above as below that value. Median or 50% coupling loss is illustrated in the graph above.

In this example, with 0 dBm coaxial power, our test antenna would have a 50% probability of receiving a signal level of -75 dBm or greater. Other probabilities can be easily calculated (see Cumulative Distribution graph above).

Statistical Values of Coupling Loss (other than the median 50%)

Because the median or 50% value is given for each RADIAX cable, it is possible to determine from a special nomograph the coupling loss value necessary to provide other percentages of communications. Obviously a radio system where communications existed in only 50% of the coverage area would prove unacceptable, so higher percentages such as 95% are commonly specified in system designs. The nomograph above consists of a family of curves that can be used to determine the extra coverage margin necessary to convert from the catalog 50% value to higher coverage percentages. An example of how to use this nomograph is included later in this section.

The following calculations show examples of design techniques that can be used effectively.

Example 1

A 10W UHF repeater is connected to a T arrangement of RADIAX cable as shown in the diagram. A portable at point A talks to a portable at point D.

The tee consists of two legs of RXL6 RADIAX® cable connected to the base receiver via a power divider and a short piece of HELIAX® jumper. The system is to provide reliable communications, defined by 95% coverage at a receiver input level of -90 dBm.

This means that throughout 95% of the coverage area, a signal level of -90 dBm or stronger must be received at the base receiver input connector.

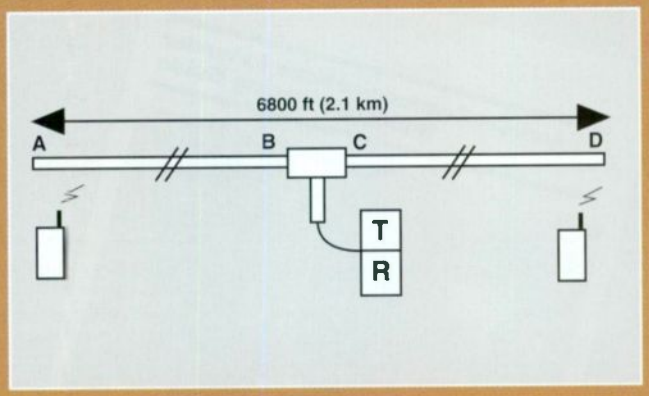
Evaluating the contents of the system and using some of the definitions previously explained, the system link budget looks like this:

Reverse Path (Uplink)	
Portable TX Output Power (2W)	+ 33 dBm
Portable Antenna Loss	- 6 dB
RXL6 Coupling Loss (50% MEDIAN)	- 66 dB
RXL6 Attenuation (C - D @ 450 MHz)	25 dB**
Coverage Margin for 95% based on above 25 dB	- 30 dB
Power Splitter Loss	- 3.5 dB
Coax Jumper Loss	- 1.5 dB
RX Input Power from Above	- 74 dBm
System Min Required Input Power	- 90 dBm
System Margin	+ 16 dB
Forward Path (Downlink)	
Base TX Output Power	+ 40 dBm
Coax Jumper Loss	- 1.5 dB
Power Splitter Loss	- 3.5 dB
RXL6 Attenuation (C - D @ 450 MHz)	25 dB**
Coverage Margin for 95% based on above 25 dB	- 30 dB
RXL6 Coupling Loss (50% Median)	- 66 dB
Portable Antenna Loss	- 6 dB
Body Blockage*	- 6 dB
Portable RX Input Power from Above	- 73 dBm
System Min Required Input Power	- 90 dBm
System Margin	+ 17 dB

* Body blockage is not included in the uplink budget because in a portable-initiated call, it is assumed that the radio is at head level (normally worn on belt).

** Shown for reference only. Not included in link budget.

To review how the the Coverage Margin of 30 dB was determined, refer to the curves described previously as "Cumulative Distribution vs Section Loss". Choose the curve for 25 dB, as this is the total attenuation or section loss from Point C - D. Come down the curve to



where the 95% line intersects and read the required coverage margin; 30 dB in this case. This is the value necessary to be added to the catalog 50% or Median coupling loss; 66 dB for RXL6 at 450 MHz.

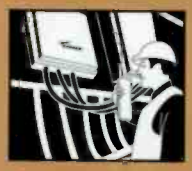
Important Note: RADIAX cable catalog coupling losses are determined from measurements made inside a concrete building in order to simulate real environments. Environment can have a considerable effect on the coupling loss of all radiating cables. Tunnel experience has shown that median values can vary from one condition to another. Factors such as construction materials, tunnel cross-section, and location of cable are just some of the variables that can cause an increase or decrease in the coupling loss from that specified in the catalog. Andrew has Applications Engineers available to help you with your specific application. Contact our Customer Service Center for details.

Installation Orientation

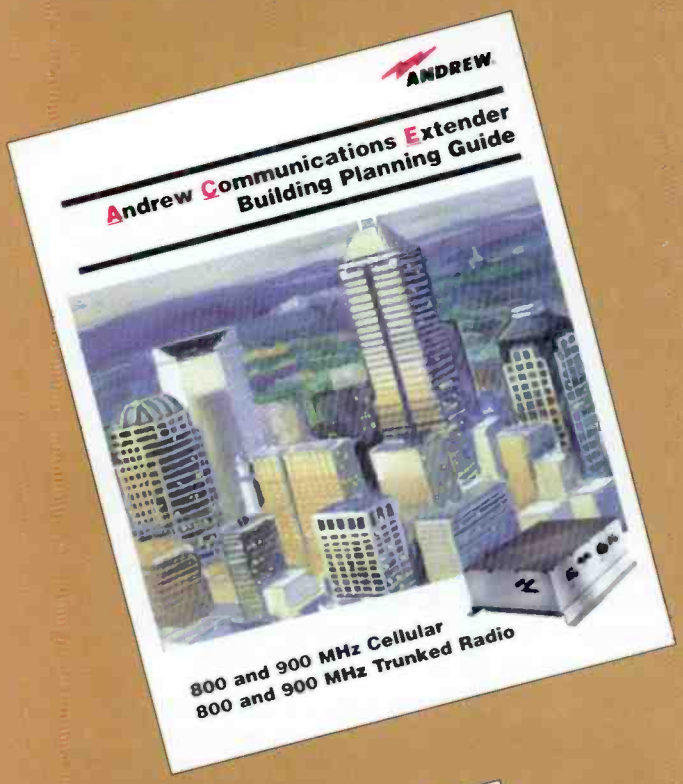
An often asked question is whether the location of the slots is critical to RADIAX cable coupling performance. Test range and anechoic chamber tests have shown that slot orientation has negligible effect on coupling loss. This is because the slots are not "radiating" like apertures but are causing excitation of surface currents on the outside of the outer conductor. The result is a closely concentric field surrounding the cable.

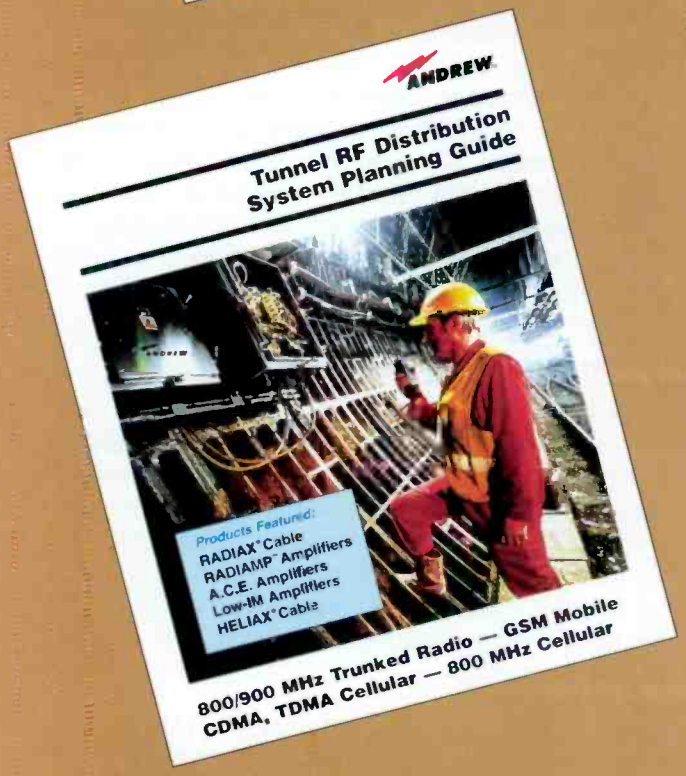
Polarization

Due to inherent multipath effects from the RADIAX cable and also multipath reflections caused by the surrounding environment, both vertical and horizontal polarizations can be used effectively.



Wireless Distributed Communications





For More Information

System Design Software

R-P-Calc® - Use this performance calculator to perform operating margin calculations for systems that use RADIAX® radiating cable. This software indicates applicable system components after entry of user-defined system characteristics. Displays sample diagram of typical systems. Includes 3-1/2" Diskette and instructions. **Request M100.**

RF System Planner for Buildings and Tunnels - RF system designers can utilize this software to design their own communications system for use in tunnels and inside buildings where RF signals are typically blocked. Provides information on a wide range of RADIAX and amplifier products. Includes frequencies from VHF through PCS. This software is compatible with all Windows formats. Includes CD ROM and instructions. **Request M305.**

RF System Design Bulletins

Andrew Communications Extender Building Planning Guide for 800 and 900 MHz Cellular and Trunked Radio - This bulletin gives RF system designers a detailed description of the A.C.E. system, its components, and information on designing an off-air A.C.E. extension system to provide RF coverage in areas not covered by conventional means. Floor plan examples, illustrations, and installation discussions are provided. Includes ordering information, order form and price list. **Request Bulletin 1947.**

Tunnel RF Distribution System Planning Guide - This illustrated, comprehensive guide provides information on designing an off-air extension or base station fed distribution communications system for confined areas. Includes U.S. Cellular, U.S. 800 MHz trunked, GSM cellular and U.S. 900 trunked services and features RADIAX cable, RADIAMP amplifiers, A.C.E. amplifiers, Low IM amplifiers, and HELIAX® cable. **Request bulletin 3860.**

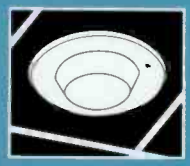
Application Briefs and Professional Papers

Andrew Corporation offers a broad range of documents to aid in the design of RF communication systems in tunnels, in buildings, and in other enclosed areas where radio frequencies do not propagate. Please contact the Andrew Customer Service Center to request application briefs and professional papers.

Wireless RF Active Products

INDEX

Wireless RF Active Products



Wireless RF Active Products

The Illuminator™

Fiber Optic - Active Antenna System for AMPS Cellular Applications

The Illuminator™ fiber-fed active indoor antenna system from Andrew Corporation provides the ultimate solution in improved cellular coverage. This product is specifically designed to deliver high quality RF signals inside open buildings, such as convention centers, malls, underground tunnels, and throughout multistoried office complexes.

Donor Control Unit

The Donor Control Unit provides the physical interface between the wireless central office equipment and the Active Remote Antenna Unit.

Active Remote Antenna Unit

The Active Remote Antenna Unit delivers enhanced cellular signals to the remote areas of a building or facility for improved communications and increased profits. The low profile design makes this a very attractive product in a high visibility area.

Fiber Optic Distribution

The Illuminator™ system connects the Donor Control Unit with its Active Remote Antenna over a fiber optic cable link. An Active Remote Antenna can be located more than a mile from the Donor Control Unit (when the local power option is used).

Power for the Active Remote Antenna can be delivered along with the fiber cable when installed with the Andrew special Composite Optical Fiber Cable (Type No. 242755-10). This special fiber/copper combination saves the customer both time and money.

Multiple Channel - Full Duplex Operation

Up to 20 digital or analog cellular channels can be in-use simultaneously at each Active Remote Antenna location.

Self Diagnostics

Integrated loopback alarm with RF pilot tone for easy detection of outages. Provides alarm outputs for direct interface to remote monitoring systems.

Specifications

Donor Control Unit	
Operating Frequency	824-894 MHz
RF Input per channel	+10 dBm
Max. number of Channels	20
Max. composite RF Input	+23 dBm
RF Output per Signal	-100 to -45 dBm
Output carrier to noise	55 dBc min.
Operating Voltage	+19 to +30Vdc
Height	1.7 inches
Width	19 inches
Depth	4.75 inches
Weight	2 lb, 8oz
Operating Temperature	32° to 140° F

Active Remote Antenna Unit	
Operating Frequency	824-894 MHz
RF Output per channel	+10 dBm
Max. number of Channels	20
Max. composite RF Output	+23 dBm
RF Input per Signal	-100 to -45 dBm
Output carrier to noise	55 dBc min.
Output - carrier to intermod	43 dBc min.
Operating Voltage	+19 to +30Vdc
Height	4.25 inches
Diameter	8.5 inches
Weight	2 lb, 6oz
Operating Temperature	32° to 140° F

Ordering Information

Type Number	Description
621034-1	Active Remote Antenna Unit (direct feed)
621034-2	Active Remote Antenna Unit (local transformer)
621033-1	Donor Control Unit (10 dBm maximum input)
621033-2	Donor Control Unit with 10 dB attenuator pad (20 dBm maximum input)
242755-10	Composite Optical Fiber cable with integrated 18-gauge wires with connectors (RISER)
242756-10	Composite Optical Fiber cable with integrated 18-gauge wires with connectors (PLENUM)
242761-1	Duplex Optical Fiber Cable (PLENUM) with connectors
621032-2	24 Volt dc Power Transformer

Specifications for TA1915

Operating Frequency	1850-1910 MHz
System Gain	15 dB min
System Noise Figure	2.5 dB
Bypass Loss	1.9 dB max
3rd Order Intercept	36 dBm
Return Loss	14 dB min
Lightning Protection	Gas Arrestor (Internal)
Operating Voltage	+19 to +30 Vdc
Alarming	RF Pilot Tone (1750 MHz)
Alarming Output	1. Relay Closure (N.O. / N.C.)
Alarming Output	2. Open Collector (alarm = low)
Filter Attenuation	65 dB @ 1810 MHz 60 dB @ 1930 MHz 80 dB @ 894 MHz

Tower Top Unit

Weight	7.9 lb
Height	9.75 in (25 m)
Diameter	5.5 in (14 m)
Mounting	4 x 1.625 in Uni-Channels
Connectors	7-16 DIN type jack
Operating Temperature	-22° to 185° F (-30° to 85° C)

Ground Control Unit

Weight	3.9 lb
Height	3.5 in (88 mm)
Width	19 in (482 mm)
Depth	8 in (203 mm)
Mounting	19 in Telco Type Rack
Connectors	7-16 DIN type jack

Specifications for TA9015

Operating Frequency	901-902 MHz
System Gain	15 dB min
System Noise Figure	2.5 dB
Bypass Loss	1.9 dB max
3rd Order Intercept	32 dBm
Return Loss	15 dB min
Lightning Protection	Gas Arrestor (Internal)
Operating Voltage	+19 to +30 Vdc
Alarming	RF Pilot Tone (947.5 MHz)
Alarming Output	1. Relay Closure (N.O. / N.C.)
Alarming Output	2. Open Collector (alarm = low)
Filter Attenuation	30 dB @ 891 MHz 30 dB @ 912 MHz 55 dB @ 875 MHz 55 dB @ 928 MHz

Tower Top Unit

Weight	9 lb
Height	11.25 in (285 mm)
Diameter	5.5 in (140 mm)
Mounting	4 x 1.625 in Uni-Channels
Connectors	N Female
Operating Temperature	-22° to 185° F (-30° to 85° C)

Ground Control Unit

Weight	3.9 lb
Height	3.5 in (88 mm)
Width	19 in (482 mm)
Depth	8 in (203 mm)
Mounting	19 in Telco Type Rack
Connectors	N Female

Type Number	Description
TA9015	Narrowband PCS Tower Top System
TA1915	PCS Tower Top System

Wireless RF Active Products

Andrew Tower Top Systems

Andrew Tower Top Systems utilize the latest technology in high frequency components and substrates to deliver high reliability and improved performance in active antenna receiver systems.

These systems provide an overall signal performance increase of 15dB (±0.5dB) for wireless band applications. This allows low power (distant) signals to achieve a 15dB gain while offending out-of-band signals are removed through the use of symmetrical bandpass filters. The output is then sent to the base station through a ground control unit.

Each system consists of a low noise amplifier (LNA) module connected to a ground control unit through a coaxial cable. The RF signals as well as dc power and a supervisory tone are delivered to and from the LNA through the coaxial cable which connects the two units. A 120 Vac transformer with a 24 Vdc output is included.

Electronic Products and Systems

INDEX

Systems and Products

for Surveillance and Communications Requirements

Andrew Corporation's Communication Systems Group (CSG) is a recognized leader in the design and production of signal intelligence, surveillance and communication products and systems used throughout the free world. The entities comprising CSG provide unique capabilities that are second to none. CSG is ISO-9001 certified and registered.

CSG is dedicated to producing world class products and systems for applications with military and other governmental and civilian agencies. We back this up with a commitment to superior customer training and field support. Professional civilian and military expertise vested in CSG totals hundreds of years and forms the basis of a credible appreciation of customer needs.

Andrew SciComm develops custom engineered products and fully integrated surveillance systems. Covering 100 kHz to 40 GHz, Andrew SciComm's products and systems are used in aircraft, aboard ships and on land to detect, intercept and analyze electromagnetic signals and to locate transmission sources.

Andrew Kintec provides a broad range of experience in pedestal technology for acquisition, tracking and pointing. Systems capabilities include landbased, shipboard and airborne applications. Products include integrated gimbals, pedestals, rotators and controls. Applications include communications, fire control, electronic warfare and border security surveillance systems.

Andrew Government Antenna Systems, a part of Andrew Canada, specializes in the design and manufacture of a wide variety of antenna configurations covering a broad range of frequencies from 0.5 MHz to 50 GHz. Applications include test range instrumentation, signal intelligence collection, electronic intercept, HF communications, air traffic control and weather radar.

Technical Services. SciComm / Kintec's best technicians are assigned to this section. Highly experienced personnel are ready to serve customer's needs and requirements in the areas of repair services, field engineering support, customer repair part storage and tracking as well as complete depot support. These support personnel hold security clearances which allow them access to secure areas and repair of classified equipment when the need arises. In addition to Andrew SciComm / Kintec equipment, these employees are capable of repairing and maintaining other vendors' equipment.

Andrew SciComm Inc. Garland, Texas, U.S.A.

Andrew Canada Inc. Whitby, Ontario, Canada

Electronic Products and Systems

Transportable SIGINT System incorporating both microwave and communications DF as well as automated intercept and data processing functions.

SCR-2900DF Integrated Radar Monitoring System.

Systems

Andrew provides complete integrated systems for intercepting, collecting, monitoring, identifying and locating signal emitters. Component products available for complex systems include high performance antennas, receivers, analyzers, direction finders and software products from Andrew as well as selected products from other suppliers. Applications include fixed, mobile, transportable, shipborne, and airborne systems. Examples are those supplied for ESM, COMINT, ELINT, frequency monitoring and management as well as HFDF/SSL (Single Site Location).

To support our system integration capability, we have the highest level of in-house design, development and manufacture of subsystems and components including:

- *Receivers*
- *Analyzers*
- *Signal enhancement systems*
- *Processors*
- *Antennas*
- *Displays*
- *Pedestals*
- *DF and DF/SSL sets*
- *Optical gyros and sensors*
- *Servo Controls*
- *Shelter Integration*
- *Frequency monitoring*

SIGINT Systems

ELINT systems covering 0.1 - 40 GHz currently are in service by U. S. and friendly foreign military services. COMINT systems covering 10 kHz to 3400 MHz also are in service by these military services. Civilian agencies find applications for variations of these equipments in regulating the ever more crowded radio frequency spectrum.

HF Communications Enhancement Systems

The ARX-5000 HF digitally adaptive beamforming system represents a significant improvement in technology that minimizes the effects of interference and enhances reception through beam and null forming techniques.

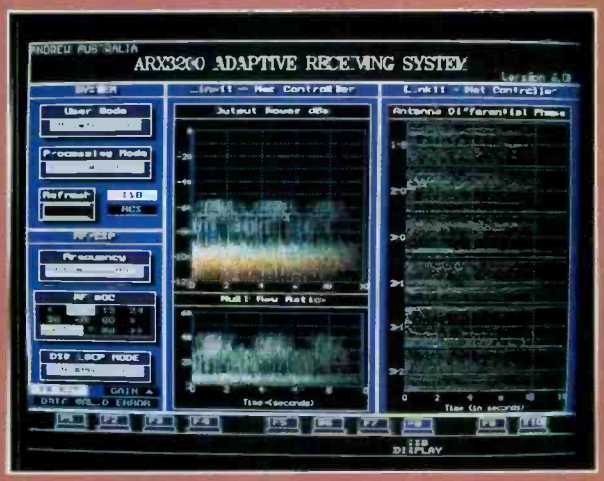
The ARX-5000 adaptive array processing technique rapidly identifies the desired signal waveforms, forms antenna nulls in the direction of unwanted signals, and then forms an antenna maximum on the desired signal. The algorithms utilized do not impose phase or amplitude modulation on the desired signal. This results in improvement of the signal-to-noise ratio (SNR) and reduction in the bit error (BER).

The receiving system can be employed in conjunction with existing antenna configurations or optimized Andrew active antennas to achieve this performance and is transparent to data and link established protocol.

Transportable HFDF/SSL Transmit Case System

HFDF/SSL Systems

The HFDF/SSL systems' product-improved designs incorporate second generation open systems architecture. VME processors, Ethernet Local Area Network (LAN), X-Windows, ORACLE relational databases and the SPOX Operating System™ provide upgraded, powerful collection tools with superior connectivity. Our field-proven upgrades simplify full integration of HFDF/SSL systems into your present and future collection resources.



ARX3200 Adaptive Receiving System Operator Display

Reconnaissance Products and Systems

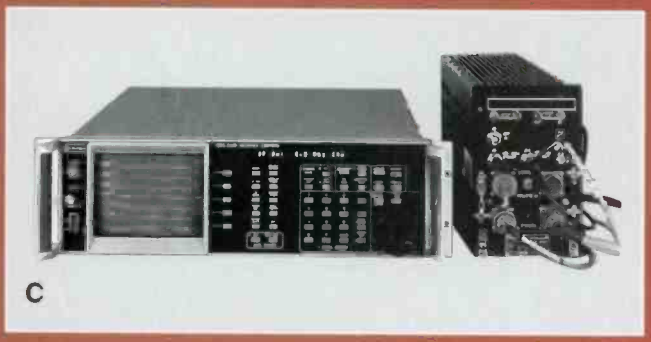
Andrew SciComm designs and manufactures a wide range of receiving and signal processing equipment for signals intelligence (SIGINT) applications. These products are designed to search and monitor the electromagnetic spectrum from below 100 kHz to greater than 40 GHz. The receiver product line is sold as individual units or as fully integrated systems with emphasis on sensitive, extremely stable, high dynamic range performance. (A, B, C, and D - see next page.)

SCR-7204AF Receiver

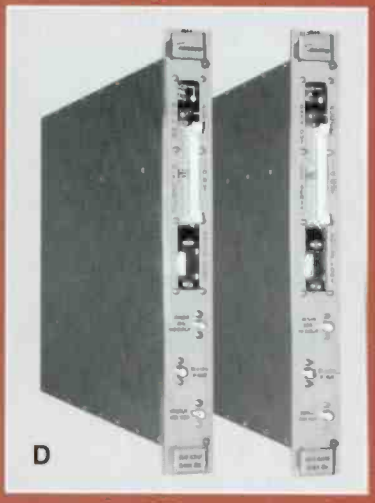
Electronic Products and Systems

A

B



C



D

E

A The compact SCR-7204 receiver product line covers the RF spectrum from 100 kHz to 2.6 GHz, provides sophisticated signal acquisition and control features, and is supported by a full range of internal IF demodulators as well as external spectrum display units, IF-to-tape converters and other ancillary equipment.

B The SCR-2725 FastSCAN High Probability VHF/UHF Signal Acquisition System allows almost instantaneous recognition of communications signal activity and provides the capability to accurately tune external monitor receivers to selected signals in the 20 to 1200 MHz frequency range.

C The SCR-2800 Modular Microwave Receiving System features a controller which provides a high resolution, digitally refreshed display and a flexible analysis demodulator. The RT-0518SW tuner provides high performance coverage of the 0.5 to 18.5 GHz frequency range. With the addition of other components, a sophisticated system with up to 4 controllers, 32 tuners, 32 channels of dedicated demodulation and RF coverage up to 100 GHz can be configured.

In addition to the RT-0518SW, SciComm offers the RT-0518SV Tuner. The RT-0518SV is the latest superheterodyne microwave tuner. It features a direct digital synthesis (DDS) based architecture for fast phase lock scans and 10 Hz frequency resolution with improved phase noise over conventional designs. On board computing power results in an extremely flexible design, supporting multiple system architectures and interfaces.

Other products covering diverse frequency ranges are also manufactured and available from Andrew SciComm.

D 5101 A-1 HF and 5101 B-1 VHF/UHF VXI Receivers. The 5101-A1 module is our HF general purpose receiver, with frequency coverage of 10 KHz to 32 MHz. The receiver, consisting of a high performance synthesizer, tuner and digital board is contained within a single slot VXI module.

The 5101-B1 module is a VHF/UHF general purpose receiver, with frequency coverage of 20 MHz to 3400 MHz. The receiver, consisting of a high performance synthesizer, tuner and digital board, is contained within a single slot VXI module.

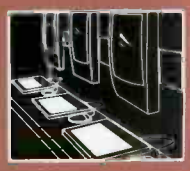
E Andrew SciComm signal processing products provide high-resolution, real-time, high-throughput processing and analysis of pulsed signals. These products are available as stand-alone pulse processing units or as fully integrated collection, processing, analysis and data storage systems.

The SCP-2960 Pulse Analysis System and the newly designed SCR-2900DF ELINT Direction Finding System provide the customer with high performance signal analysis in the 0.5 - 18 GHz range, with optional extentions to provide 0.1 to 40 GHz coverage.

The RDU-2960 and RDU-2960DF Pulse Analyzers, the heart of the SCP-2960 and SCR-2900DF Systems, process wide bandwidths with superior digitizing accuracy, high processing speed, large memory capacity (32K to 512K pulse descriptor words), and interactive display capability.

These systems are ideal for analyzing signals in today's complex, high density ELINT/ESM environments.

Electronic Products and Systems

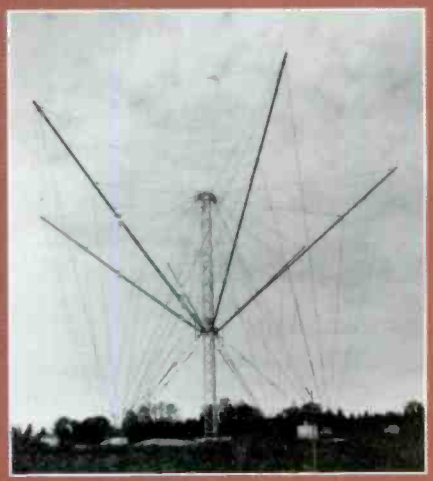


S-band ATC Radar

L-band Primary Surveillance Air Traffic Control Radar

Present weather Sensor
Licensed from Her Majesty in Right of Canada

Next Generation Weather Radar Antenna (NEXRAD)



Type 3002A SPIRA-CONE Omnidirectional Antenna

Government/Military Antenna Systems

Utilizing its broad design and manufacturing experience, Andrew has developed a wide range of antennas and antenna systems, some of which incorporate Andrew Kintec pedestals, to satisfy needs in:

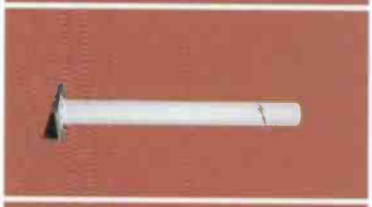
- *Air traffic control radar*
- *Weather radar and present weather sensor*
- *Satellite earth station and terrestrial microwave antenna systems*
- *Navigation aid antennas*
- *HF antennas*
- *Tracking and intercept antennas*
- *Airborne antennas*
- *Tactical antennas*

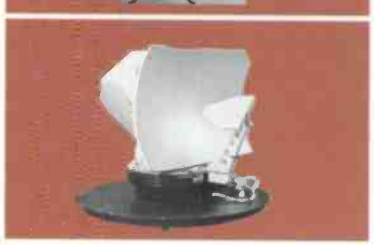
Special Application Antennas

Andrew Corporation uses its accumulated knowledge and experience to provide efficient, cost-effective solutions for special applications antenna requirements.

Diverse requirements can be addressed with a wide variety of antenna configurations including parabolic reflector, log periodic, helical, bifilar, arrays, conical, discone and helicone. These antenna designs cover a broad range of frequencies from 2 MHz to 50 GHz.

Special Application Antennas





58135 Horn Antenna

- *Capable of working over a frequency range of 1400 - 2300 MHz*
- *Linear polarization, vertical or horizontal; input power 100 Watts, CW*
- *1.75 to 1 VSWR*
- *Gain of 13.3 to 15.8 dBi*
- *150 mph (240 km/h) wind survival*

55070 Airborne Antenna

- *Available in specific bandwidths covering frequency ranges from 0.8 to 13 GHz*
- *Vertical polarization; average power rating 50 Watts CW*
- *Gain of 5 dBi; omnidirectional radiation pattern*
- *Low silhouette design minimizes drag to withstand high air speeds*

58200, 19050 Discone Antenna

- *Frequency coverage from 215 to 2600 MHz*
- *Vertical polarization; input power 400 to 1500 Watts CW*
- *2 to 1 VSWR*
- *Nominal gain at 2.0 dBi*
- *150 mph (240 Km/h) wind survival*

58700 Omnidirectional Antenna

- *Available in various bands from 1400 to 3000 MHz*
- *Vertically polarized; input power 50 Watts CW*
- *1.5 to 1 VSWR*
- *Nominal gain at 8 dBi*
- *150 mph (240 km/h) wind survival*

55305, 60116, 60117 Helical Antenna

- *Available in two frequency ranges: 1600 to 2000 MHz and 2100 to 2300 MHz*
- *Circular polarization*
- *1.5 to 1 VSWR*
- *Gain ranging from 13 to 15 dBi*
- *Enclosed in a rugged radome for protection from environmental elements*

63305A-5 and 63305A-6 Bifilar Helical Antenna

- *Operates in the 245 to 315 MHz band*
- *Right hand or left hand circular polarization*
- *1.5 to 1 VSWR*
- *Rugged, field transportable*
- *Collapsible tripod mount*
- *Optional motorized polar ground mount*

171888 and 172315X Direction Finding Antennas

- *171888-Adcock array for VHF/UHF in 3 sub-bands, 20 - 100 MHz*
- *172315X-Linear and slant linear polarization in 2 sub-bands, 0.5 - 2 GHz and 2 - 18 GHz*
- *Sector scan and variable rotation speed of up to 200 rpm for microwave DF system*
- *Environmentally protected in an integral radome*

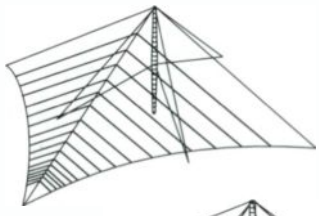
172601 through to 172608 Broad Band High Power Antennas

- *Available in various bands from 120 MHz to 18 GHz*
- *Peak power rating of 4 kW at 120 MHz to 2.5 kW at 18 GHz*
- *Nominal gain from 12 dBi at 120 MHz to 31 dBi at 12 GHz*
- *Selectable LH and RH circular polarization*

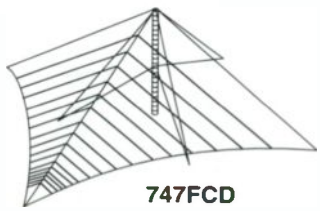
Type No.	Freq GHz	Polarization	Gain Nom. dBi	VSWR	Wind Survival mph (km/h)	Input	Dimensions, in (mm) Length x Width x Height		
Horn									
58135	1.4-2.3	Lin., V/H	13.3	1.75	125(200)	NJack	20(508)	16(406)	11(279)
Airborne									
55070-03	0.39-0.40	Lin., V	5.0	1.3	600 (965)	N Jack	7.23 (184)	3.13 (80)	0.69 (18)
55070-09	0.880-0.920	Lin., V	5.0	1.3	600 (965)	N Jack	3 (76)	3.13 (80)	0.69 (18)
55070-10	1.01-1.125	Lin., V	5.0	1.5	600 (965)	N Jack	2.63 (67)	3.13 (80)	0.69 (18)
55070-13	1.27-1.37	Lin., V	5.0	1.3	600 (965)	N Jack	2.16 (55)	3.13 (80)	0.69 (18)
55070-14	1.435-1.54	Lin., V	5.0	1.3	600 (965)	N Jack	1.84 (46)	3.13 (80)	0.69 (18)
55070-15	1.575	Lin., V	5.0	2.0	600 (965)	N Jack	2.06 (52)	3.13 (80)	0.69 (18)
55070-17	1.70-1.85	Lin., V	5.0	1.3	600 (965)	N Jack	1.78 (45)	3.13 (80)	0.69 (18)
55070-17A	1.7-2.3	Lin., V	5.0	1.3	600 (965)	N Jack	1.78 (45)	3.13 (80)	0.69 (18)
55070-18	1.8-2.1	Lin., V	5.0	1.5	600 (965)	N Jack	1.78 (45)	3.13 (80)	0.69 (18)
55070-21	2.1-2.3	Lin., V	5.0	1.3	600 (965)	N Jack	1.78 (45)	3.13 (80)	0.69 (18)
55070-23	2.335-2.385	Lin., V	5.0	1.3	600 (965)	N Jack	1.78 (45)	3.13 (80)	0.69 (18)
55070-25	2.5-2.7	Lin., V	5.0	1.3	600 (965)	N Jack	1.75 (44)	3.13 (80)	0.69 (18)
55070-27	2.7-3.0	Lin., V	5.0	1.3	600 (965)	N Jack	1.28 (33)	3.13 (80)	0.69 (18)
55070-44	4.4-5.0	Lin., V	5.0	1.3	600 (965)	N Jack	0.91 (23)	3.13 (80)	0.69 (18)
55070-50	5.0-5.4	Lin., V	5.0	1.3	600 (965)	N Jack	0.91 (23)	3.13 (80)	0.69 (18)
55070-54	5.4-6.0	Lin., V	5.0	1.3	600 (965)	N Jack	0.91 (23)	3.13 (80)	0.69 (18)
55070-64	6.4-7.0	Lin., V	5.0	1.3	600 (965)	N Jack	1.03 (26)	3.13 (80)	0.69 (18)
55070-66	6.6-7.3	Lin., V	5.0	1.5	600 (965)	N Jack	0.91 (23)	3.13 (80)	0.69 (18)
55070-121	12.1-13.2	Lin., V	5.0	1.5	600 (965)	N Jack	0.38 (10)	3.13 (80)	0.69 (18)
Discone									
58200-14	1.435-2.3	Lin., V	2.0	2.0	125 (200)	N Jack	12.5 (318)	3 (76) diameter	
19050-2	0.215-0.420	Lin., V	2.0	2.0	100 (160)	7/8 EIA	13 (330)	16 (406) diameter	
19050-3	0.4-1.0	Lin., V	2.0	2.0	100 (160)	7/8 EIA	14 (356)	10.5 (267) diameter	
19050-4	0.5-1.55	Lin., V	2.0	2.0	100 (160)	7/8 EIA	14 (356)	9 (229) diameter	
Omnidirectional									
58700-14	1.435-1.54	Lin., V	8.0	1.5	125 (200)	N Jack	36 (914)	3.5 (89) diameter	
58700-21	2.1-2.3	Lin., V	8.0	1.5	125 (200)	N Jack	27 (686)	3.5 (89) diameter	
58700-25	2.5-2.7	Lin., V	8.0	1.5	125 (200)	N Jack	23 (584)	3.5 (89) diameter	
Helical									
55305-1,-3,-5	2.1-2.3	RH circ.	15	1.5	125 (200)	N Jack	17 (432)	3.4 (86) diameter	
55305-2,-4,-6	2.1-2.3	LH circ.	15	1.5	125 (200)	N Jack	17 (432)	3.4 (86) diameter	
60112-1,-3,-5	0.70-0.85	RH circ.	12	2.1	125 (200)	N Jack	30 (762)	6 (152) diameter	
60112-2,-4,-6	0.70-0.85	LH circ.	12	2.1	125 (200)	N Jack	30 (762)	6 (152) diameter	
60114-1,-3,-5	1.06-1.33	RH circ.	12	1.5	125 (200)	N Jack	27 (686)	5 (127) diameter	
60114-2,-4,-6	1.06-1.33	LH circ.	12	1.5	125 (200)	N Jack	27 (686)	5 (127) diameter	
60115-1,-3,-5	1.3-1.6	RH circ.	13	1.5	125 (200)	N Jack	16 (406)	3.4 (86) diameter	
60115-2,-4,-6	1.3-1.6	LH circ.	13	1.5	125 (200)	N Jack	16 (406)	3.4 (86) diameter	
60116-1,-3,-5	1.6-2.0	RH circ.	13	1.5	125 (200)	N Jack	16 (406)	3.4 (86) diameter	
60116-2,-4,-6	1.6-2.0	LH circ.	13	1.5	125 (200)	N Jack	16 (406)	3.4 (86) diameter	
60117-1,-3,-5	2.0-2.5	RH circ.	13	1.5	125 (200)	N Jack	12 (305)	3.4 (86) diameter	
60117-2,-4,-6	2.0-2.5	LH circ.	13	1.5	125 (200)	N Jack	12 (305)	3.4 (86) diameter	
60118-1,-3,-5	2.5-3.0	RH circ.	14	1.5	125 (200)	N Jack	12 (305)	3.4 (86) diameter	
60118-2,-4,-6	2.5-3.0	LH circ.	14	1.5	125 (200)	N Jack	12 (305)	3.4 (86) diameter	
(-1 and -2 no mount, -3 and -4 13550 mounting adaptor, -5 and -6 51930A manual mount, 2" IPS pipe, mounting adaptor.)									
Bifilar Helical									
63305A-1,-3,-5	0.245-0.315	RH circ.	12.5	1.5	100 (160)	N Jack	122 (3099)	39 (991) diameter	
63305A-2,-4,-6	0.245-0.315	LH circ.	12.5	1.5	100 (160)	N Jack	122 (3099)	39 (991) diameter	
(-1 and -2 no mount, -3 and -4 54157 mount for 4" IPS pipe, -5 and -6 51930 manual mount with 62280 tripod)									
DF Antenna									
171888	0.02-0.1	Lin., V	-	11.0	100 (160)	N Jack	78 (1980)	60 (1524) diameter	
(4 array	0.1-0.5	Lin., V	-	7.0	100 (160)	N Jack	18 (457)	12 (305) diameter	
element)	0.5-1.0	Lin., V	-	7.0	100 (160)	N Jack	8 (203)	6 (152) diameter	
172315X	0.5-2.0	Lin., Slant	4	3.0	100 (160)	N Jack	17 (432)	19 (483) diameter	
	2.0-18.0	Lin., Slant	15	3.0	100 (160)	N Jack	17 (432)	19 (483) diameter	

GRANGER® HF Antennas

Andrew manufactures the complete range of GRANGER HF antennas. These include fixed, transportable and rotatable log-periodic antennas, conical monopoles, broadband dipoles, baluns and multicouplers.



747CD

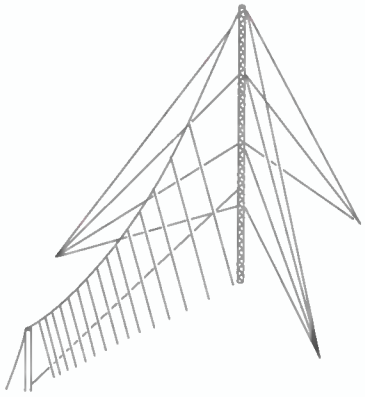


747FCD

747 Horizontally Polarized Log-Periodic

- *2 - 30 MHz or 4 - 30 MHz Frequency Range with Single Input*
- *Up to 20 kW Average 40 kW Peak Power Rating*
- *Horizontal Polarization*
- 2.0:1 Nominal. 2.5:1 Maximum VSWR (2.0 MHz Version)
- *Short-, Medium-, and Long-Range Communications*

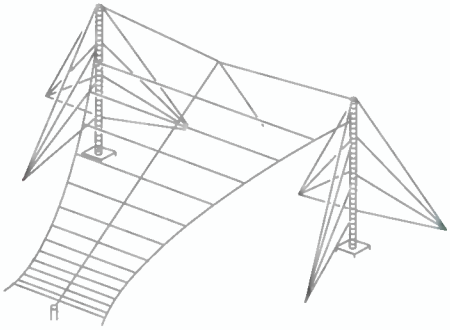
Bulletins 1410 (747CD), 1411 (747FCD)



1703 Long-Haul, Log-Periodic

- *Choice of Frequency Range: 4.0 - 32, 4.6 - 32, 5.4 - 32, 6.5 - 32 MHz*
- *Up to 20 kW Average, 40 kW Peak Power Rating*
- *Vertical Polarization*
- *2.0:1 Maximum VSWR*
- *Low Angle Radiation at All Frequencies*
- *Low Sensitivity to Off-Path Signals*
- *Minimum Space Required*
- *Short-Range Communications (Groundwave)*
- *Long-Range Communications (Skywave)*

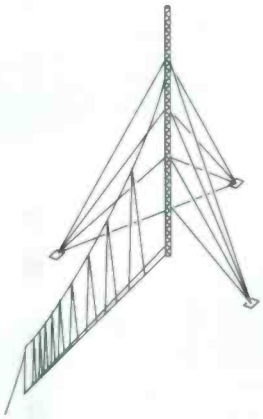
Bulletin 1417



2701/2702 Horizontally Polarized, Log-Periodic

- *2 - 32 MHz Frequency Range*
- *Up to 20 kW Average, 40 kW Peak Power Rating*
- *Horizontal Polarization*
- *2.0:1 Maximum VSWR*
- *Short- to Medium-Range and Medium- to-Long-Range Communications*
- *Minimum Space Required*

Bulletin 1424



2726 Vertically Polarized, Log-Periodic

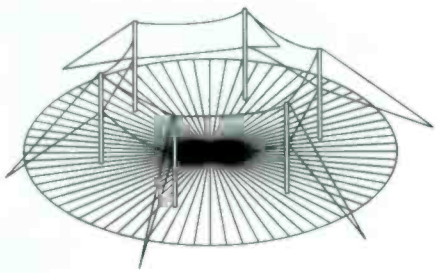
- *2.5 - 32 MHz Frequency Range*
- *Up to 10 kW Average, 20 kW Peak Power Rating*
- *Vertical Polarization*
- *2.0:1 Maximum VSWR*
- *Long-Range HF Communications*
- *Minimum Tower Height*
- *Minimum Space Required*

Bulletin 1426

2731/2004 Rotatable Log-Periodic

- *2 - 30 MHz Frequency Range*
- *Up to 25 kW Peak Power Rating, Depending on Type*
- *Horizontally Polarized*
- *2.0:1 VSWR*
- *High Gain*
- *Easy to Install and Maintain*
- *High Efficiency - Up to 98%*
- *Medium- and Long-Range Communications*
- *Two Versions - Full Tower Size and Compact Roof Size*

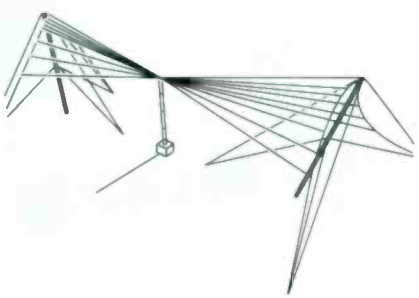
Bulletin 1423



794 Monocone

- *Wide Range of Frequencies: 2 - 30, 2.5 - 32, 3 - 32 MHz*
- *Up to 40 kW Average, 160 kW Peak Power Rating*
- *Vertical Polarization*
- *2.0:1 Maximum VSWR*
- *Low-Angle Radiation Patterns*
- *Short-Range Communications (Groundwave)*
- *Long-Range Communications (Skywave)*

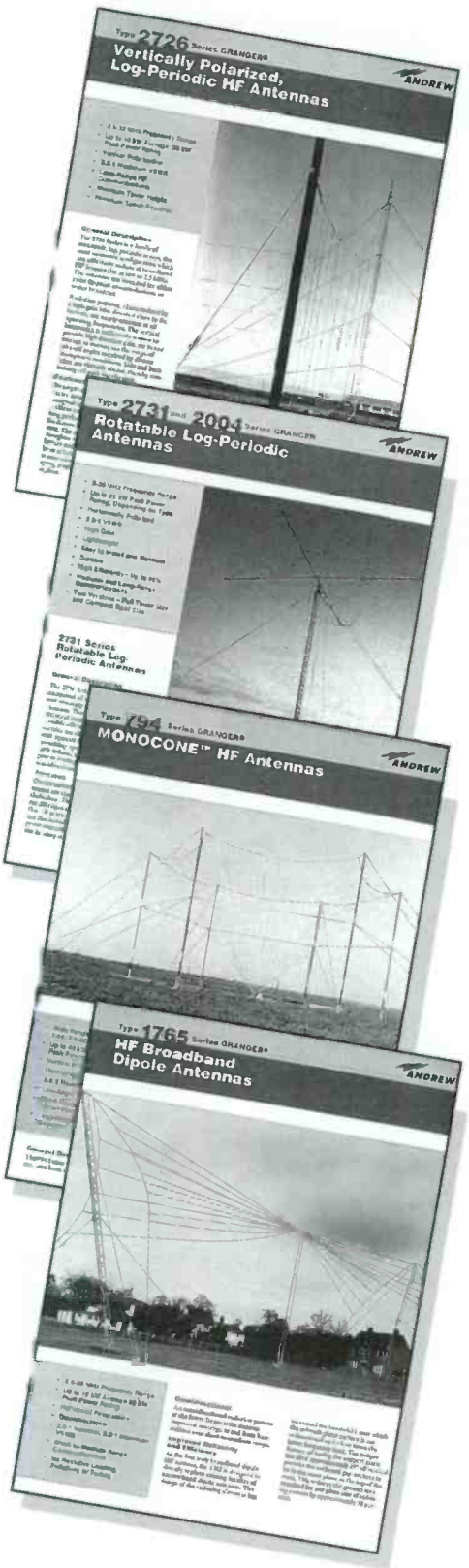
Bulletin 1416



1765 Broadband Dipole

- *1.6 - 30 MHz Frequency Range*
- *Up to 10 kW Average, 20 kW Peak Power Rating*
- *Horizontal Polarization*
- *Omnidirectional*
- *2.0:1 Nominal, 2.5:1 Maximum VSWR*
- *Short-to-Medium Range Communications*
- *No Resistive Loading, Switching or Tuning*

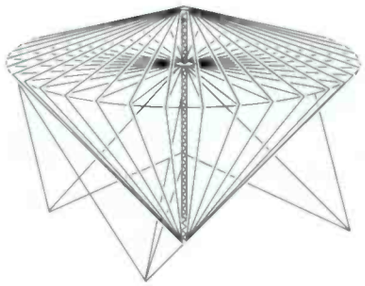
Bulletin 1420

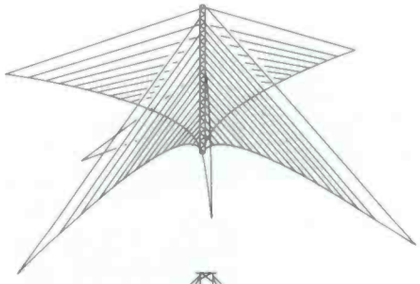


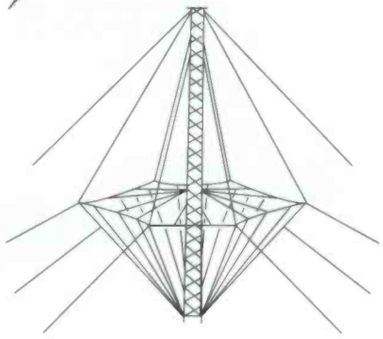
Electronic Products and Systems

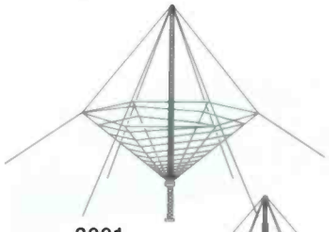
Patented SPIRA-CONE

The unique patented SPIRA-CONE antenna, which is a GRANGER HF type, permits simultaneous radiation in high-and low-angle modes without frequency restriction.

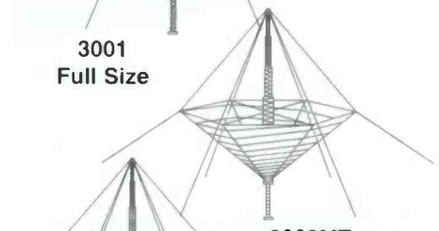




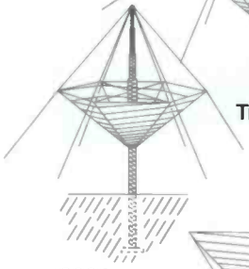




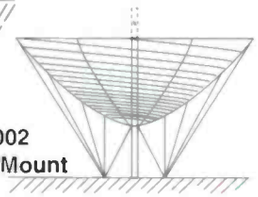
3001
Full Size



3003MT
Transportable



3004
Fixed



3002
Roof Mount

1794 Monocone

- *1.6 - 32 MHz Frequency Range*
- *40 kW Average 160 kW Peak Power Rating*
- *Vertical Polarization*
- *Omnidirectional*
- *2.0:1 Maximum VSWR*
- *Long-Range Communications (Skywave)*
- *Short-Range Communications (Groundwave)*
- *Low Angle Radiation Patterns*
- *Minimum Installation Ground Area*

Bulletin 1421

2001 Elliptically Polarized Broadband

- *Broadband 2 - 30 MHz Frequency Range*
- *Up to 25 kW Average, 50 kW Peak Power Rating*
- *Horizontal-Elliptical Polarization to Reduce Fading*
- *Full Efficiency - No Resistive Loading*
- *2.0:1 Maximum VSWR*
- *Short- to Medium-Range Communications*
- *On-Site Selection of Polarization Sense*

Bulletin 1422

2753 Conical Monopole

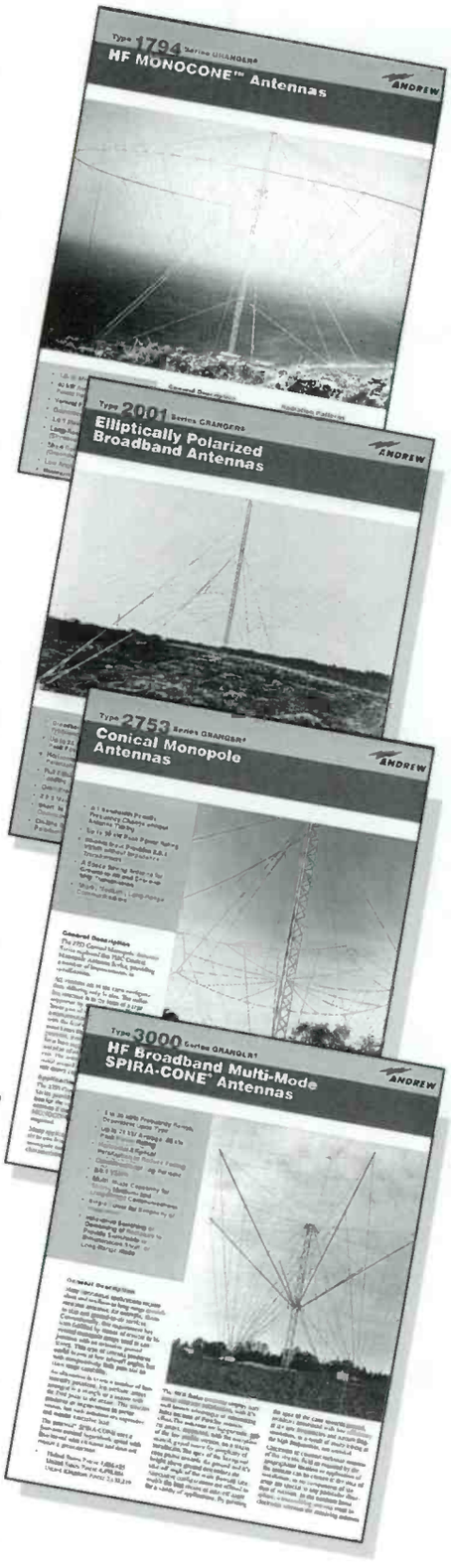
- *6:1 Bandwidth Permits Frequency Change without Antenna Tuning*
- *Up to 50 kW Peak Power Rating*
- *50-ohm Input Provides 2.0:1 VSWR without Impedance Transformers*
- *A Space Saving Antenna for Ground-to-Air and Shore-to-Ship Transmission*
- *Short-, Medium-, and Long-Range Communications*

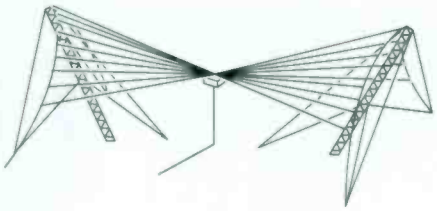
Bulletin 1531

3000 Broadband Multi-Mode SPIRA-CONE ®

- *2 to 30 MHz Frequency Range, Dependent Upon Type*
- *Up to 25 kW Average, 50 kW Peak Power Rating*
- *Horizontal-Elliptical Polarization to Reduce Fading*
- *Omnidirectional Log-Periodic*
- *2.0:1 VSWR*
- *Multi-Mode Capability for Short-, Medium- and Long-Range Communications*
- *Single Tower for Simplicity of Installation*
- *Innovative Switching or Combining of Radiators to Provide Switchable or Simultaneous Short- or Long-Range Mode*

Bulletin 1405

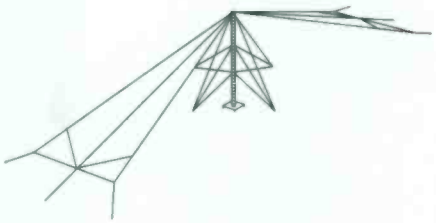




3065 Broadband Dipole

- *1.6 - 30 MHz Frequency Range*
- *Up to 2.5 kW Average, 5 kW Peak Power Rating*
- *Horizontal Polarization*
- *Omnidirectional*
- *2.3:1 Maximum VSWR*
- *Short-to-Medium Range Communications*
- *No Resistive Loading, Switching or Tuning*
- *Minimum Installation Ground Area*

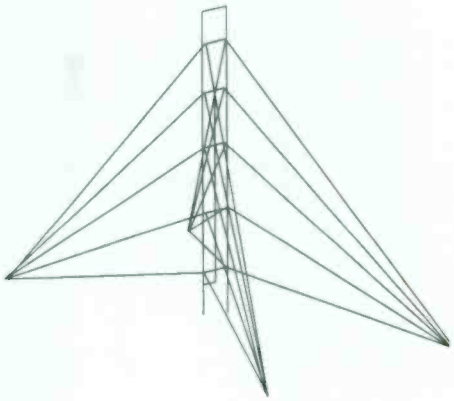
Bulletin 1430



4065 Horizontally Polarized, Transportable

- *2 - 30 MHz Frequency Range*
- *1 kW Average, 2 kW Peak Power Rating*
- *Horizontally Polarized*
- *Omnidirectional*
- *2.0:1 VSWR*
- *Short- to Medium-Range Communications*
- *Tactical*

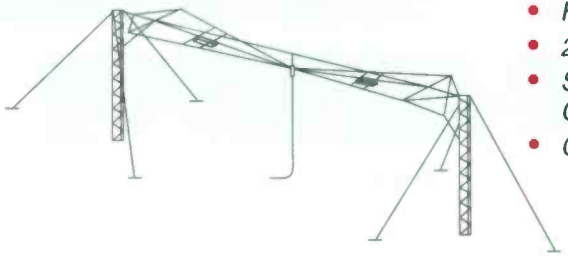
Bulletin 1532



4094 Omnidirectional

- *2 - 30 MHz Frequency Range*
- *1 kW Average, 2 kW Peak Power Rating*
- *Vertical Polarization*
- *2.5:1 Nominal, 3.0:1 Maximum VSWR*
- *Short-, Medium-, and Long-Range Communications*
- *Deployable or Fixed Versions*

Bulletin 1431



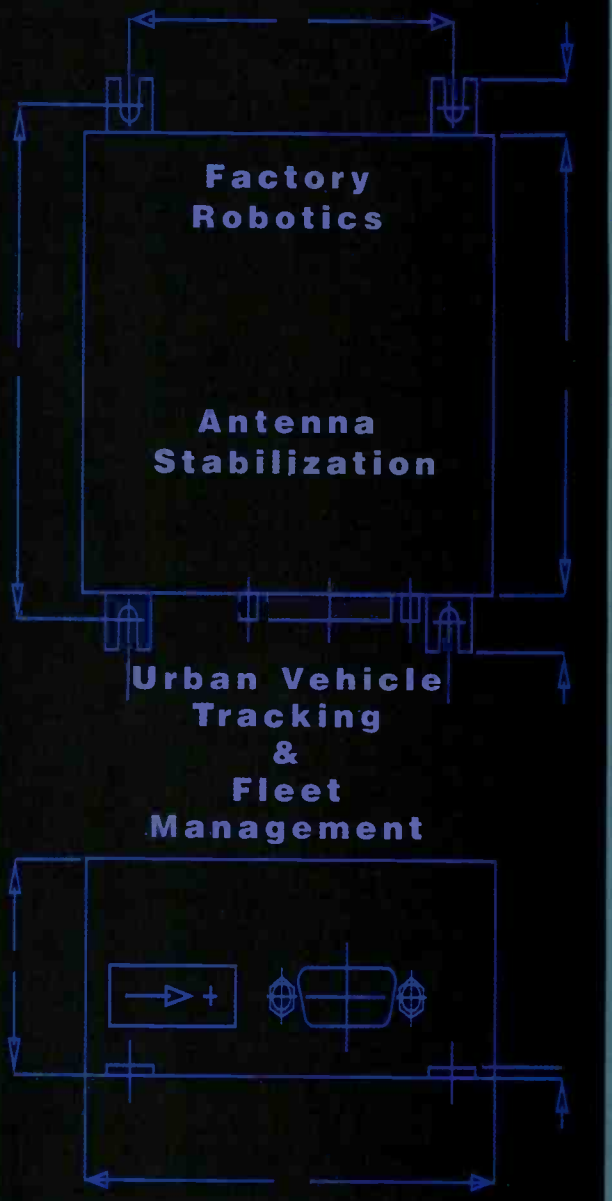
5065 Broadband Compact Dipole

- *2 - 30 MHz Frequency Range*
- *1 kW average, 2 kW Peak Power Rating*
- *Horizontal Polarization*
- *2.5:1 Nominal VSWR*
- *Short- to Medium-Range Communications*
- *Compact Roof Mountable*

Bulletin 1534

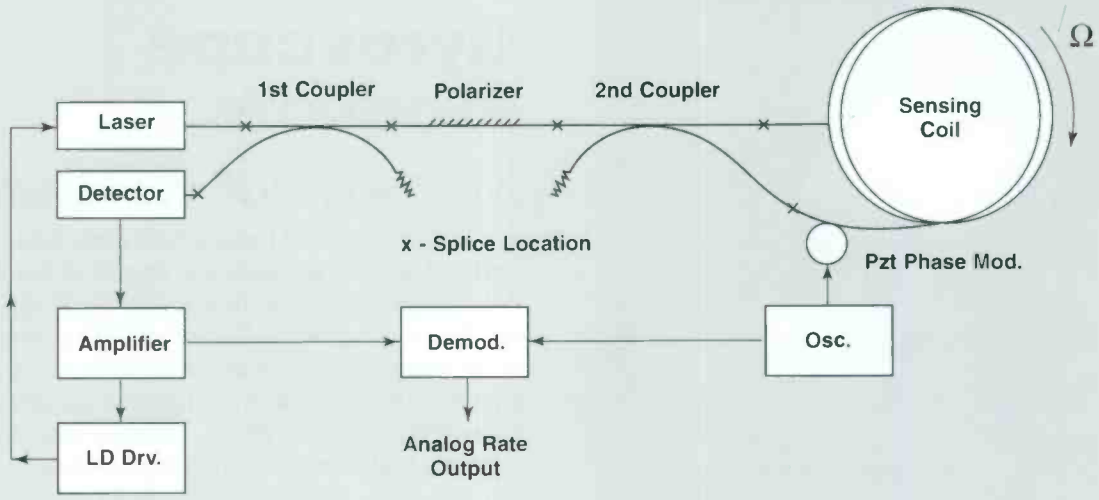
Fiber Optic Gyroscopes

Continuous Positioning System™



Gyroscope and Navigation Systems

INDEX



Affordable Fiber Optic Gyroscopes and Land Navigation Systems

Advantages of Andrew Fiber Optic Gyroscopes

- *No moving parts to wear out*
- *Excellent reliability*
- *Insensitive to vibration and acceleration*
- *Digital or analog output*
- *Optimized for land navigation and robotics*

Advantages of Andrew Land Navigation Systems

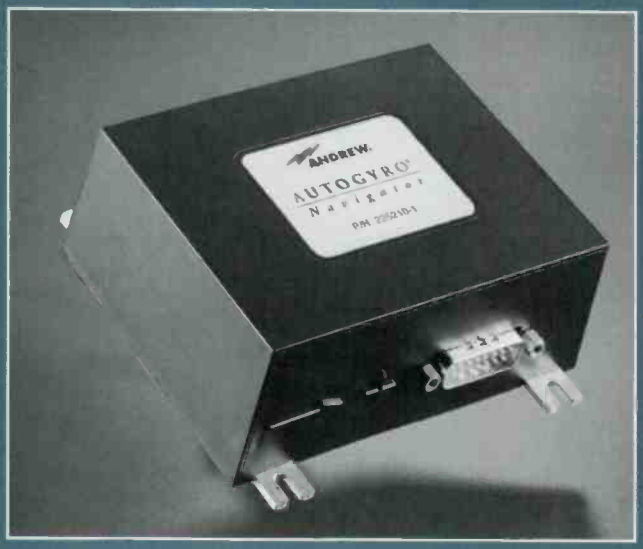
- *Continuous location of vehicle position, azimuth and speed*
- *Overcomes blockage of GPS signals by buildings, tunnels and heavy foliage*
- *Reduces the effect of selective availability and multi-path errors in GPS positions*
- *Accurately determines vehicle velocity and heading, even at low speeds*
- *Differential GPS and communications interfaces available*

Principles of Operation

Fiber optic gyroscopes are true single-axis rate sensors, measuring the angular rotation about an axis perpendicular to a coil of optical fiber. The open-loop optical configuration employed in the Andrew AUTOGYRO® Navigator and RA/RD 2000 series gyroscopes consists of a broadband solid state optical source, and polarization-maintaining fiber components fabricated from Andrew ECore® elliptical-core fiber. The light energy passes through a first directional coupler that isolates the detector, a polarizer to ensure a single polarization state, and is then split in two by the second directional coupler and fed into opposite ends of a coil of polarization maintaining fiber, which serves as the sensing element. The Sagnac effect, known since 1913, and which is also the basis of the ring laser gyro, can be considered as a relativistic version of the Doppler effect. When the coil is not rotating, the light path in either direction is the same length, and the light adds in phase as it returns to the directional coupler, and passes through the polarizer to the detector. When the coil rotates, the path lengths differ and the signal magnitude is a function of the rotation rate. A piezoelectric modulator introduces a periodic phase shift which enables the signal processing to be performed at high frequency to increase sensitivity and avoid dc drifts.

The signal processing involves synchronously detecting the fundamental component of the piezoelectric modulation frequency, whose magnitude is proportional to the rotation rate. The gyro has no moving parts, resulting in enhanced reliability. There are no cross-axis sensitivities to vibration, acceleration or shock. The gyro is stable with temperature and time, making it useful in a wide variety of applications, including land navigation, positioning, robotics and instrumentation.

Gyroscope and Navigation Systems



Gyroscope Products

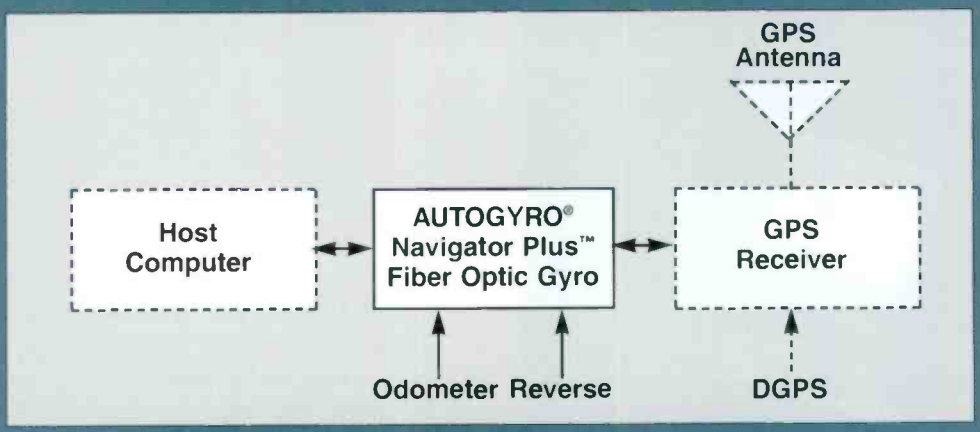
AUTOGYRO® Navigator

Accurate location of the position of vehicles on roads and highways is an essential aspect of the development of Intelligent Transportation Systems (ITS). Although the Global Positioning System (GPS) provides world-wide geographic location information, the accuracy is limited by the imposition of random variations called Selective Availability (S/A). Location and navigation systems that demand continuous coverage cannot depend solely on GPS, as the radio transmissions are blocked by buildings, heavy foliage, and rugged terrain. Filling in these gaps, and smoothing the GPS data itself is most economically done with dead reckoning.

Dead reckoning systems navigate on the earth by determining the azimuth of the vehicle and the distance traveled. An economical method of performing this task is with an inertial measurement of the angular rotation performed by a gyroscope combined with distance measurement performed by the vehicle odometer. Angular rotation data are integrated to determine the change in vehicle azimuth and the number of odometer pulses totaled for the interval and combined into a serial digital data output. The GPS data is used to bound and correct the inaccuracies which accumulate with time. Andrew has developed the AUTOGYRO Navigator to perform this function in an accurate and economic manner.

Fabricated from Andrew ECore® polarization maintaining optical fiber and operating from unconditioned vehicle power, the AUTOGYRO Navigator is the ideal dead reckoning sensor. The AUTOGYRO Navigator can also be used in robotics and positioning applications. The circuits are protected against transients and reverse voltage polarity and the unit has been awarded the CE mark, indicating conformance to the European Union EMC Directive.

Characteristic	Performance
Rotation Rate, deg/sec	± 100
Scale Factor Linearity, percent rms	
Constant Temp	<0.5
Full Temp	<1
Scale Factor vs. Temperature, percent	<1
Angle Random Walk,	
°/hr√Hz	20
°√hr	0.3
Instantaneous Bandwidth, Hz	100
Bias Drift, deg/sec	0.005 (fixed temp.) 0.025 (repeatability)
Temperature range, deg C	
Operating	-40 to +75
Storage	-50 to +85
Warm-up time	1 sec
Power Supply Voltage, VDC	+9 to +18, transient and reverse voltage protected
Output Data	
Analog	+2.5 Vdc (zero rotation) ±2 V, into 10 kilohm 20 mV/deg/sec scale factor
Digital	16 bits, serial, RS-232, 9600BPS, 10 values per second
Power Consumption, watts	
Analog	<2
Digital	<3
Physical Dimensions	
in	4.5 x 3.5 x 1.6
mm	115 x 90 x 41
Weight	
lb	0.55
kg	0.25
Ordering Information	
AUTOGYRO Navigator, analog	**225210-1**
AUTOGYRO Navigator, RS232	**225140-1**
AUTOGYRO Navigator, RS422	**225140-2**



AUTOGYRO® Navigator Plus

The AUTOGYRO Navigator Plus adds dead reckoning (DR) to your Autonomous Vehicle Locator System (AVL)without another data interface to the host computer.

The AUTOGYRO Navigator Plus AVL sensor combines a DR sensor and your GPS receiver into one serial asynchronous data stream. The DR sensor data provided by the AUTOGYRO Navigator fiber-optic gyro comprises angular rate and interfaces to the vehicle odometer and backup indicator; an interface to your GPS receiver permits all of the position sensor information to be combined into a single data channel.

Varying data protocols for GPS receivers are accommodated by two operating modes, binary and NMEA. In each instance, the GPS receiver data is merged with the DR data without altering the DR sensor timing, and unpacked in the host computer. Example software is provided.

The circuits are protected against transients and reverse voltage polarity. The unit has been awarded the CE mark, indicating conformance with the European Union EMC Directive.

The AUTOGYRO Navigator Plus AVL sensor is ideal for upgrading existing systems to cope with GPS blockage problems.

Type No.	222140-1-1	222140-1-2	222140-2-2	222140-2-1	222140-1-3	222140-2-3
Host	RS-232	RS-232	RS-422	RS-422	RS-232	RS-422
GPS	RS-232	RS-422	RS-422	RS-232	TTL	TTL

Gyroscope and Navigation Systems

RA/RD 2000 Series Rate Gyros

The RA/RD 2000 fiber optic rate gyro can be used to replace mechanical gyroscopes in applications such as antenna and optical stabilization, navigation, positioning, robotics, and instrumentation. Excellent resolution, threshold, and dynamic range combined with resistance to shock and vibration solves a wide variety of system needs. The gyro is packaged in a rugged aluminum housing with weather resistant gaskets.

Analog or digital output versions are available, with the analog signal representing the intrinsic rate gyro output. The digital output is the result of integrating the rate output and can be interpreted as either the incremental angle change during the measuring interval or the average rate; the wide analog bandwidth is maintained while reducing the output data rate. All the required voltages are internally generated from a single wide-range input voltage that is suitable for direct connection to vehicle power. The circuits are protected against transients and reverse voltage polarity, and the unit has been awarded the CE mark, indicating conformity to the European Union EMC Directive.

For replacement of mechanical gyros or new system design, the RA/RD 2000 series fiber optic gyros provide precision measurement of rotation with high reliability, ease of interface, and freedom from preventive maintenance.

Specifications – Precise Rate Gyro Series

Performance	RA2030	RA2100	RD2030	RD2100
Input Rate, max, ± °/sec	30	100	30	100
Resolution Rate, *°/sec*	0.014	0.014	0.004	0.004
Scale Factor, *mv/°/sec*	66.7	20	–	–
°/bit	–	–	0.0000916	0.000305
Nonlinearity, %, RMS	0.2	0.5	0.2	0.5
Full Temp., %, p-p	1	2	1	2
Bias Stability				
Constant Temp.°/sec, 1σ	0.0006	0.002	0.0006	0.002
Full Temp, °/sec, p-p	0.06	0.2	0.06	0.2
Repeatability,°/sec, p-p	0.006	0.02	0.006	0.02
Angle Random Walk, *°/hr√Hz*	5	5	5	5
°√hr	0.08	0.08	0.08	0.08
Bandwidth, 3 dB, 45° phase shift	100	100	100	100
Turn-on-time, *sec*	1	1	1	1

Ordering Information

Type Number	Maximum	Power	Serial Output	Output Rate
RA2000 Series				
225386-1	30	12	–	–
225386-2	30	24	–	–
225386-3	100	12	–	–
225386-4	100	24	–	–
RD2000 Series				
225382-1	30	12	RS-232	10
225382-2	30	12	RS-422	10
225382-3	30	24	RS-232	10
225382-4	30	24	RS-422	10
225382-5	100	12	RS-232	10
225382-6	100	12	RS-422	10
225382-7	100	24	RS-232	10
225382-8	100	24	RS-422	10
225382-9	30	12	RS-232	100
225382-10	30	12	RS-422	100
225382-11	30	24	RS-232	100
225382-12	30	24	RS-422	100
225382-13	100	12	RS-232	100
225382-14	100	12	RS-422	100
225382-15	100	24	RS-232	100
225382-16	100	24	RS-422	100

Land Navigation Systems

CPS – Continuous Positioning System™

Never lose track of your vehicles again!

Solve the urban canyon problem with a CPS/Continuous Positioning System. Combining the uninterrupted positioning capability of a dead reckoning (DR) system with the absolute positioning capability of GPS (DGPS as an option) satisfies the most demanding AVL and land navigation requirements.

GPS-based AVL and navigation systems are extremely popular because of their simplicity and low cost, but GPS signals are often blocked by buildings and foliage, leading to coverage gaps. In cities, the loss of coverage can exceed 50 percent, and may be almost total in core urban areas. In these situations, multipath also occurs, leading to erroneous position reports.

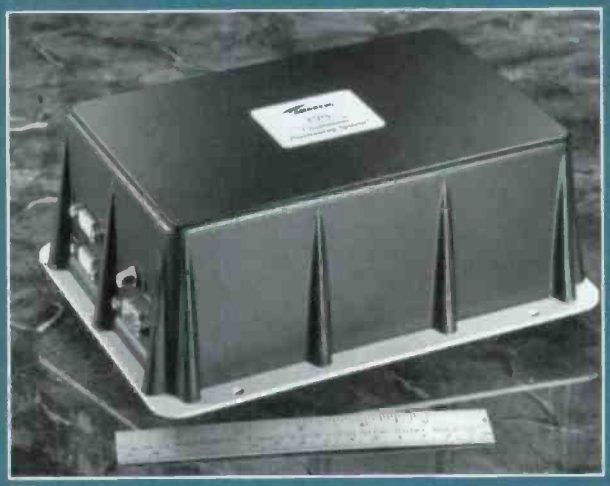
Dead reckoning navigation combines the angular measurement made with a gyroscope and the distance traveled measured by the vehicle odometer. Since both sensors produce continuous data, the position determination is uninterrupted. But such sensors are not without errors and, without correction and calibration, the errors soon build to unacceptable values.

The solution is a combination of the methods: a blending of the information that takes into account the anticipated errors in each. Kalman-filter signal processing, adapted from avionics and aerospace applications, optimally blends the information, yielding the best estimate of the vehicle position, heading, and speed, without any loss of coverage. Data output in NMEA 0183 format allows the Andrew CPS to substitute for existing GPS receivers without further system modifications. Other data communications protocols and interfaces are available.

The circuits are protected against transients and reverse voltage polarity. The unit has been awarded the CE mark, indicating conformance with the European Union EMC Directive.

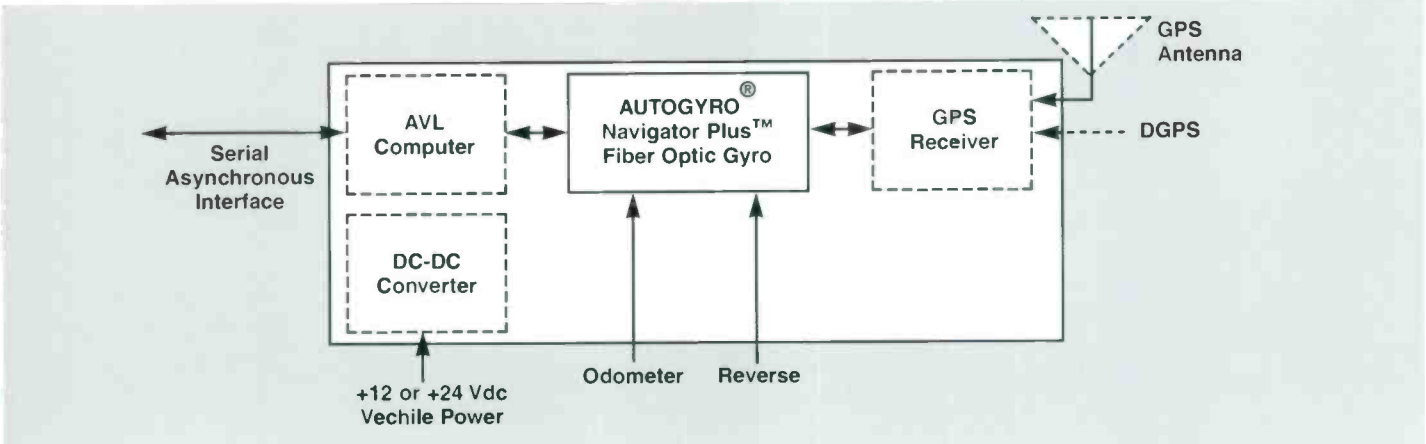
Versions of this system are available for Fleet Management, Public Transit, and other on-the-road applications.

Gyroscope and Navigation Systems



Product Specifications

Characteristic	Performance
GPS Antenna	Active, various mounting arrangements
Odometer	40>V>2Vdc, 0 to 2500pps
Reverse	40>V>2Vdc
Host Interface (typical)	RS-232, NEMA 0183 (selected sentences)
Environmental	SAE 1807
Temperature, deg C	
Operating	-40 to +75
Storage	-50 to +85
Physical Dimensions	
in	6 x 8.25 x 3
mm	152 x 210 x 76
Weight	
lb	2
kg	0.9
Power	12 watts, +12 or 24 VDC unconditioned vehicle power



Gyroscope and Navigation Systems

Fusing a Directional Coupler

ECore® Polarization – *Maintaining Optical Fiber*

Since 1975, Andrew has actively pursued its proprietary optical fiber technology for applications requiring advanced polarization holding components.

Andrew E- and D-Series single mode optical fibers employ the property of geometrical birefringence to achieve their unique polarization preserving characteristics. This is accomplished with an elliptically-shaped core region of significantly higher index than the surrounding cladding.

Fibers are constructed of high grade silica materials and various rare earth dopants. Andrew employs a proprietary process to manufacture a uniform fiber product. A dual UV-cured acrylate coating is applied to standard fibers which inhibits moisture penetration, preserves fiber strength and improves handling characteristics.

The advantages of such construction are significant. Fiber has been produced with low loss and high polarization maintaining ability (typically 48 dB•m). Andrew fibers also retain these characteristics under adverse conditions of bending, twisting and wide temperature variations. This combination of exceptional optical performance and environmental stability is crucial to the development of fiber sensors for real world applications.

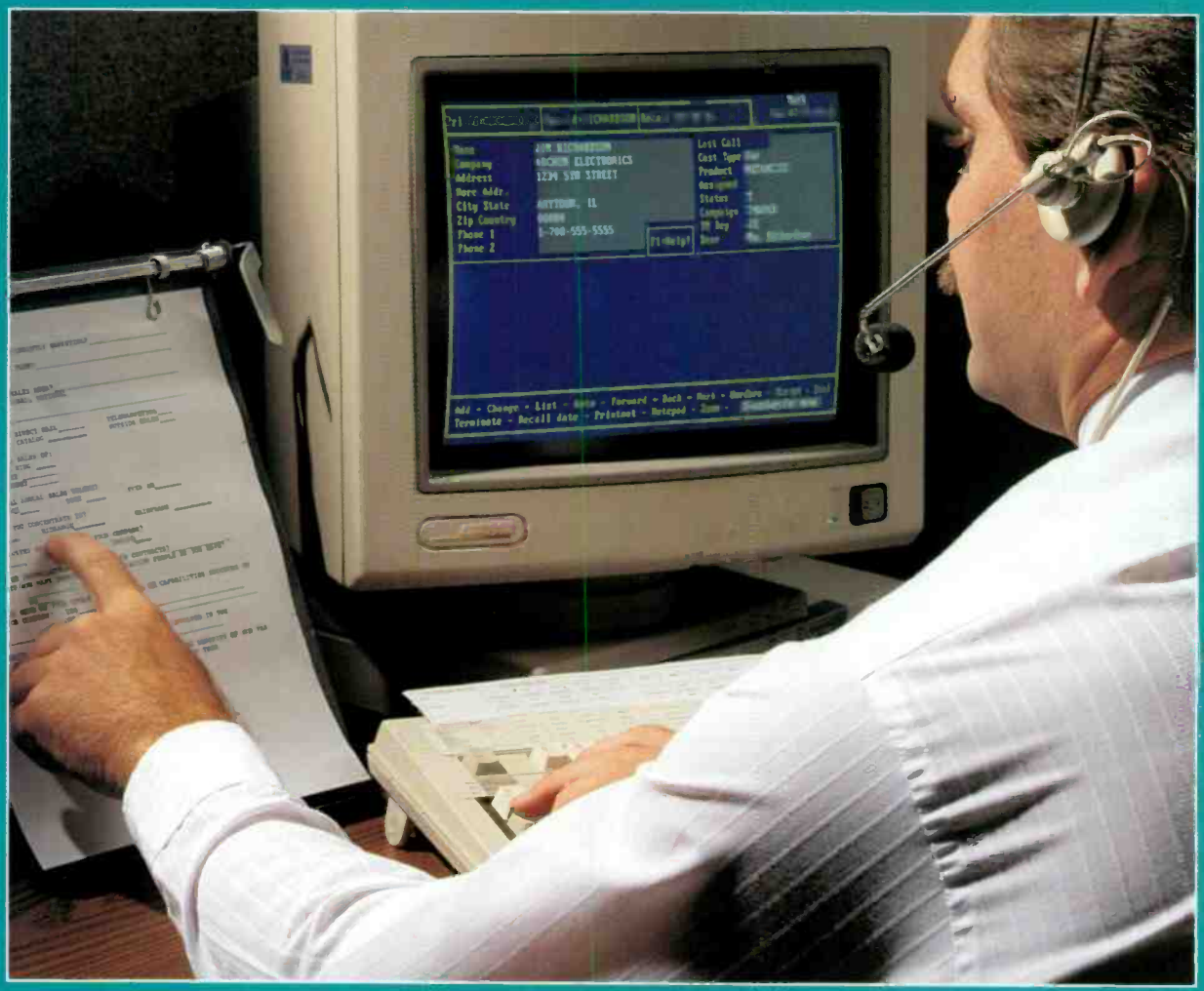
D-series fibers exhibit the excellent optical qualities of E-series fibers along with a special external geometry that permits easy access to the guiding region without grinding or polishing. Also, the major axis of the elliptical core is parallel to the flat of the "D", allowing accurate alignment of the birefringent axes.

ECore™ Polarization Maintaining Fiber - E-Series

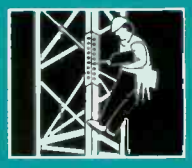
	48280-633S-1	48280-820S-1	48280-1060S-1	48280-1300S-1	48280-1550S-1
Nominal Operating Wavelength, nm	633	820	1060	1300	1550
Single Mode Operating Band, nm	600-700	750-900	960-1260	1100-1400	1350-1680
Cut-Off Wavelength, nm	550 ±50	700 ±50	900 ±60	1040 ±60	>1100
Attenuation, dB/km	13-20	7-9	4-5	3	2-3
Polarization Holding (h), dB-m	35	48	48	48	48
Normalized Birefringence	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}
Beat Length, mm	4	5.5	7	8.5	10
Fiber Diameter. microns ±3	70	80	125	125	125
Coating Diameter, microns ±20	240	240	240	240	240

ECore™ Polarization Maintaining Fiber - D-Series

	205170-633S-2	205170-820S-2	205170-1060S-2	205170-1300S-2	205170-1550S-2
Nominal Operating Wavelength, nm	633	820	1060	1300	1550
Single Mode Operating Band, nm	610-700	760-900	970-1260	1110-1400	1360-1680
Cut-Off Wavelength, nm	550 ±60	700 ±60	900 ±70	1040 ±70	>1090
Attenuation, dB/km	25-45	9-20	8-12	3-8	2-5
Polarization Holding (h), dB-m	27	40	40	40	40
Normalized Birefringence	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}	1.5×10^{-4}
Beat Length, mm	4	5.5	7	8.5	10
Fiber Diameter. microns ±3	70	80	125	125	125
Center of Core to Flat, microns	9	10	16	16	16
Coating Diameter, microns ±20	240	240	240	240	240



Services



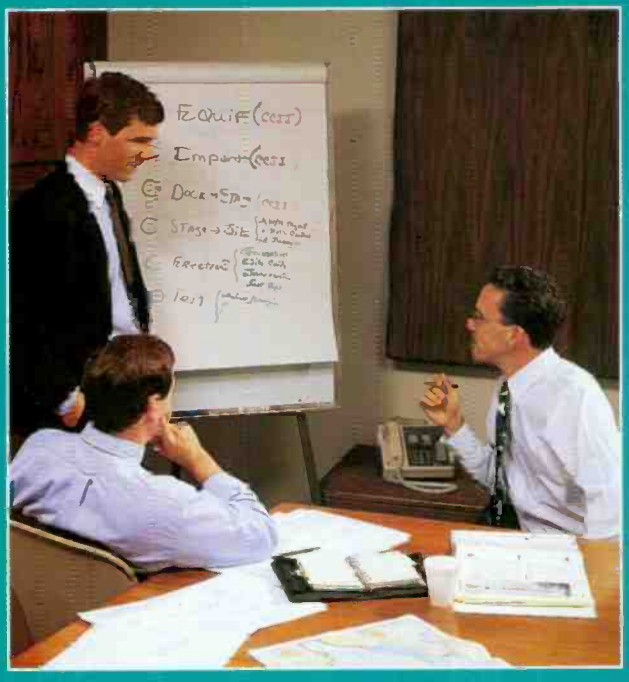
Systems Management

Andrew Systems Management Teams have the proven capability and expertise to completely coordinate and manage your next project. In addition to supplying all of the materials and components, Andrew can provide people to help in preplanning and design, site preparation, installation, testing and inspection. And, since every project is unique, you can pick and choose from any or all of our services to meet your specific requirements.

Program Planning and Design

In order for you to have the most cost-effective system, Andrew will supply a team of experienced professionals who will assist you when you begin the initial planning stages of your project. This group will work with you so your project is completed on time and on budget.

Preplanning can avoid costly delays by ensuring that you have achieved the best component interface designs which will provide the highest system performance at the least cost to you. Accurate material lists are supplied which can eliminate last minute shipments. And, preplanning results in efficient use of field time.



Services

Program Management

Andrew can provide a program manager who assumes responsibility for the implementation, installation, testing and inspection of your project. Working with the program manager, experienced engineering and support personnel will integrate all services and system components supplied by Andrew or others. The program manager will monitor all crews and their performance and report progress to you.

We provide cellular and PCS antenna systems installation and microwave antenna installation. We also provide complete site preparation including site clearing and grading, construction of foundations for earth station antennas, towers, equipment buildings, electrical work, fence installation, construction of access roads, site clean-up and debris disposal.

Ongoing inspections by our experienced site superintendents and field inspectors assure that Andrew provided products and services meet our strict standards and meet your project requirements.

Since communication with all parties is an essential part of any project, daily status reports from the field are received to monitor progress. Weekly status updates are given to you. This total coordination saves time and money by eliminating schedule conflicts, exrtra personnel and material oversights.

Since Andrew can supply you with a wide range of systems management programs and capabilities, you can be assured that Andrew professionals will have your project completed on time and within your budget. You can depend on Andrew products and services for a top performing system.

Outstanding service has always been a hallmark of Andrew Corporation.

This commitment to service is an ongoing process as we continually strive to improve, adapt and upgrade our services in order to meet your needs.

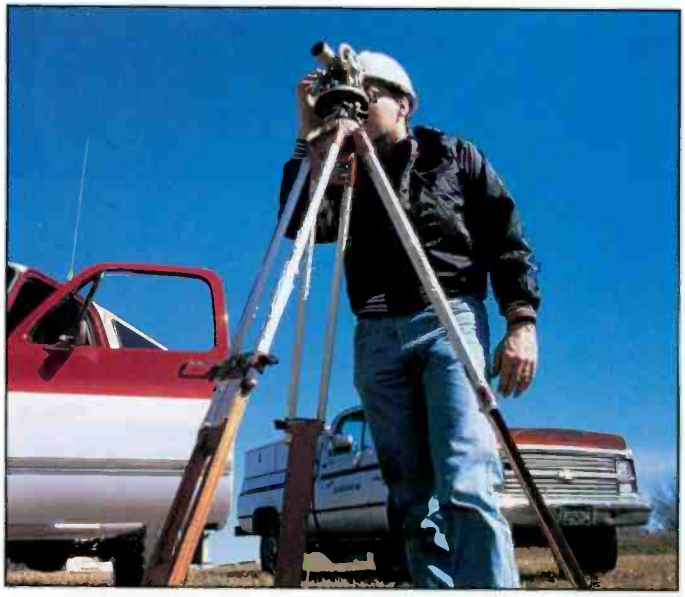
We created the Andrew "Customer Service Center", a service and information resource, which you can access toll-free in the U.S.A., Mexico, Canada, the U.K., the Republic of Ireland, Australia and New Zealand. If you are planning a new system, you can call and request a budgetary estimate of the products and services needed for your individual system (not for electronics or for earth station systems).

We've also improved our 24-hour Emergency and Technical Services departments.

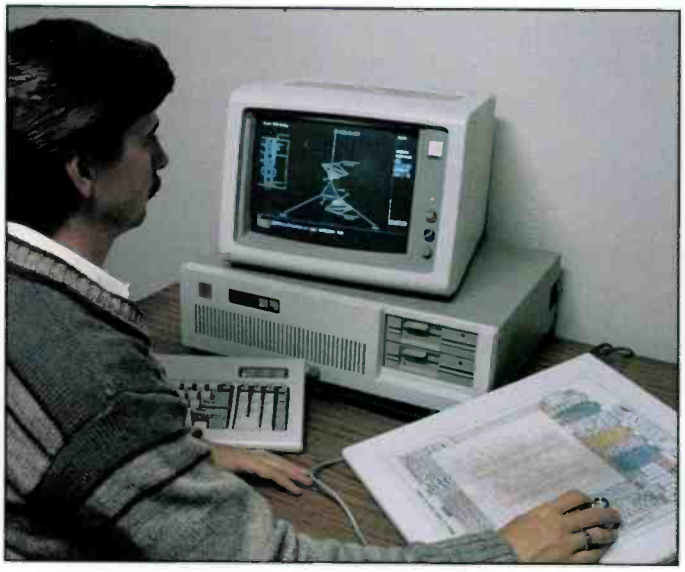
At Andrew, we're proud of our half-century tradition of imagination, innovation, dedication and efficiency in serving you, our valued customers.

Services

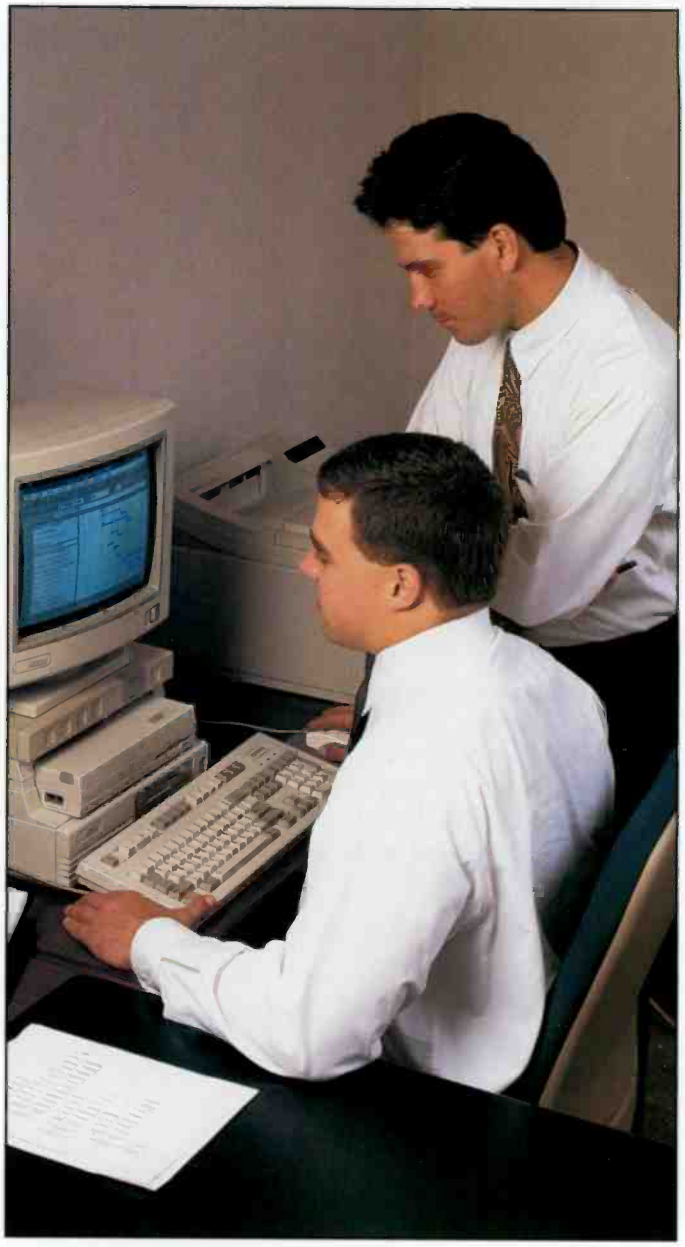
Any or all of the following services can help create a successful program:



Site Surveys



System and Design Engineering

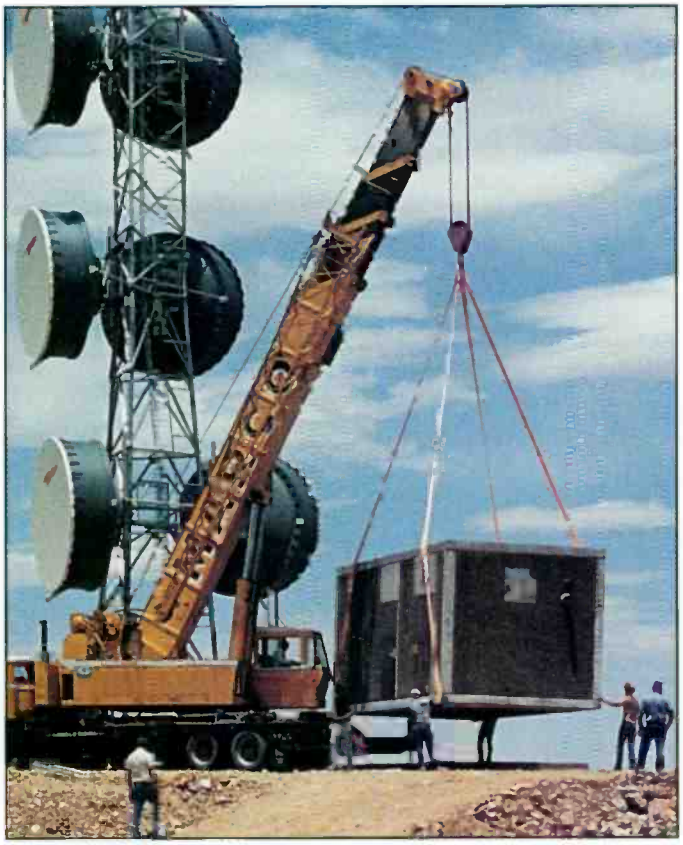


Applications Engineering

Manufacturing Coordination

Delivery of Materials

Site Civil Work



Construction, Installation, Integration and Implementation

Complete Testing and Commissioning Services

Numerical Index

Numerical Index

Numerical Index

HRL-HT

Numerical Index

Numerical Index

Numerical Index

Numerical Index

Numerical Index

Numerical Index

500000-699999

Alphabetical Index

Alphabetical Index

How To Contact Andrew

In North America, the United Kingdom, the Republic of Ireland, Australia and New Zealand, call Andrew Customer Service, toll-free. For other locations, contact one of the Andrew Sales Offices.

Customer Service Center

The Andrew Customer Service Center gives you direct access to the information and personal service you need.

- ***Place Orders***
- ***Check Order Status***
- ***Pricing Information***
- ***Replacement Materials***
- ***Product Information***
- ***Service***
- ***Repairs***
- ***Returns***
- ***Technical Assistance with System Planning***

Call from:

United States, Canada and Mexico
(Except Network Products* and Wireless Accessory Products**)

Telephone, Toll Free **1-800-255-1479**
Telephone..... **(708) 873-2307**
FAX, Toll Free **1-800-349-5444**
FAX .....**(708) 349-5444**

United Kingdom
Telephone, Toll Free **0800-250055**
FAX .....**+44 0118 9794005**

Republic of Ireland
Telephone, Toll Free **1-800-535358**
FAX .....**+44 0118 9794005**

Australia
Telephone, Toll Free.....**1800-803 219**
FAX.....**61 3 9357-9110**

New Zealand
Telephone, Toll Free **0800-441 747**
FAX.....**61 3 9357-9110**

***Network Products** - Includes LAN Products, Midrange Solutions, and Advanced Wiring Management Solutions. For further information see page 17.

Telephone, Toll Free **1-800-328-2696**
Telephone .....**(708) 349-3300**
FAX .....**(708) 349-5673**

****Wireless Accessory Products** - MAXIM® wireless accessories for cellular and PCS phones. For further information, see pages 18-25.

Telephone, Toll Free **1-800-458-2820**
Telephone .....**(630) 250-9900**
FAX .....**(630) 250-9917**

Emergency Technical Assistance

For emergency assistance, 24 hours a day:

Call From	To	Telephone Number	FAX Number
North America (toll free)	U.S.A.	1-800-255-1479	1-800-349-5444
Any Location (International)	U.S.A.	(708) 349-3300	(708) 349-5410
Europe/Africa	U. K.	+44 1592 782612	+44 1592 782380

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FAX: (972) 278-0270

Andrew DCS
2425 N. Central Exwy #800
Richardson, TX U.S.A. 75080
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FAX: (972) 234-6014

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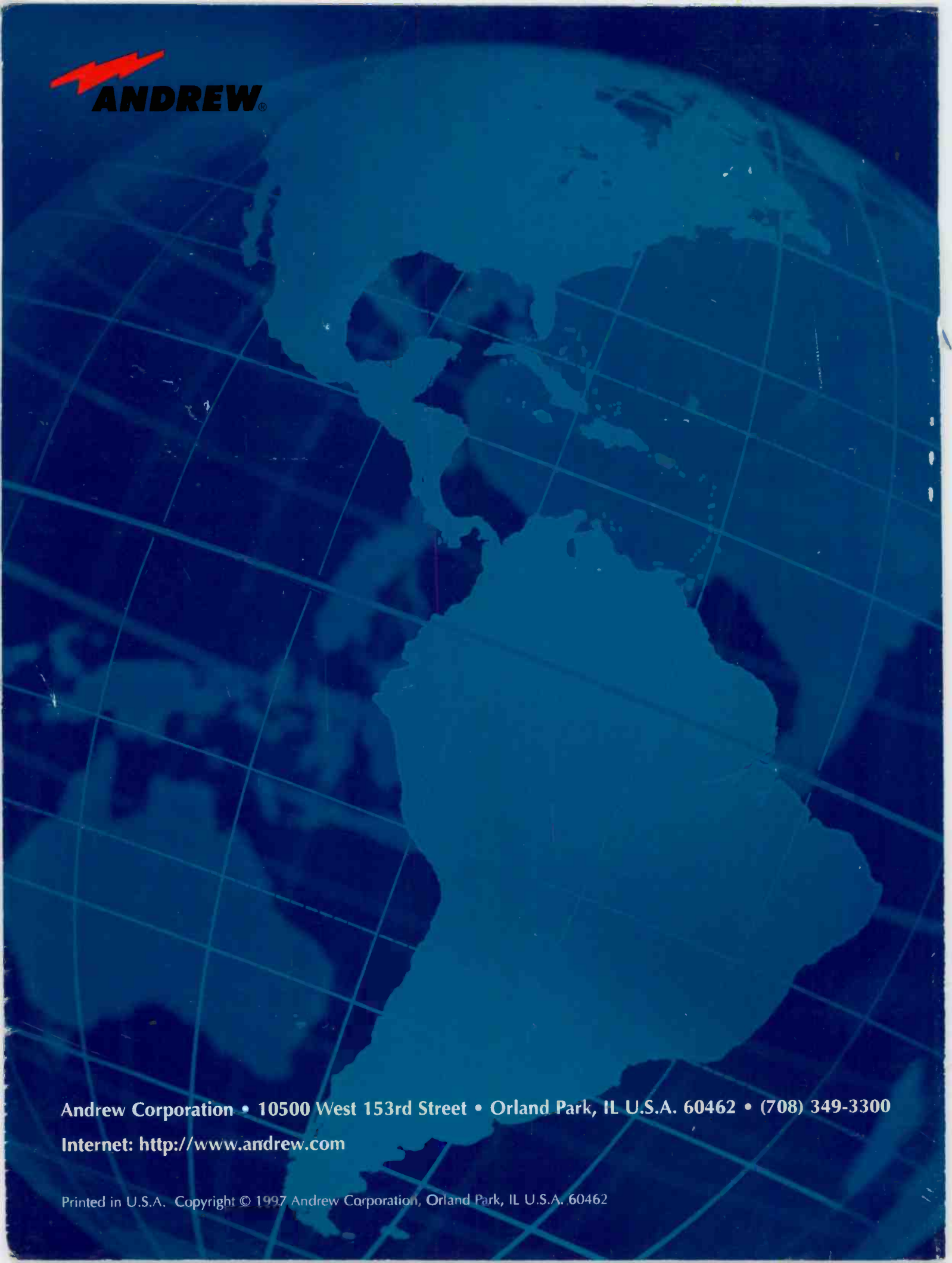
Andrew has Sales Agents and Distributors throughout the world. Contact our Customer Service Department or one of the listed Sales Offices for further information.

FAX-on-Demand

North America: 1-800-861-1700
Australia: 1-800-141317
Belgium: 0800-7-2790
Hong Kong: 800-933117
Ireland: 1-800-55-9433
Netherlands: 06-0225949
United Kingdom: 0800-96-2197
Other Regions: 708-873-3614

Internet

http://www.andrew.com



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