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It's hard to believe that so many outstanding features could be packaged in a compact, desk-top audio console. But we did it. The new ADM 1600 Series II sets new standards for versatility and capability.

This new console is available with up to 16 discrete inputs, 4 submaster and 2 master outputs. Along with a host of optional modules, the 1600 is perfectly matched to today's production and broadcast environments. And, like all ADM consoles, it is manufactured to the highest quality standards and backed by an exclusive 5-year warranty.

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1600 SERIES II

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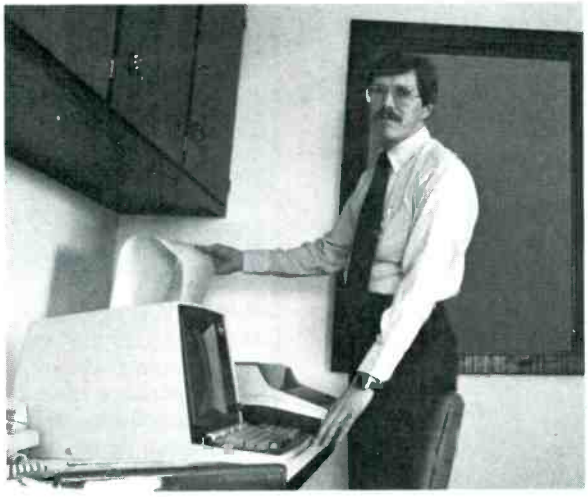

Danny Jenkins, Chief Financial Officer
Great Empire Broadcasting

Danny Jenkins
Chief Financial Officer
Great Empire Broadcasting

Donna Bush, Administrative Assistant
Computer Concepts Corporation

Original KFDI Facility

New KFDI Headquarters

Kathy Mager, WP Specialist
Computer Concepts Corporation

A few years ago, Great Empire Broadcasting consisted of four radio stations. Today, it is a group of ten. Much of the group's success is owed to Chief Financial Officer Danny Jenkins. Danny is a financial professional who uses a computer system from COMPUTER CONCEPTS CORPORATION to ply his trade. For example, at the group's flagship station, KFDI in Wichita, the average accounts receivable age is a mere 60 days. For local accounts, the average age is even less. Their COMPUTER CONCEPTS computer makes this possible by producing an accounts receivables aging report quickly at the end of each month so that Danny can collect on problem accounts before they get out of hand.

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A system from COMPUTER CONCEPTS can save you time and money. Ask Danny Jenkins. Or any of the other users of the Broadcast System. There are 100 of them, coast to coast . . .

"Every professional broadcaster should have this tool..."

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BROADCAST engineering

The journal of broadcast technology

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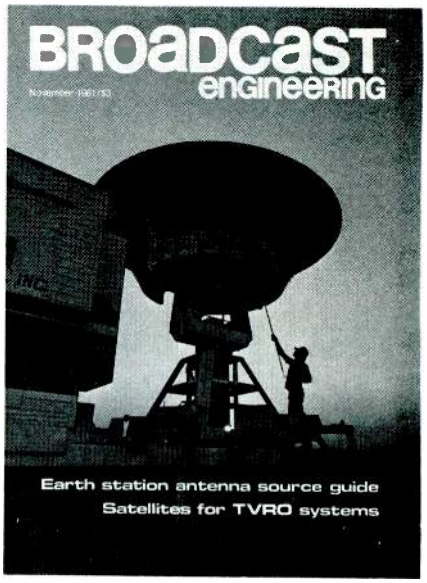

THE COVER this month shows a mobile video production van, the Compact Video model C-42 system, equipped with a transportable earth station to provide direct satellite communications. An article describing the company's rationale behind designing and building mobile video production vans for broadcasters, with special emphasis on the Compact 40 used by several networks, begins on page 58.

NEXT MONTH Leading radio and TV broadcasting authorities from ABC, CBS, NBC and NPR and groups such as the FCC, NAB and NRBA will speak out on key issues that they see as critical factors shaping the future of broadcasting. Charles Ferris, former FCC chairman, will give his thoughts on how the industry is going to move and the legislative roadblocks that might be expected. There will also be a comprehensive look at post-production techniques being considered by the Bonneville International production group.

We could have just added bigger reels to make a great three-hour VTR. But we didn't.

We built the HR-300 from the ground up with a new heavy-duty tape transport system designed to handle the stress of larger, heavier 14" three-hour reels. The result is a one-inch production VTR with a three-hour capability—and the technology required to meet those extended production demands.

The HR-300 includes all the exclusive Hitachi features found in our popular HR-200: retracting tape guide for ease of threading; "Pro" tape path for longer tape life; instant head replacement that lets you change all six heads in less than three minutes; slow-motion 1/4 REV-2X Fwd and full audio and video confidence.

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BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons also include consulting engineers and dealer/distributors of broadcast equipment.

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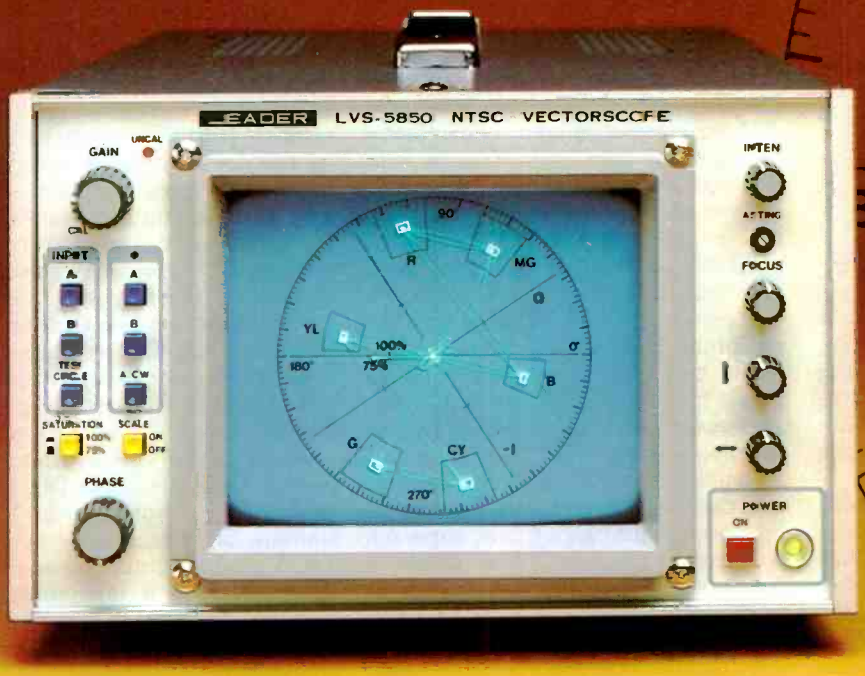


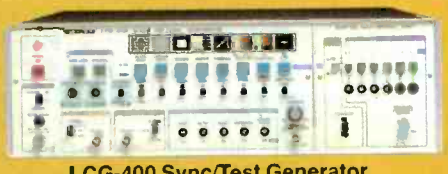
The Leader Vectorscope is unique.

Only the Leader LVS-5850 NTSC Vectorscope offers CRT-generated phase/amplitude targets that are as bright and clear as the vectors themselves. And electronically generating the targets eliminates non-linearity errors caused by CRT aging, so you can be confident that what you see is what you've got.

The LVS-5850 fits directly into your present vectorscope rack. It provides a test circle pattern—75% or 100% saturation—and lets you select the reference phase from either of two video signals or a subcarrier.

Precise NTSC sync/test pattern generators.

Leader's LCG-400 series provides accurate reference signals for any off-the-air broadcast or non-broadcast use. Available in multiburst or sweep marker configurations, they provide EIA and full-field color bars as well as staircase, raster (in eight colors), window, convergence and cross-hatch test signals...plus gen-lock capabilities and a host of auxiliary outputs. As a matter of fact, Leader's sync/test generators do virtually everything the $4,000 generators do... except cost as much.



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A network-proven 50 MHz oscilloscope.

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FCC update

November 1981

Editor's note: These are excerpts from a speech given by FCC Chairman Mark S. Fowler to the National Radio Broadcasters Association on Sept. 15.

Today there is scarcely a location in the country where the listening public does not have available to it a number of program options, custom-tuned to virtually every taste from pop to country and western, to soul, to public broadcasting.

Certainly this multiplicity of radio services presents a strong case to free radio from the regulatory grip that clamped down when the industry was much different than it is today. Although I was not a member of the commission when it issued its 1980 Radio Deregulation order, I unequivocally support its public interest judgment. I also applaud the recent action of the Congress in enacting long-needed reforms in broadcast regulation.

These actions gratify me, but they do *not* satisfy me. We need to combine further administrative and legislative action to achieve the regulatory relief that your industry deserves, and the commission is actively engaged in a program designed to secure that relief. Most of you know by now that the commission is currently reviewing each and every one of its procedural and substantive rules on a comprehensive, first-priority basis. The aim is to eliminate rules not cost-justified in terms of the consumer benefits they produce. Many of these actions will particularly benefit smaller stations, which bear a disproportionate regulatory burden because of their size.

In addition, we will specifically focus our attention during the next several months on ways to enable you to provide better broadcast service to your listeners. Now that we have finally—and I believe correctly—resolved the 9kHz issue, we can redirect our time and staff engineering resources to proceedings designed to bring about more realistic consumer benefits. As the first step in this direction, I intend to bring the AM stereo proceeding to a conclusion by April of next year. I have also directed the staff of the Broadcast Bureau to examine regulatory alternatives to enable AM daytimers to expand the service they now provide. I anticipate that I will be able to report the results of this analysis by the beginning of next year.

The commission can and will do much to improve the regulatory environment of radio broadcasting. Plainly, however—particularly when it comes to deregulation—the commission cannot do it all. Many of the rules that impose the significant costs on you come from the Communications Act, not the policies of the commission. To eliminate these rules, Congress must intervene. I particularly welcome the efforts and commitment of Senator Robert Packwood and his staff on the Senate Commerce Committee who are working hard to develop legislation that will significantly deregulate the broadcast industry. I and my fellow commissioners are looking forward to working actively with Senator Packwood on this legislative agenda.

Many of our rules impose costs on you that can be measured in terms of dollars and man-hours. But the Communications Act also imposes a rule that takes its toll in a more insidious way. This rule prescribes the types of issues you must present and how you must present them. In so doing it limits your constitutionally protected ability to use your broadcast facilities to speak on important issues, on the assumption that such limitations are required in the larger interests of the public.

I am referring, of course, to the equal opportunities provisions of Section 315 of the Act—the so-called "equal time" requirements and the Fairness Doctrine. And my position on these laws is simple and clear—get rid of them.

Why do I say this? I begin with the premise that the right to freedom of speech guaranteed to all Americans by the First Amendment is our most precious right, the cornerstone of all the other freedoms we enjoy under the Bill of Rights. The courts have consistently held that it may be infringed by the government in only the most compelling circumstances, and then only to the extent necessary to satisfy a legitimate governmental concern.

Program content regulation, typified by the Fairness Doctrine, is wrong because it assumes the government can limit the freedom of speech of a broadcaster because the station uses a scarce resource. In almost all markets today, there are more radio and TV outlets than there newspapers. In Washington, DC, there are seven TV stations, over 35 radio stations, and exactly one newspaper. Yet, I hear no group advocating that Congress pass a law applying the Fairness Doctrine to the *Washington Post*, to be administered by a Federal Newspaper Commission. The scarcity argument may have made sense to some at the beginning of broadcasting, but it does not justify the burden of a Fairness Doctrine on free expression today.

You may recall that in 1941 the commission outlawed station editorials. In 1949, it reversed itself, permitting editorializing, but under the limits of the Fairness Doctrine. It is time to remove those limits. Broadcasters who abuse their right of free speech in the marketplace will face what every boor, every zealot, every loudmouth faces—people will stop paying attention. That is how the marketplace of ideas works. And I for one would like to give it a chance to work in broadcasting, just as it has worked for newspapers, magazines, books and films.

Surely no one doubts that we are living in the age of mass communications, or, to be more precise, in an Information Age in which the public has increasingly ready access to steadily growing sources of diversion and information. To say that despite the explosion of nonbroadcast sources of entertainment and information we still need the Fairness Doctrine, or any other form of federal program content rules, to spur broadcasters into covering important issues responsibly is like trying to accelerate a K Car by striking the hood ornament

MAGNECORD MC-II
Modern Performance with Traditional Quality

The Magnecord MC-II is a rugged, precision tool for the broadcast control room—be it fully automated or D.J. assisted. The MC-II is made that way, by design, in the Magnecord tradition. Of course, it meets or exceeds NAB standards with IEC equalization on request.

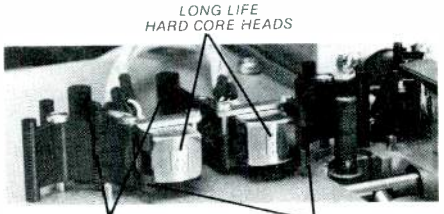
Superior dc Servo Drive
The dc servo, Hall effect motor with flutter-filter belt drive, provides exceptional speed stability (to 0.05%), totally unaffected by line voltage or frequency fluctuations. And it runs so cool, no ventilation is required.

Full Broadcasting Features
Unlike some other cart machines, the Magnecord MC-II comes with the extra features broadcasters desire at no added cost. Built-in full remote control capability. Automation compatible cue tones (stop, secondary, tertiary) with LED indicators and contacts for external cue switching. Cue track input and output access for FSK logging. A universal mic/line input and front panel headphone jack to "preview" or time new carts and for servicing convenience.

Flexible Broadcast Use
The MC-II is so flexible it virtually defies obsolescence. You can choose mono or stereo models, play only, or with record capability. Best of all, play models are field-convertible to record/play. The record electronics come in a separate housing for convenient, space-saving installations.

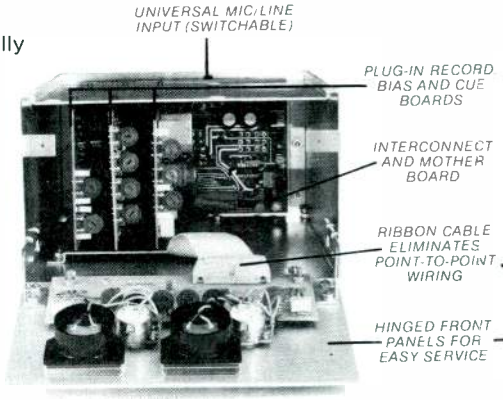
Rugged Magnecord Design
As with all Magnecords, the MC-II is designed to work long and reliably. For example, the woven polyester drive belt and polyurethane pressure roller are virtually indestructible. The regulated dc power supply has universal line capability (100-140V, 200-280V, 45-65Hz), consumes nominal power and is brown-out proof. Computer grade push buttons are rated at 10 million operations. A single piece chassis and machined base plate assure positive alignment of all tape transport parts. Hard core, long life heads are mounted on unique, glass-filled Lexan® head brackets with precision, phase-locked tape guides. Carefully designed circuit boards and a Mu-metal shield make the MC-II immune to RFI, even when operated directly under a transmitting tower.

Convenient Service Access
When a Magnecord MC-II needs service, downtime is minimized. The covers and front panels are hinged for convenient access. All solid state circuitry is on plug-in epoxy boards. Plug-in ribbon cables eliminate point-to-point wiring. And, of course, the Magnecord MC-II is made in the U.S.A. so parts are readily available.

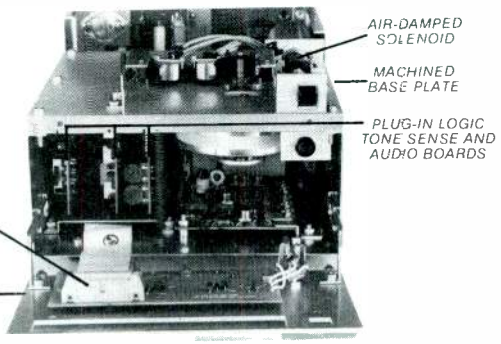


HEAD ASSEMBLY

When you compare performance, reliability, and cost, the MC-II is indeed a modern tool worthy of the name Magnecord, because it's made in the tradition of rugged excellence.



FRONT VIEW RECORD ELECTRONICS



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Fluke introduces two new advanc synthesized signal generators you

With 20 years experience in RF instrumentation, we're driving down the cost of high performance.

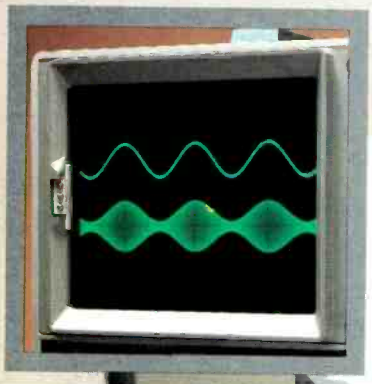
The 6070A and 6071A are designed to fill a critical gap in today's signal generator market: the price/performance gap that separates $10,000 synthesizers with limited capabilities from the more sophisticated, state-of-the-art units costing $25,000 and up. As such, they represent a new generation of RF synthesizers from Fluke that deliver the industry's most-wanted features at a very affordable price.

Innovative design achieves signal purity and broad frequency coverage.

Fluke engineers developed a number of unique and cost-effective synthesis techniques for the 6070A and 6071A that deliver a high degree of spectral purity without sacrificing broadband range.

The frequency range of the 6070A is 200 kHz to 520 MHz and the 6071A extends the range to 1040 MHz. Yet both instruments have spurious output levels of 90 to 100 dB below carrier, performance equalling or exceeding the best cavity-tuned generators on the market today. Microprocessor control – which Fluke introduced to signal generator design in 1975 with the 6010A – allows precision resolution and settability you can't find from any other manufacturer.

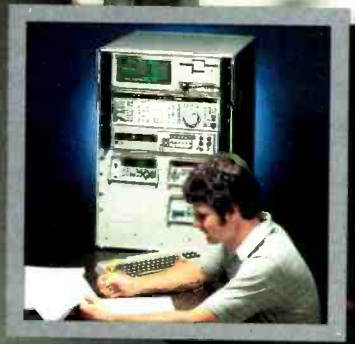
Fluke's new approach to synthesis in the 6070A and 6071A combines several unique elements: a refined single loop de-



***Internal modulation** is fully programmable from 20 Hz to 200 kHz with 3 digits resolution. The generators can also function simultaneously as signal generators and independent audio oscillators – two instruments in one.*

***Pinpoint frequency tuning** provided by optically coupled, magnetically detented spin knob. Combines digital precision with the speed and convenience of analog control.*

***Built-in, easy-to-program IEEE-488** interface ties the signal generator capability of the instruments to the power of automated system control. Talk/listen capability provides "learn" and "teach" modes.*



***Output level adjustable** in 0.1 dB steps from + 19 dBm (13 dBm above 520 MHz) to -140 dBm – displayed in dBm or volts and in relative or absolute units.*

IEEE-488

ed technology can specify with confidence.

sign that both improves reliability and lowers maintenance costs; a Surface Acoustic Wave (SAW) device to achieve low noise performance; and a delay line discriminator in a phase-locked loop that improves spectral purity and increases the modulation flexibility of the instruments.

A major emphasis on packaging design minimizes RF leakage and insures spectral purity. Fluke's own thick film hybrids improve RF performance and keep the parts count low. And a high efficiency power supply helps reduce weight, volume and heat rise.

Versatile modulation brings you two instruments for the price of one.

AM, FM and ØM are internally selectable. Modulation frequencies from 20 Hz to 200 kHz can be selected. Modulation can be applied separately or simultaneously for frequency, amplitude or phase, and the internal signal can also be used as an independent signal source, separate from the RF output, giving the user two instruments – a signal generator and an audio oscillator – in one high performance package.

A high deviation mode of up to 1 MHz or 100 radians is provided for frequency of phase modulation. External dc coupling for AM and FM is also available.

More microprocessor benefits.

The advanced 16-bit microprocessor control of the 6070A and 6071A makes these signal generators easy to operate and a pleasure to use.

Complex functions are executed rapidly from simple, direct keyboard commands.

A remarkably fluid-feeling spin knob gives even greater precision and control by allowing you to tune around any frequency, amplitude or modulation parameter, or spin quickly to another setting: rapid-tuning convenience with digital precision.

A built-in memory for storage of front panel set-ups is provided to save time and reduce operator errors. And the 6070A and 6071A also include a relative units function that allows you to define a zero point for subsequent programming, useful in both the frequency and amplitude domains.

Both instruments are IEEE-488 programmable for complete system use. Plus self-diagnostics, error code displays, digital sweep and other special functions combine to simplify testing in any RF design application. A full line of options and accessories is available to expand the capabilities of the 6070A and 6071A.

For more information on these new signal generators, call toll free **800-426-0361,** use the coupon below or contact your nearest Fluke sales office.

***Digital frequency sweep** for sophisticated testing of narrowband crystal filters, wideband amplifiers and other devices: manual, single and auto modes are standard.*

***Noise performance** exceeds the cavity-tuned generators: SSB phase noise -138 dBc/Hz at 20 kHz offset from the carrier at 500 MHz broadband noise floor -150 dBc/Hz.*

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with a buggy whip: it gets us nowhere and it chips the paint whenever we miss.

The time has come for the commission and the Congress to recognize that changing technology is one piece of a pattern of social, attitudinal and economic changes that are combining to render much of our current regulatory approach outmoded. We need to re-examine the precepts of the "public interest" in light of current-day realities and not on the basis of outdated, ivory tower folklore. In other words, it is time for the federal government to get out of the way and do what the Supreme Court said we should do 40 years ago: allow a licensee to survive or succumb according to its ability to make its programs attractive to the public. Let the people make their choices in the marketplace, and let the broadcasters act accordingly. Let the government's role in telling the people what it is that they should see and hear, cease.

There is an old saying that when eras die, their legacies are left to strangers to police. It comes to my mind now because, in a real sense, the old era of comprehensive federal regulation and obtrusive protectionism is unmistakably over. The time has come to remove the lurking shadow thrown by the federal government on activities that no longer have any need for such overshadowing. Accordingly, I have directed the staff to prepare for the commission's consideration a recommendation that the Congress abolish Section 315 of the Act. The commission will soon vote on this recommendation. My vote will be to eradicate Section 315 and vindicate the First Amendment.

In light of the many complex changes that have brought this new era about, the present commission indeed finds itself in the shoes of a policer of outdated policies and practices. I consider myself very fortunate to be chairman during the critical period of reassessment.

In this process we will need the data, opinions and insights that only those of you with actual experience as regulatees can contribute. It is my hope that through this process we will enter a new era of telecommunications regulation in which the commission and the regulated industries will no longer be antagonistically aligned as policers and those policed but rather as cooperative strivers, each in its own way, toward the common goal of providing the best possible communications services to the American people. □

FCC Field Operations Bureau Public File Checklist

If you are anticipating an FCC inspection, the following checklist will help you prepare for the visit.

	Commercial Television	Non-commercial Radio & TV	Commercial Radio
a. Construction permit or program test authority application if filed within the last seven years	●	●	●
b. Two latest renewal applications	●	●	●
c. Ownership reports covering last seven years	●	●	●
d. Annual employment reports for the last seven years	●	●	●
e. Two latest equal employment opportunity model programs	●	●	●
f. "The Public and Broadcasting – A Procedure Manual"	●	●	●
g. File for time requests by political candidates (according to the FCC, this file may be empty)	●	●	●
h. Letters received from members of the public for the last three years	●		●
i. Statement of TV program service	●		
j. Composite week logs for the last seven years	●		
k. Annual problem-program lists for the last seven years	●	●	
l. Leader interview documentation for the last seven years	●	●	
m. Two most recent community leader checklists	●	●	
n. General public survey (if non-commercial, documentation required for last seven years)	●	●	
o. Statement of sources consulted and ascertainment methodology		●	
p. Community composition documentation		●	
q. Issue-program lists			●

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There is one audio mixer that complements the new 1" VTRs. Designed for both production and post production needs, the Neve 542 Series is available in 8 models with 6 to 16 inputs, including a truly portable Ni-Cad powered 8 input suitcase mixer. With Neve's superior quality and support at an affordable price, you can be assured that your audio productions will do justice to your new (or existing) TV and video facilities. Please call or write today for Neve's comprehensive TV audio console information package.

Model 5422
Suitcase Mixer
Ni-Cad powered

Model 5442
Table Top
Mixer

Other 542 Range Mixers:
Model 5422R Rack Mount
Model 5432
Table Drop Through
Model 5452
12 or 16 Inputs

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Rupert Neve GmbH 6100 Darmstadt Bismarckstrasse 114, West Germany Tel: (06151)8.764

Circle (9) on Reply Card

Study predicts growth in home satellite terminal market

The home satellite terminal will be a key, not only to high resolution television, but also to home information systems, according to a recently released market study by Frost & Sullivan Inc.

Improved TV broadcasting requires the technology inherent in small earth terminals because such systems require easier-to-read TV screens than that possible with current 512-line sets, according to the report. This need could launch another industrial boom.

The 289-page report, which identifies about 40 companies engaged in the manufacture and distribution of small earth terminal equipment, admits to finding major obstacles in the way of this industry. These include opposition by the broadcasting and communications industry, in general, and from foreign countries who fear the technology for its potential to Americanize their culture.

Significant developments over the past few years include:

- The formation of a Society for Private and Commercial Earth Stations, which held its first national convention in 1979.
- Publication of *SATGuide* as a counterpart to *TV Guide*.
- COMSAT's announcement that it would develop programming for direct-to-home satellite broadcasting.

Declining costs provide the biggest impetus to the use of satellite terminals by home owners. Home satellite terminals, defined as antennas 12 to 16 feet in diameter, which cost more than $100,000 in 1975 and could only handle a single channel, now cost about $12,000 and have a 24-channel capacity.

For those handy enough to install their own, the cost can be as little as $3000. Just around the corner are more advanced antennas that will be smaller in size and more powerful in reception. They will cost less and thereby enhance market potential.

COMSAT president proposes restructuring of satellite systems

Dr. Joseph V. Charyk, COMSAT president and chief executive officer, recently proposed a bold restructuring of the system of civil earth sensing satellites. Appearing before a joint hearing of the House Space Science and the Senate Science, Technology and Space Subcommittees, Charyk outlined COMSAT's proposal for a unification of the management of non-experimental earth sensing satellites in the private sector.

Currently, the Federal Government—through the National Oceanographic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA)—operates two independent systems of satellites that perform such sensing functions as weather and crop forecasting. Under the COMSAT proposal, the mangement of these satellite systems would be unified, thus eliminating the need for duplicate facilities.

The COMSAT president also proposed that the management of a combined earth sensing satellite system be transferred to the private sector. □

All those in favor of patch panels, raise your right hand.

Wrestling with those patch cords is cumbersome, awkward and not very good engineering.

But now there's a way to route audio signals with pushbutton ease. Without the patch cords. Without the separate amps, the noisy pots and the mad scramble to adjust levels every time you switch inputs.

Introducing the "electronic patch panel."

Meet the incredible new Ramko ARA-1612 Audio Router/ Amplifier.

It lets you use front panel and/or remote control pushbuttons to route 16 inputs to any of 12 outputs, simultaneously or individually, with an instant LED display of what signal is going where.

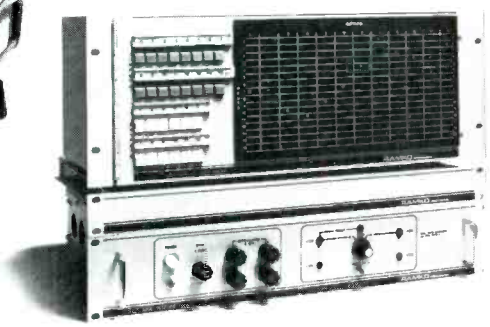
Each balanced input has its own gain adjustment. The balanced outputs are buffered so you can feed a single input to all 12 outputs with *no* interaction. In addition, each output module contains stereo/mono switches enabling operation in either mode. And, incredibly, you need only a single shielded twisted pair to make all 16 inputs available at a remote location.

More good news.

The Ramko ARA-1612 system also features solid, broadcast-level performance specs. Expandability up to 45 in and *thousands* out. Remote control capability. A dual instant-switchover power supply for 100% on-air reliability. And it's backed by the only two-year warranty in the industry.

Our unique two-week free trial.

Try the Ramko ARA-1612 free for two full weeks (with prior credit approval) so you can pushbutton it through its paces. Write Ramko Research, 11355 Folsom Boulevard, Rancho Cordova, CA 95670 for the details. Or just call (916) 635-3600 collect – we'll set you free.



RAMKO

Dealer Inquiries Invited

Circle (11) on Reply Card

NRBA

National Radio Broadcasters' Association

1705 De Sales Street, NW
Washington, DC 20036

Board votes for new directors

Via the mail, the NRBA Board of Directors recently voted to fill 11 openings in its 35-member council. This completes the 1981 election of regional directors and directors-at-large. The new directors are:

John Bayliss
Charter Broadcasting
San Diego, CA

Lynn Christian
Century Broadcasting
Chicago, IL

Robert Duffy
The Christal Co.
New York, NY

Jack Gennaro
WFHR/WWRW
Wisconsin Rapids, WI

Ragan Henry
Broadcast Ent. Nat'l.
Philadelphia, PA

Paul Lange
KDLR/KDVL
Devils Lake, ND

Ray Livesay
WLBH
Mattoon, IL

Frank Moore
WVCG/WYOR—Insilco
Coral Gables, FL

Nicholas Verbitsky
WHN—Mutual Brdct. Sys.
New York, NY

Norman Wain
Metroplex Communications
Cleveland, OH

Tom Worden
KRSB
Roseburg, OR

More than 4000 people attend NRBA '81

More than 4000 radio industry executives attended NRBA '81 in September in Miami. The convention provided a continuous series of panels, roundtables, forums and candid dialogues covering every phase of radio station operations. Many of the workshops (for example, *Cuban Interference Problem*) received both local and national TV, radio and print press coverage. Luncheon addresses were given by FCC Chairman Mark Fowler, Senator Bob Packwood, Rep. Cecil Heftel, veteran radio broadcaster Gordon McLendon and former FCC Chairman Bob Lee. All meetings, luncheons, exhibitors and most hospitality suites were located at the Fontainebleau Hilton.

Executive committee selected

NRBA's 36-member Board of Directors met in September to elect new officers for the coming year and to formulate the association's policies.

CREATIVITY TAKES FLIGHT ON AMPEX VIDEO TAPE.

BROADCASTERS AND PRODUCTION COMPANIES DEPEND ON AMPEX TAPE.

From videotape equipment to the video tape itself, broadcasters and production companies throughout the world depend on Ampex. High quality, durability, reliability, and prompt service are just some of the reasons.

Ampex 175 Highband Quadruplex Video Tape has proven itself under every conceivable type of operating condition within every video standard. Excellent color performance, low drop-outs, and a tough durable formulation with low headwear are features which have contributed to this dependability.

And now Ampex 196 High Energy Broadcast Helical Video Tape has been specifically engineered to fill the increasing needs of a particularly demanding group of video professionals—those who have chosen one of the new broadcast helical VTRs.

No matter what your video tape needs are, there's an Ampex video tape for you. And, once you've tried Ampex tape, you'll see why broadcasters and production companies have grown to depend on Ampex.

AMPEX

REFLECTIONS OF REALITY. AND BEYOND.

Ampex Corporation, Magnetic Tape Division,
401 Broadway, Redwood City, CA 94063 415/367-4463
Circle (13) on Reply Card

Associations

Sis Kaplan, president of Sis Radio, Charlotte, NC, was re-elected president. Bill Clark, general manager of the Radio Division of Shamrock Broadcasting and president and general manager of KABL, San Francisco, CA, was elected chairman of the board. He replaced Bob Herpe, president of General Communicorp, who retired after serving seven years.

Bernard Mann, president of Mann Media, High Point/Raleigh, NC was elected vice president East. Joseph Costello III, president of Gulf South Broadcasters, New Orleans, LA, was elected vice president Midwest. Robert Duffy, president of the Christal Company and Duffy Broadcasting Corp. was elected vice president West. Ted Dorf, general manager of WGAY, Washington, DC, was re-elected treasurer. Stephen Trivers, president of Fairfield Broadcasting and Kalamusic, Kalamazoo, MI, was elected secretary. And Bob Herpe, president of General Communicorp, New Haven, CT, was elected assistant treasurer.

SOCIETY OF BROADCAST ENGINEERS INC

First women certified by SBE

The first women broadcast engineers, Dorothy Altman, Nancy Dyki and Janet Kowalczyk, were certified by the Society of Broadcast Engineers after fulfilling all the requirements for certification, including passing the June 1981 certification exams.

Altman is a technician with KOOL-TV in Phoenix, AZ. Dyki is a master control and videotape engineer with WKAR-TV at Michigan State University in East Lansing, MI. Kowalczyk is engineering manager with KDKA Radio in Pittsburgh, PA.

The SBE Certification exams will be given again from February 1 through February 19, 1982. The deadline for applying for this exam session is November 2. For a copy of the Certification Program booklet and application, write to the Certification Secretary, SBE, P.O. Box 50844, Indianapolis, IN 46250.

SMPTE

Society of Motion Picture & Television Engineers

Scheetz named executive director

Conrad L. Scheetz has been appointed executive director of the Society of Motion Picture and Television Engineers (SMPTE). Scheetz will supervise SMPTE's headquarters staff and coordinate and carry out the policies of the SMPTE Board of Governors.

SMPTE adds sustaining members

Recent additions to the more than 190 sustaining member companies roster of SMPTE include:

- Anton/Bauer Inc., Shelton, CT
- Lenco Inc., Jackson, MO
- Getty Film Laboratory Inc., Van Nuys, CA
- Harris Corporation, Broadcast Products Division, Quincy, IL.
- Maxell Corporation of America, Moonachie, NJ
- TVC Laboratories Inc., New York, NY. □

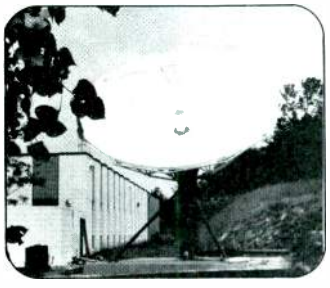
If you're looking for low-cost TV programming with broadcast quality...

There's a Harris earth station system to fit your needs

9.0 meter

The Harris SSL* family offers a variety of satellite earth stations *specifically designed for broadcasters.* Whatever your system requirement—large or small, downlink or uplink—Harris has the complete package for you, including total planning, rapid reposition antennas, video receivers, exciter-high power amplifiers, microwave links, remote control and complete installation. All backed by Harris 24-hour-a-day service—the most responsive in the broadcast industry.

The high-speed drive system of the Harris kingpost pedestal allows rapid and accurate repositioning of the antenna, so that it can be rotated automatically between any domestic communications satellites in less time than a normal commercial break.



6.1 meter

The Harris 9.0 meter SSL provides the industry's most advanced feed horn antenna design, with video receive S/N (signal-to-noise) in the high 50s for network quality broadcasting. This antenna is also designed for uplink service, *where specifications and price outperform 10 meter designs!*

The 6.1 meter SSL provides *highly cost effective* TV receive only (TVRO) service for broadcasters, with S/N performance in the mid-50s.

Set your sights on a whole new universe of TV program sources. Contact Harris Corporation, Broadcast Products Division, Quincy, Illinois 62305-4290. 217-222-8200.

*Satellite to Studio Link

HARRIS

Circle (15) on Reply Card

"OUR NEW SONY ALL KNOWN

"Finally there's a ¾-inch recorder that doesn't just inch along," says Fred Rheinstein, president of The Post Group.

A major post-production facility in Hollywood, The Post Group counts among its clients all three networks, PBS, and major cable TV and syndicated production companies. It will edit the new syndicated children's show "We're Moving" entirely on the BVU-800.

"The 800 is amazingly fast. To be able to go backward and forward at 40 times play speed means you can search for your edit points—and find them—more than twice as fast as ever before," continues Rheinstein. "And this machine goes from its highest speed to a still frame. Instantly. Without slewing or breaking up.

"It also has a direct-drive system, which promises greater reliability and accuracy.

"We have extremely critical clients," says Rheinstein. "They're used to the best performance, in terms of picture quality and in terms of flexibility. This new Sony can deliver it.

"It's the perfect combination of U-matic economy and broadcast quality. It's a true mastering process; with the BVU-800, there's no need to transfer to one-inch and lose a generation in order to edit your tape."

U-MATIC BREAKS SPEED RECORDS."

Fred Rheinstein, THE POST GROUP

Other breakthroughs incorporated in the BVU-800 include its ability to make machine-to-machine cuts without a separate controller; its adjustable, removable edit control panel; and its narrow, front-loading design, which makes rack mounting possible.

"We've always bought a lot of Sony, because we can depend on the company for reliability and innovation," says Rheinstein. "Now, with the BVU-800, Sony makes its competitors look like they're operating in reverse."

Sony makes a full line of 1-inch and ¾-inch broadcast equipment, including cameras, recorders, editors and digital time-base correctors.

For more information, write Sony Broadcast, 9 West 57th St., New York, N.Y. 10019. Or call us in New York/New Jersey at (201) 368-5085; in Chicago at (312) 860-7800; in Los Angeles at (213) 537-4300; or in Atlanta at (404) 451-7671.

SONY®
Broadcast

Sony and U-matic are registered trademarks of Sony Corp.

*When used in conjunction with the BVT-2000 digital time-base corrector.

Circle (16) on Reply Card

Tele-Color Productions acquires digital mix effects system

Tele-Color Productions Inc. in Washington, DC, has acquired the NEC digital mix effects system with full-frame synchronization and a range of digital video effects including split, horizontal and vertical flip, and mosaic effect.

Dave Bell Associates acquires Vanguard

Datatron Inc. recently announced the sale of a Vanguard computerized videotape editing system to Dave Bell Associates in Hollywood, CA.

The Vanguard is a microprocessor-based 5-VTR SMPTE/control track editor that interfaces to a variety of quads, cassette decks, 1-inch type "C" VTR's, audio decks and telecines. The unit can control a variety of video production switchers and is capable of performing A/B rolls and A/B/C/D synchronized rolls. The new Smart Scan learn mode variable speed editing capability includes edit compression/expansion and motion effects. Other features include: selectable operator reaction time, split edits, auto assembly from up to four program sources, up to 999 events of edit list memory and flexible edit list management.

Dave Bell Associates Inc. has been producing TV series, documentaries and other specials since 1960. The company has won numerous awards for excellence including several Emmys, The Cine Golden Eagle award and the Ohio State Award.

Leitch Video opens new plant

Leitch Video Ltd. is expanding its US facilities with the addition of a 12,000 square foot manufacturing and distribution plant in Virginia. The facility is located as follows: Leitch Video of America Inc., 825 K Greenbrier Circle, Chesapeake, VA 23320; (804) 424-7920. The phone was not in service at press time.

Taft Broadcasting installs Harris satellite earth terminals

Taft Broadcasting Company recently installed Harris satellite earth stations at three of its TV facilities. Nine-meter dishes purchased from the Broadcast Products Division of Harris Corporation are now being used by WTVN-TV, Columbus, OH; WKRC-TV, Cincinnati, OH; and WBRC-TV, Birmingham, AL.

The 9m dishes are part of the Harris SSL (Satellite-to-Studio-Link) system, which features a frequency agile receiver and a kingpost pedestal that allows repositioning of the antenna between any domestic communications satellites in less time than a normal station break.

Harris SSL systems are employed by three other Taft Broadcasting TV stations, including WDAF-TV, Kansas City, MO; WTAF-TV, Philadelphia, PA; and WDCA-TV, Washington, DC.

Ikegami expands West Coast facilities

Ikegami Electronics Inc. has expanded its West Coast operations. The former office and warehouse at 1916A Van Ness Ave., Torrance, CA, has now been relocated to larger (20,000 square feet) quarters at 3445 Kashiwa St., also in Torrance. The new telephone number is (213) 534-0050. The enlarged facility provides more space and greater inventories of equipment and replacement parts to improve customer service.

Arrakis Systems relocates

Arrakis Systems has moved its facilities to Colorado and can be contacted at: 1713 Willox Court, Ft. Collins, CO 80524.

Marconi receives NATAS award

Marconi was among the companies honored at the United States National Academy of Television Arts and Sciences (NATAS) annual awards ceremony in September in New York.

The pioneering work done by Marconi in TV cameras has been recognized with a citation for "Engineering innovation in the design and development of a system for the automatic alignment of color TV studio cameras."

The development and introduction of the Marconi Mark VIII color TV camera in 1970, the world's first automatic system, was a major breakthrough in color TV camera technology. Some 550 camera channels were sold to more than 30 countries before the introduction of the Marconi Mark IX in 1978. In 1981 the Mark IXB followed with microprocessor control of the automatic registration sequence.

Earth stations make corporate teleconferences possible

Transportable Earth Stations Inc., Burbank, CA, provided a Compact 42 transportable earth station to HP Corporate TV for two interactive satellite-fed teleconferences held by Hewlett-Packard in August.

The first teleconference, linking 37 H-P offices throughout the United States and Canada, introduced H-P's new line of small business computers. The second event was an 8-hour session aimed at the company's sales and service instrument group representatives at 30 office sites.

The home base of both teleconferences was H-P's corporate TV studio in Palo Alto, CA. The studio, according to producer Marika Ruumet, has three RCA 46 cameras, a Grass Valley 1600 switcher, 1-inch computer editing, film chain and character generator.

Scientific-Atlanta to supply digital earth stations for NBC

Scientific-Atlanta Inc. has received a letter of intent from the NBC Radio unit of National Broadcasting Company Inc. for Scientific-Atlanta to supply digital satellite earth stations for use in the NBC Radio Network and the Source Network.

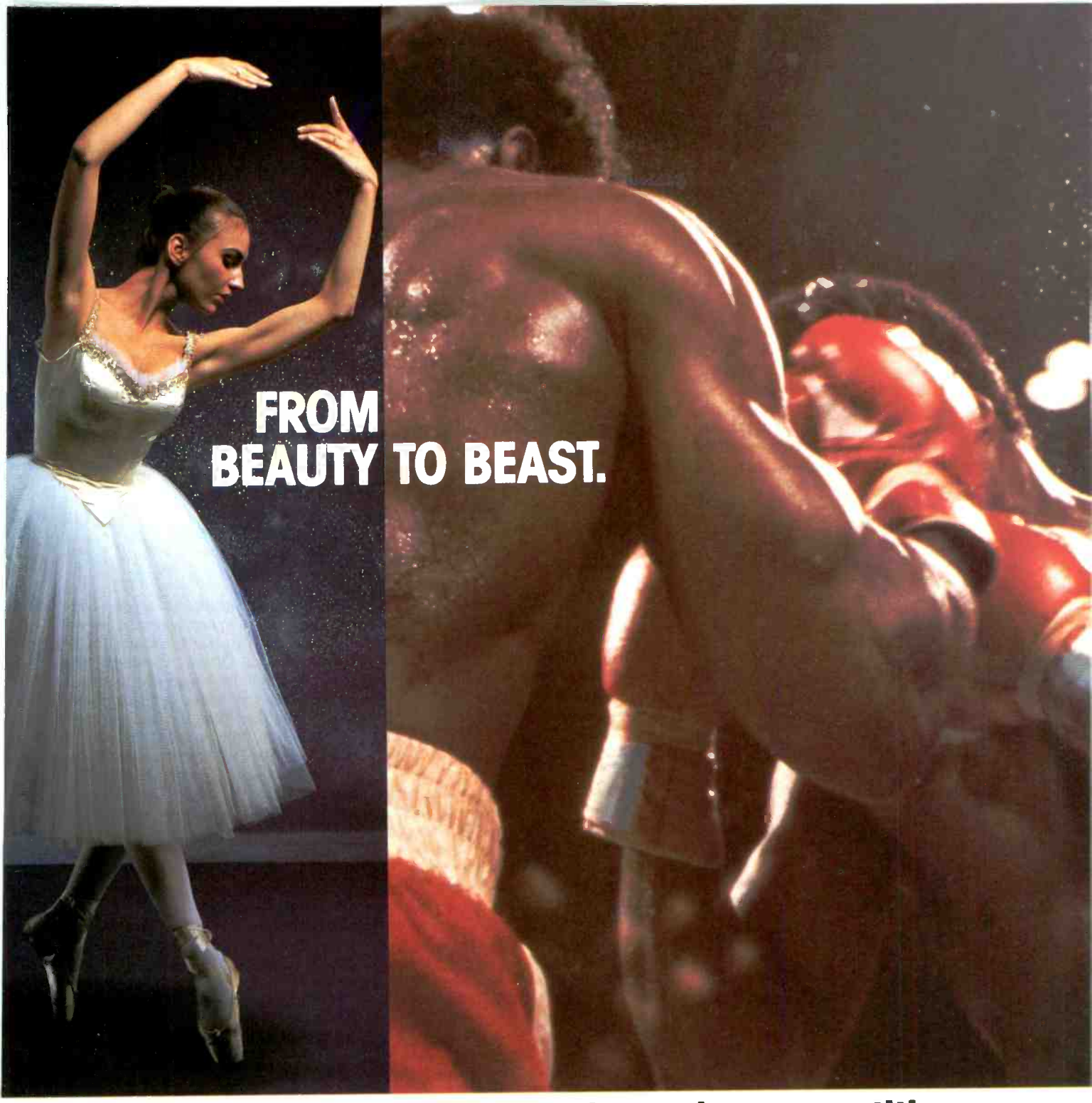
The 3-meter satellite earth stations will be installed at most of the 600 NBC affiliated radio stations throughout the United States. The order results from Scientific-Atlanta's development of the first commercial models of satellite products for digital transmission of high fidelity audio signals.

California Microwave receives $1.8 million in digital products contracts

California Microwave Inc. (CMIC-OTC) has announced receipt of $1.8 million in contracts for digital products for the Bell Telephone System (AT&T) and for International Telephone and Telegraph (ITT).

California Microwave received a $1,300,000 contract from the Bell System for 25 of the company's Model 81 Bit Access Test Systems, which are used in the Bell System's Digital Data Service, a computer communications network now being implemented nationwide.

A $500,000 contract to provide T-carrier protection equipment was received from ITT Telecommunications Corporation. California Microwave's automatic protection switch systems reduce the cost of maintaining T-carrier digital transmission networks by automatically rerouting telephone signals around cable and repeater failures and by assisting in diagnosing the source of failure. □



The Compact 22. Priced to keep the competition on its toes.

Our 22-foot mobile unit gives you big production capability at a price that's easy on the purse.

With four cameras and three VTRs, it's versatile enough to handle large or small productions with ease.

Precision engineered to knock down equipment set-up time, the Compact 22 enables you to go from one performance to another and still maintain the highest production standards.

To meet the heavyweight performer that's priced to earn a round of applause...call us today.

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WEST COAST HEADQUARTERS: 1104 WEST CHESTNUT STREET, BURBANK, CALIFORNIA 91506 TELEX: 19-4855 TWX: 910-498-4987

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Earth station basics

By Mark G. Fehlig, P.E., product marketing manager, Satellite Transmission & Facility Control Systems, Harris Corp., Quincy, IL

Increasingly, more TV and radio broadcasters are realizing the assisting in diagnosing the source of having a satellite earth station. Independent TV stations and sports broadcasters were the first to benefit by installing their own systems. But now, virtually all broadcasters are seriously investigating, and many are purchasing, multiple-position, motorized and frequency-tunable satellite receiving systems.

For example, Taft Broadcasting has equipped its two independent stations, its NBC affiliate, and its three ABC affiliate stations with satellite earth stations. Having made such a move after an extensive financial analysis, John Owen, Taft vice president of TV Engineering said, "In the past, TV broadcasters have experimented and innovated with satellite relay systems. In the future, they will use satellite communications to survive."

The business aspect of qualifying an earth station as a solid economic investment is the most important step in analyzing a satellite relay system. In addition to the current interconnect savings for sports remotes, access to Independent Network News (INN), and Blair-Sat Commercial Delivery, a new era of entertainment delivery is blossoming.

Paramount Television's *Entertainment Tonight* and *Solid Gold*, plus Metromedia Producer's *Merv Griffin Show* have announced plans to distribute via satellite this year.

Major syndicators—such as Chuck Barris, Phil Donahue, Lawrence Welk and a wealth of other specials—are expected to follow. Once the pioneer programming starts to flow, many satellite services are certain to follow. Perhaps the TV syndicated offerings of the future will rival the major networks in providing programming geared to a station's specific demographic benefits.

To take advantage of the future of satellite communications, broadcasters need to start educating and familiarizing themselves and their staffs immediately. Proper planning for overall requirements within individual facilities is necessary. Broadcasters should not let their programming department's contracts with certain delivery services force them into purchasing or using equipment that they will not be happy with in the long run. They should be aware of cable TV or even backyard/home entertainment equipment and prices. Likewise, they should scrutinize the quality of cameras and VTRs before making any purchases.

The following coverage of TVRO earth station basics provides guidelines to help in selection of a practical, professional system.

In general, the most important measurement of a TVRO earth station performance is its video signal-to-noise ratio S/N. In most cases, the higher the number, the better the performance and the higher the cost.

Typically, a telephone-delivered network feed, coupled with a 2-inch videotape recorder or a studio camera, delivers a 53dB S/N. System designs under 48dB video S/N are considered below broadcast quality; between 48 and 52dB is considered acceptable; and from 53dB on up, excellent.

Values of more than 54dB can often involve widely differing subjective determinations of merit. Nonetheless, a video signal-to-noise ratio of up to 60dB can be achieved in some areas of the country using a 9m (or larger) dish with currently available non-cooled Gallium Arsenide Field Effect Transistorized (GaAs FET) low noise amplifiers (LNAs).

Broadcasters' systems should be based upon their video S/N criteria. Other important features, such as high-speed motorized positioning for full arc coverage,* and de-icing and/or future uplinkability (for 9m or larger dishes) should be considered. Site selection is also critical in determining performance.

Site Search

Because the frequency band used is the same as common carrier and point-to-point terrestrial services (such as AT&T and local Bell Telephone operating companies), a computerized *cull* is necessary to determine site feasibility.

Several frequency search companies have the required computer data bases to analyze the choice of local sites. Three companies are:

- Comsearch Inc.
  7633 Leesburg Pike
  Falls Church, VA 22043
  Attn: Harry Stemple
  (703) 356-9470
- Compucon Inc.
  P.O. Box 401229
  Dallas, TX 75240
  Attn: Rick Miller
  (214) 233-4380
- Spectrum Planning Inc.
  P.O. Box 1360
  Richardson, TX 75081
  Attn: Dennis Gross
  (214) 699-3536

Large metropolitan areas have many microwave services and are apt to be difficult in finding a site for an earth station. Often, a remote site (such as a remote broadcast transmitter site) must be used. Inter-city relay microwave facilities to link a remote earth station will be required. Also, a remote control will be necessary if the remote system is unmanned. (The Harris 9100 Facility Controller is available as a model specifically designed to handle remote receive only or uplink systems). Be certain to examine closely all the remote control features available to control the entire earth station system from the studio. These include: antenna positioning, receiver tuning, uplink exciter and HPA tuning, and complete facility housekeeping.

FCC licensing is voluntary for receive-only systems and is required for uplink or transmitting stations. The computer cull previously mentioned, when combined with actual on-site measurements, can be presented as a technical exhibit when filing for an FCC license. Having a license allows those having earth stations to object to any new interference proposed in their areas. The frequency search companies also have services that "keep an eye out for you" to inform earth station operators of newly proposed and possibly interfering services in their areas.

Questions to consider

The staff investigating the purchase of earth station equipment is faced with some difficult questions:

- How big an antenna do I need?
- What other equipment do I need?

*A feature first offered by Harris in its SSL (Satellite to Studio Link System).

THE ULTIMATE TAPE CARTRIDGE

NEW Master Cart II™

Over 20 years of cartridge experience brings you the new Fidelipac Master Cart II - the ultimate tape cartridge.

- **Superior performance in any tape machine.**
- **Extremely low friction tape path for minimum wow and flutter and longest tape life.**
- **New front corner post for precise tape alignment and excellent stereo phase stability.**
- **Factory loaded with Fidelipac's exclusive HOT TAPE®, for up to 8dB more output than standard tapes.**

GET YOUR HANDS ON MASTER CART II!

Just send us $1.00 to cover postage and handling, along with your business card or letterhead and we'll rush you a Master Cart II for your evaluation. This offer expires December 31, 1981 and is limited to one cartridge per station.

Fidelipac Corporation

P.O. Box 808, Moorestown, NJ 08057
609 235-3511 Telex II 710-897-0254

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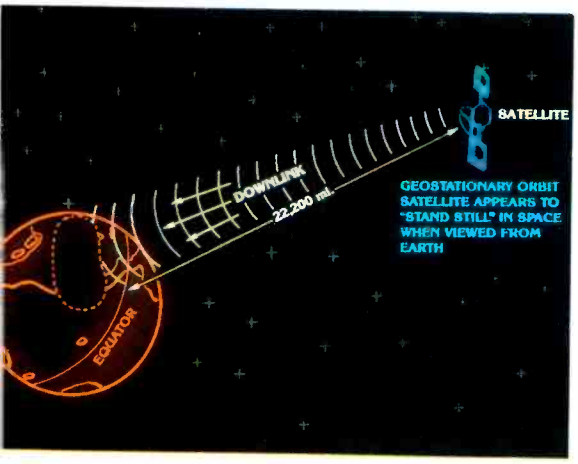


Figure 1. The geostationary satellite

Earth station

- What features are required in my receivers?
- How do I hook up the equipment?
- Which manufacturer's claims can I believe?
- What does the jargon mean?

The geostationary satellite

Satellites used for distributing TV programs are in *geostationary* orbits over the equator, about 22,200 miles (35,750 km) from the earth's surface. Frequencies used for the *downlink* signals are usually between 3700 and 4200MHz, divided into 12 or 24 channels, each about 36MHz wide. TV signals are frequency-modulated onto a carrier, with the audio typically on a subcarrier at 6.8MHz.

EARTH STATION COMPONENTS

The components typically found in an earth station are shown in Figure 2.

ANTENNAS. Generally speaking, the larger the antenna, the greater its gain, but some antenna designs are more efficient than others. Antennas, for example, using a highly efficient "Cassegrain" design will outperform larger *prime focus* antennas. Other efficiency considerations are surface accuracy (minor deviations will decrease signals significantly) and rigidity. The antenna must resist variations in shape caused by wind and solar heating.

FEED. The feed or feedhorn gathers the signals directed inward from the subreflector and routes them to the LNA.

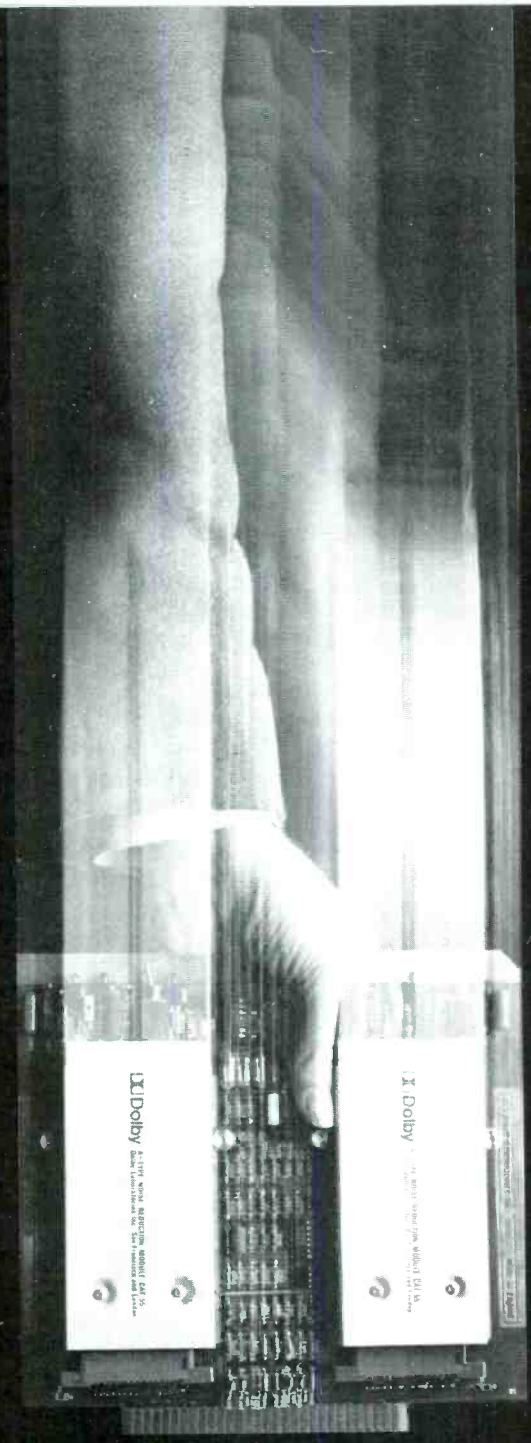
LNA. The LNA (Low Noise Amplifier) is a sensitive preamplifier mounted on the rear of the feed assembly. The most critical characteristic of an LNA is the noise it generates, usually rated in equivalent noise temperature. Typical systems use LNAs in the range 120° to 200°K. The lower the temperature, the lower the noise and the higher the cost. Noise may also be specified as Noise Figure in decibels. (For conversion between noise figure and noise temperature, see Noise Figure in the glossary section of this article.)

SECOND LNA. Satellites with 24 channels use opposite-sense polarization for even and odd channels. To receive both polarizations, the feed must have separate ports for each polarization, and a second LNA and signal cable, as shown in Figure 2.

To a large extent, the performance of any earth station depends on antenna gain and LNA noise temperature. Various combinations of antenna size and LNA temperature can give equal performance, but cost considerations may limit the choices. For example, a 6.1m antenna is commonly used with a 120°K LNA. To match this system's performance using a 4.6m antenna, a 44°K LNA costing at least 10 times as much would be required. The total station cost with the smaller antenna would be much higher.

VIDEO RECEIVER. The receiver down-converts one selected channel from the 3700-4200MHz satellite band to 70MHz, then demodulates the video. Subcarrier cards pick off and

Dolby®



Plug Better Sound Into Your Picture

The Dolby® Cat. No. 155 or 255 module allows you to plug the benefits of a Dolby A-type noise reduction directly into your Sony* BVH-1000/1100 or Ampex* VPR-2 1" VTR.* Operation is fully automatic. And at long last the audio performance of your VTR will rival that of professional audio tape recorders.

Dolby A-type noise reduction has been accepted for years throughout the world for high-quality tape recording and other audio transmission and storage media. It provides 10 dB of noise reduction from 30 Hz upwards, increasing to 15 dB at 9 kHz and above, without the audible side effects (such as noise modulation and overshoot distortion) associated with more conventional techniques. Dolby noise reduction can also lead to lower distortion, as it permits more conservative recording levels to reduce the risk of tape saturation.

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demodulate one or more audio carriers. Channels are selected either by changing a plug-in crystal through a front panel opening, or in frequency-agile models, by dialing the desired channel on front-panel switches. Frequency-agile receivers are available with a polarization switching option. A coax switch automatically selects one of two input signals, depending on the even-odd setting of the channel select switches.

ENTRANCE CABLE. Because the signal cable is carrying 4000MHz signals, special low-loss coax must be used. Up to 200 feet, ½-inch air or foam dielectric cable is standard. For runs of 200-500 feet, ⅞-inch air dielectric cable is required. Impedance for these cables is 50Ω.

VIDEO RECEIVERS

Satellite video receivers downconvert and demodulate the microwave signals from the satellite to provide video and audio baseband signals. As with any FM receiver, the signal-to-noise ratio in the output is proportional to signal strength and noise level at its input.

Figure 3 shows the performance of a selected satellite video receiver. The available carrier-to-noise ratio in the input signal to the receiver is rated in terms of C/kT—the ratio of carrier power to noise power per Hertz of bandwidth.

At some point in any receiver's performance characteristic, the ratio of input C/kT to output S/N ratio begins departing from a straight line, and rapidly degrades. At or near this point, impulse noise begins to be visible as *sparkles* in the picture. This point is generally termed *threshold*.

Video receivers are available with TDMs (Threshold Extension Demodulators)—special circuits that switch in if the signal is weak, and improve the threshold at least 3dB. One such threshold extension circuit is a *tracking filter* with reduced bandwidth, which changes its center frequency in step with the frequency modulation of the video signal. The reduced bandwidth lowers the noise level, yet the tracking lets the modulated signal through to maintain picture quality.

Video receivers are available with a range of IF bandwidths. The standard bandwidth for a full "transponder" (satellite channel band) is 36MHz. This is the recommended IF bandwidth for earth stations that will be operating at high values of signal-to-noise ratios, such as broadcast stations using larger antennas. For stations with smaller antennas or less C/kT, a bandwidth of 30MHz will reduce interference from adjacent channels, with a minimum of noticeable picture degradation. However, if several audio subcarriers are present on the signal, the full 36MHz bandwidth will be needed to provide good video quality. The wider bandwidth may, of course, increase noise levels slightly. Bandwidths narrower than 30MHz will reduce noise further, but picture quality will suffer. Figure 4 compares TV pictures at calibrated values of C/kT, through a receiver with threshold extension demodulator. Because this TED circuit is an advanced design, performance with some other receivers may be considerably inferior to that shown.

Bell System standards for microwave distribution of network broadcast signals is a video signal-to-noise ratio of 52dB or better. With typical program sources, most observers will not notice degradation until the signal-to-noise ratio drops to 48dB or below, as long as impulse noise is not visible. With the system used in Figure 4, a degraded but watchable picture is available at signal-to-noise ratios of 44dB or lower.

LOOK ANGLES

To orient the antenna toward a satellite, it is necessary to know the azimuth and elevation *look angles*. The elevation angle is also used to calculate some of the losses and noise inputs to the system and is an important step in the design or evaluation of an earth station. The geometry is

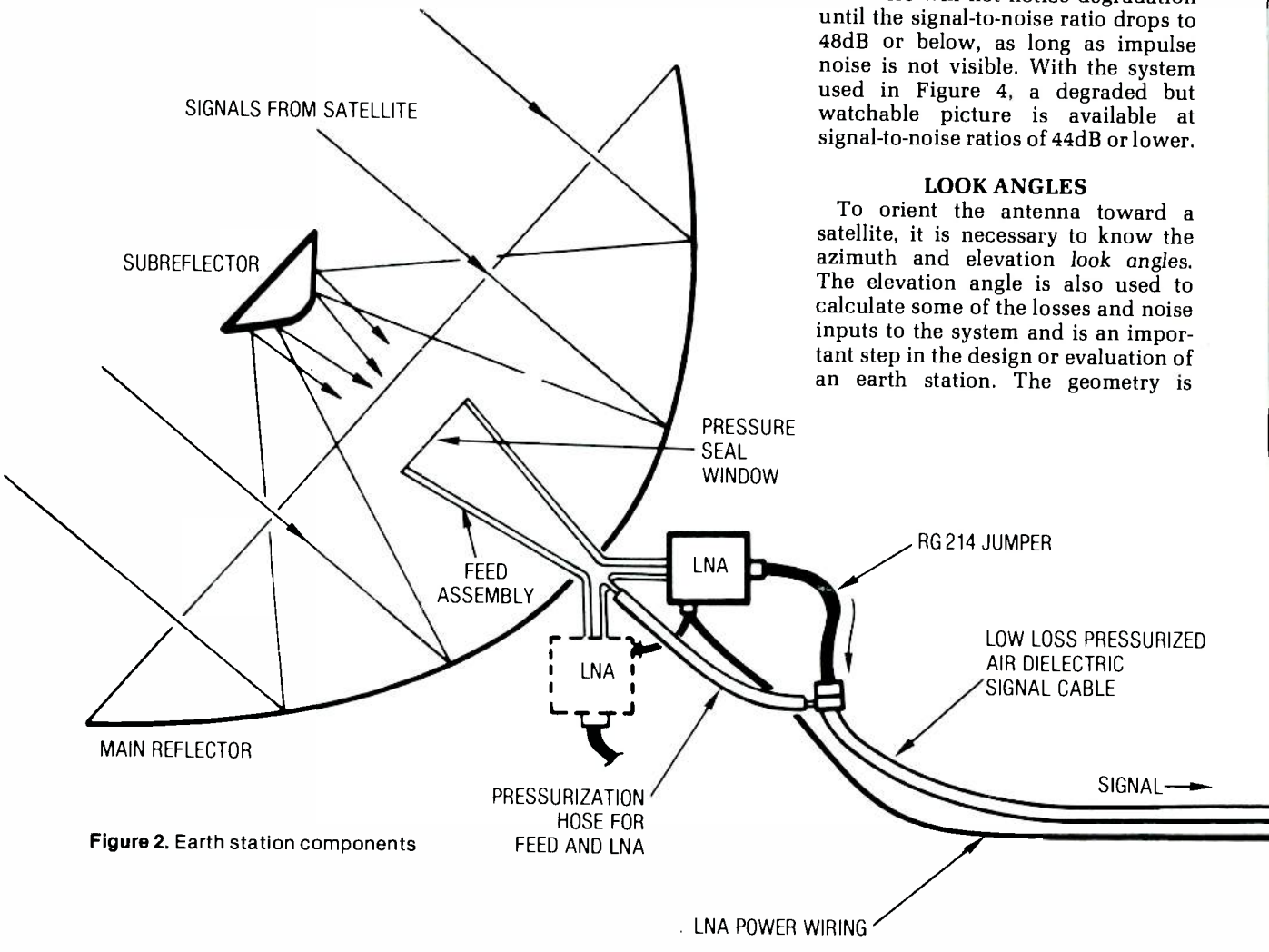


Figure 2. Earth station components

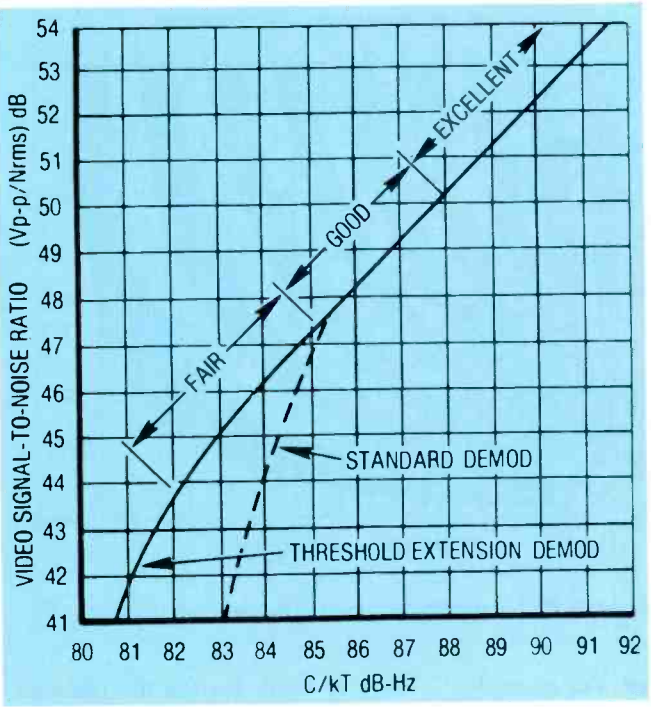


Figure 3. Satellite video receiver performance

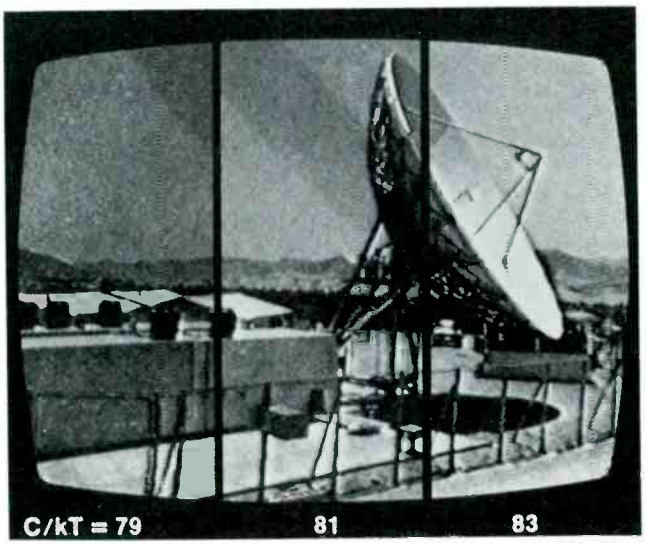
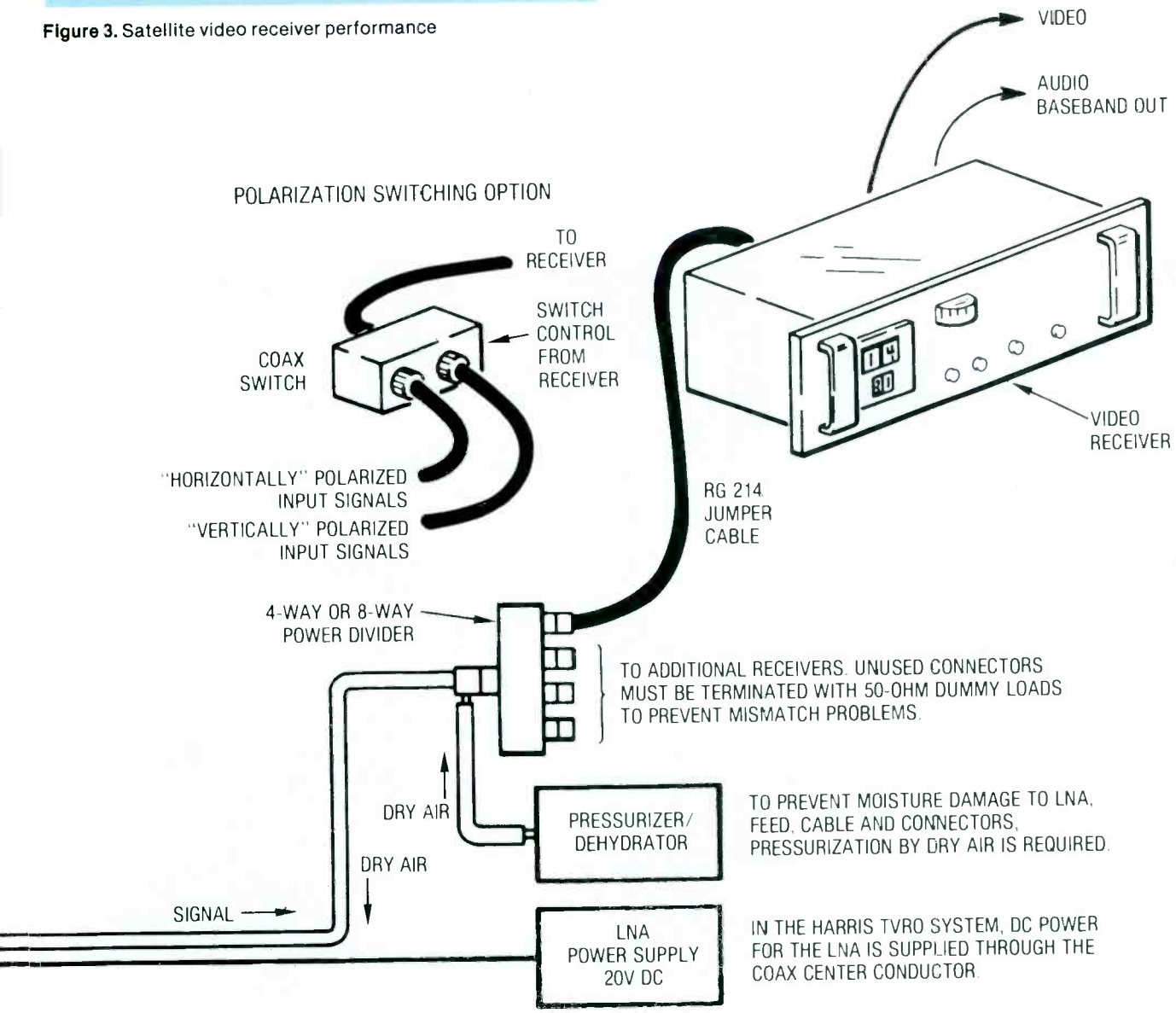


Figure 4. Video performance near threshold, using Harris Model 6522 receiver (with threshold extension demodulator).



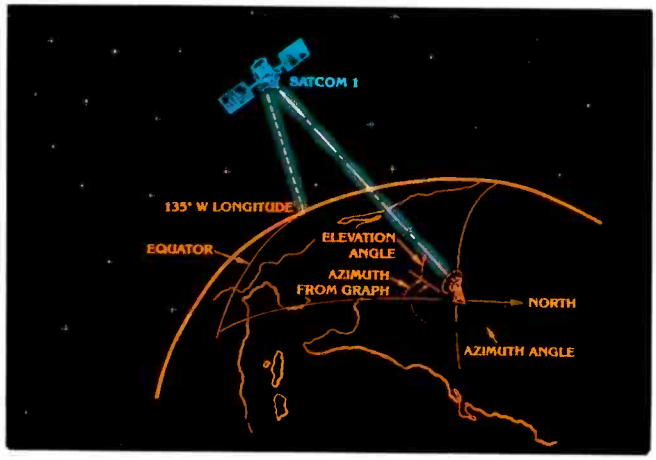


Figure 5. Satellite geometry

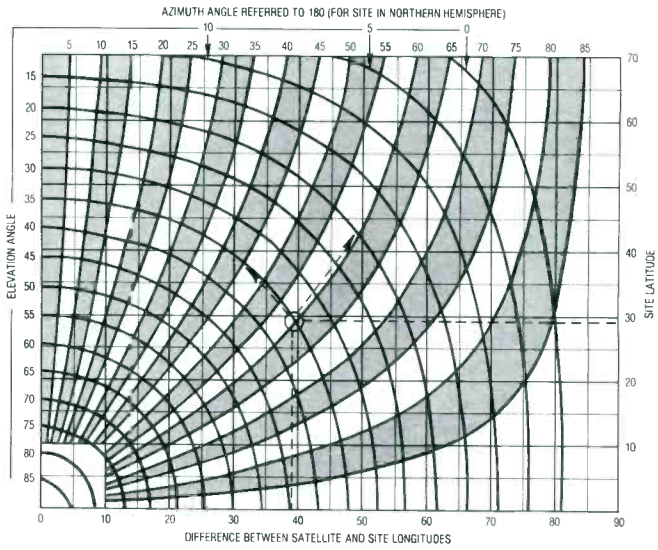


Figure 6. Plot to determine antenna azimuth and elevation.

Earth station

shown in Figure 5 and typical positions of major satellites in Table I.

Procedure for look angles

- From a good map, determine the latitude and longitude of the earth station site. For example: Houston, TX—Longitude: 95.5°W, 29.5°N.
- From Table I, identify the longitude of the satellite from which signals will be received. For example: RCA Satcom 1—135°W.
- Calculate the difference (in degrees) between the satellite longitude and the site longitude. For example: 135°—95.5° = 39.5°.
- Use Figure 6 to determine the azimuth and elevation angles for the antenna. For example: Elevation about 35°, azimuth about 59° west of south for the the Houston site.)

FOOTPRINTS

Satellite designers shape the antennas on board the spacecraft to concentrate the limited transmit power to cover a selected area on the earth's surface. The distribution of energy in this beam is usually shown on a *foot-*

Table I. MAJOR COMMUNICATIONS SATELLITES

Satellite	Degrees W. Longitude	Agency or Region
Anik 1	104	Canada
Anik 2	109	Canada
Anik 3	114	Canada
Westar I	99	Western Union
Westar II	123.5	
Westar III	91	
Satcom 1	135	RCA Americom
Satcom 2	119	
Comstar D2	95	Comsat General
Palapa 1	277	Indonesia
Palapa 2	283	Indonesia

Satellite	Degrees W. Longitude	Region
INTELSAT International Satellites		
IV F7	1	Lease
IV F2	4	Lease
IV F3	19.5	Atlantic Ocean Region
IVAF1	24.5	
IVAF2	29.5	
IVAF4	34.5	
IV F4	181	Pacific Ocean Region
IV F8	186	
IVAF3	297	Indian Ocean Region
IVAF6	300	

Note: Satellite positions are subject to small periodic changes and/or repositioning. The above positions are used as representative and for purposes of calculations. However, exact positions should be used at times of sighting.

print map. This map has contour lines of equal transmitted energy, expressed in decibels above 1W (dBW). These signal levels are termed Effective Isotropic Radiated Power of EIRP, where Isotropic means the power level measured as if it were coming from a point source radiating uniformly in all directions.

Determining the EIRP for the desired satellite and earth station position is another important step in designing or evaluating an earth station.

The EIRP does not take into account the losses between the satellite and the receiving antenna, but it is the most important single indicator of the signal available to a receiving station.

As an example, a footprint map for the RCA Satcom 1 satellite is shown in Figure 7.

As signals leave the satellite, they form a beam that spreads to cover the footprint area on the earth's surface. The intensity of the signal falls off as the distance from the satellite increases. On the equator directly below the satellite, this free space loss is 195.5dB. At other points on the earth's surface farther from the satellite, the loss increases. The total free space loss is proportional to elevation angle, as shown in Figure 8.

Some of the signal energy is also lost when it passes through the atmosphere. At 4000MHz, these losses are generally small, but can become significant during rainstorms and at low elevation angles. The combined free space loss and atmospheric loss during clear sky conditions is shown also in Figure 8. Additional losses—up to 3dB at low elevation angles—will be caused by extremely heavy rainfall.

MARGIN

For a number of reasons, additional losses and noise influence operation of every earth station. Good station performance can only be obtained if the station is designed with *margin*—additional performance to offset the additional noise and signal loss. The recommended practice is to determine the minimum value of these additional losses, then add two to three decibels for future degradation and contingencies. A brief analysis of some of these problems follow.

Uplink degradation

The signal transmitted from the ground to the satellite decreases in carrier-to-noise ratio due to noise picked up and generated by satellite equipment. Typically this degrades system performance by about 0.5dB.

Mispointing loss

It is seldom possible to point the antenna precisely at the satellite. Slight motion of the satellite in the sky is normal, up to ± 0.1 degree in both longitude and latitude. With a fixed antenna, potential losses due to misalignment are:

Antenna Diameter (meters)	3	4.6	5	6.1	7	8.8	10	11
Loss (dB)	0.1	0.2	.25	0.4	0.5	0.8	1.1	1.4

Polarization misalignment

US domestic satellites (and many others, as well) use linear polarization for transmitting signals, usually alternating between *horizontal* and *vertical* on adjacent channels. (Horizontal and vertical are relative terms only; at the earth station the horizontally polarized signal will usually not be horizontal, but at an angle. However, the incoming horizontal and vertical signals will remain polarized 90° to each other.)

If the feed is not precisely rotated to align its polarization with the incoming signal polarization, some signal will be lost. The amount of this loss is:

Polarization Misalignment (degrees)	10	15	20	25
Loss (dB)	0.1	0.2	0.5	0.9

Typical polarization misalignment loss for most systems is about 15°. (Misalignment can also increase system noise due to interference from adjacent cross-polarized channels.)

Satellite EIRP degradation

Performance of the transmitting equipment within satellites tends to degrade as the equipment ages. The signal levels from RCA's Satcom 1, for example, have decreased by about 1.8dB below original published values. (The footprint map in Figure 7 shows actual measured values in late 1979.) Some additional signal loss is likely. Short-term variations in signal level of up to ± 0.7dB are also possible.

Rainfall

Especially at low elevation angles, rainstorms can reduce signals significantly. Losses exceeding 3dB have been measured under extreme conditions.

Additional audio subcarriers

Additional audio subcarriers are being added to many video channels for services unrelated to the main TV

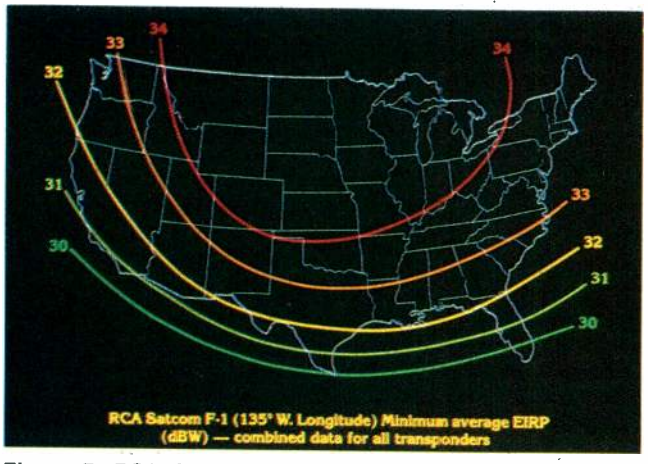


Figure 7. RCA Satcom F-1 (135° W. Longitude). Minimum average EIRP (dBW); combined data for all transponders.

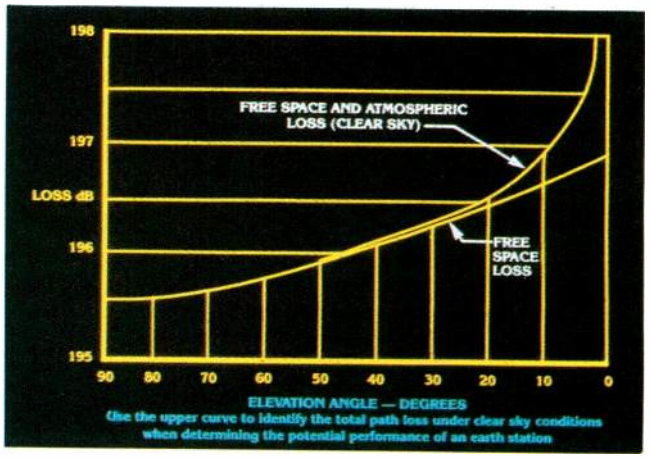


Figure 8. Free space loss. Use the upper curve to identify the total path loss under clear sky conditions when determining the potential performance of an earth station.

Outstanding Outdoors

Camera location 3 behind home plate is no place to tear down a camera. Especially if the director wants to punch it up on air to catch the next pitch. That's just one reason why the rock-steady, works-every-time HK-357A is an outstanding choice for production in the field.

Beyond its reputation for legendary Ikegami reliability, the HK-357A has a lot more to recommend it as the ideal field camera. For example, its crisp, high resolution picture, signal-to-noise ratio of better than 53 dB, and superb colorimetry.

What's more the camera really shows off when it's time to set up. Use of the optional microprocessor control brings into play Ikegami's Emmy award-winning digital techniques for automatic setup. Simply press one button and the computer automatically refreshes all set up and registration adjustments in about 45 seconds. No chip charts blowing in the wind, no tweaking. Just unpack, plug-in, auto-setup, and shoot.

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signal, such as news or classical music. The satellite uplink from WTBS, the Atlanta *Super Station* for example, has three audio subcarriers. The extra subcarriers increase the sideband energy and may reduce video quality. To maintain video quality, full 36MHz IF bandwidth is needed in the video receiver instead of the more common 30MHz. The extra bandwidth may increase noise due to adjacent channel interference.

Receiving system degradation

Good maintenance can keep this degradation low, but problems such as moisture or corrosion in connectors, deposits of soot on the feed window, and the effects of ice or wind on the antenna can also reduce earth station performance.

Interference

Unless the receiving antenna site is carefully selected, microwave signals from terrestrial links (such as those used by the Bell System, for example) can create major problems. At low levels, these signals act as increased system noise, and can be offset by improved station performance—more antenna gain, for example.

To avoid major problems, a preinstallation study by a frequency coordination agency is recommended to identify local levels of microwave signals. Thee agencies maintain computerized records of microwave patterns for most areas within the US and can provide maps showing probable levels of microwave radiation. As a general rule, if a microwave tower is visible from the antenna site, problems can be expected.

SELECTING EQUIPMENT

The performance ability of a properly installed earth station depends almost entirely on the gain and related characteristics of the antenna and on the noise temperature of the LNA. High quality receivers can deliver better pictures at fairly low values of

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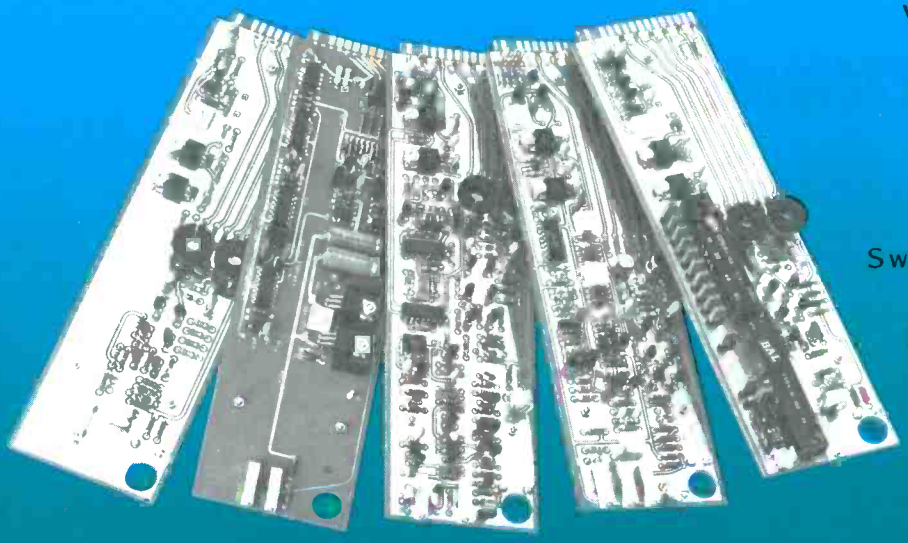

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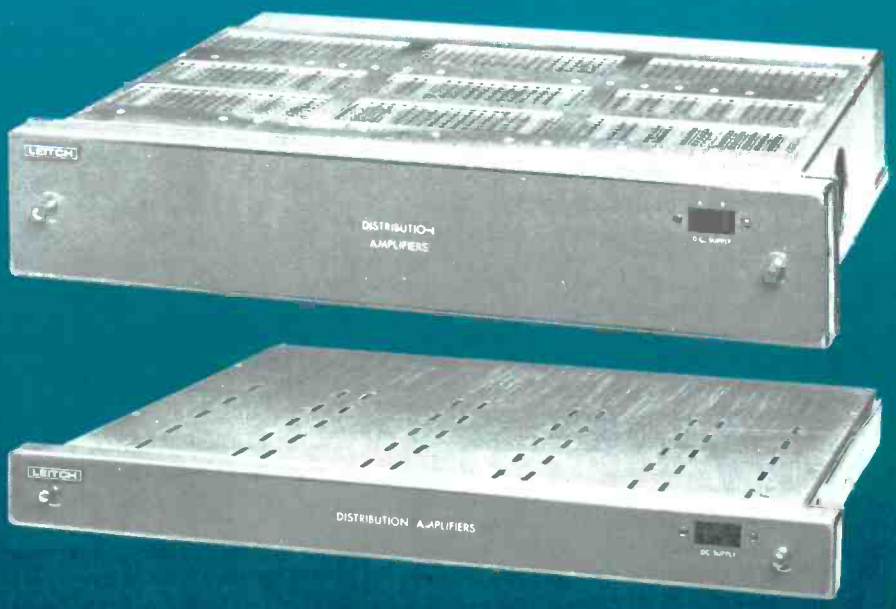

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There's a very simple, straightforward reason the MX-5050B has become the world's best-selling professional tape recorder: value. If you were to ignore all of the production features, dismiss the six year track record for unsurpassed reliability, you would still discover that the "B" is the best performing machine for your money. When you shop around you'll find out that it's easy to spend a little less or a lot more, but very difficult to justify to yourself that you are getting more. When you compare other machines, spec' by spec', you'll begin to see why there's more value in putting your money into an Otari. Spec's of course, don't tell the whole story. But, it's a damn good place to start your serious comparisons.

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THE FACTS: PERFORMANCE.

Overall Signal-to-Noise: 66 dB unweighted @ 520 nWb/m, 30 Hz to 18kHz.
Dynamic Range: 72 dB unweighted: 30 Hz to 18 kHz.
Headroom: +24 dB. Maximum output: +28 dBm.
Overall Frequency Response: 30 Hz to 22 kHz ±2.0 dB (15 ips @ +4 dBm).
Playback Frequency Response: 31.5 Hz to 20 kHz ±2.0 dB (15 ips @ +4 dBm).
Distortion: less than 0.7%, 1 kHz @ 250 nWb/m.
Crosstalk: greater than 55 dB, 1 kHz, adjacent tracks.
Wow and Flutter: less than 0.05% (15 ips).
Rewind Time: 90 seconds for 2500 feet.

THE FACTS: FEATURES.

Three switchable speed pairs: 15/7½ or 7½/3¾ ips (automatic equalization).
NAB/IEC selectable equalization.
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D.C. servo capstan motor with ±7% varispeed control.
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Earth station

carrier-to-noise ratio, but receivers cannot improve the C/kT, which determines the final video signal-to-noise ratio. High quality video signals, then, require fairly high values of C/kT.

Earth station equipment performance is generally specified in terms of G/T ("gee over tee"), a figure of merit. This figure of merit is the ratio of antenna gain to system (*not* LNA) noise temperature. Stations with equal G/T will deliver the same level of performance, if installed in the same area and used with the same satellite. Typical performance figures are shown in Table II.

The G/T needed to deliver the desired signal quality can be calculated by the steps shown in Table II.

Table II. Calculating G/T values.

(1) Note the C/kT needed to deliver the desired quality video pictures. (Refer to the section on video receivers and Figure 2.)
(Example: for 48dB S/N, C/kT needed is ..... 85.6dB)

(2) Add path loss, determined from elevation angle and graph in Figure 7.
(Example: 34° elevation, path loss is ..... 196.2dB)
(281.8dB)

(3) Add margin and miscellaneous losses.
(Example: 6.1m antenna, typically ..... 3.2dB)

(4) Subtract EIRP of desired signal at earth station site. (Refer to the section on footprints.)
(Example: Houston, TX, Satcom 1 ..... 32.0dBW)
(253.0dB)

(5) Subtract 228.6dB (Boltzmann's constant, a standard conversion factor). ..... (228.6dB)

(6) The result is the minimum G/T required for the station:
(Example: ..... 24.4dB/K)

Selecting an antenna/ LNA combination

Once the required G/T has been

Bonneville Satellite Corporation inaugurates earth station service

Bonneville Satellite Corporation (BSC) has inaugurated service of its new, full capability satellite earth station in Salt Lake City, UT. The new facility, which was designed by BSC engineers, is the first full-service commercial installation in the Intermountain West.

Participating in the ribbon-cutting ceremony were Sen. Orrin Hatch, R-UT; Utah Gov. Scott M. Matheson; Salt Lake City Mayor Ted Wilson; President Spencer W. Kimball of the Church of Jesus Christ of Latter-day Saints; and Arch L. Madsen, president of Bonneville International Corporation.

Following the ribbon-cutting, the dignitaries participated in a 2-way satellite video teleconference between Salt Lake City and San Francisco where H. P. Chung, a senior Taiwanese official, participated along with other dignitaries.

The teleconference included discussion of the impact on Utah and Taiwan of a recently negotiated 10-year, multimillion dollar coal export agreement between Utah Pacific Corporation in Provo, UT, and five Taiwanese companies.

The Mormon Tabernacle Choir performed Rimsky-Korsakov's *The Gloria* as part of the 2-way linkup.

The earth station is 3.5 miles northeast of downtown Salt Lake City. The Technical Operations Center (TOC) is in the company's corporate headquarters in the downtown area. The studio-to-transmitter link employs a Microwave Associates MG 12A with full redundancy and an 8' x 10' passive reflector adjacent to the earth station site.

The antenna is a Scientific Atlanta 10m dish with high-speed (10° per minute) elevation and azimuth positioning motors. The dish has an azimuth travel of 110° enabling a link-up with all current domestic satellites. It contains automatic deicing equipment with a 13kW heater system and is designed to withstand 110 mile per hour winds in any position with zero drift.

Transmission equipment consists of MCL 3kW high-power amplifier and Scientific Atlanta 461 exciters with full redundancy. The receiver is a Scientific Atlanta 414 with complete, standby, low-noise amplifier protection. The transmitter and receiver have half-power beam widths of ⅓ degree and ½ degree, respectively.

System control is provided by a specially designed Scientific Atlanta computer control system. TOC interconnect to KSL-TV and Video West, both wholly owned subsidiaries of BSC's parent firm, Bonneville International Corporation, is by means of a Grass Valley Model 3290 fiber-optics link. Plans call for additional fiber-optic interconnects with Western TeleCommunications Inc. and with a microwave link on top of the Beneficial Life Tower building in downtown Salt Lake City.

Aerial view of Bonneville Satellite Earth Station.

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Table III. G/T of typical systems.

Antenna Size (Meters)		3.0	4.6	5.0	6.1	8.8	11	
Typical Gain (4000 MHz) Decibels		39.1	43.5	44.5	46.5*	49.7*	51.9*	
LNA Noise Temp. (°K)	140°	16.7	21.1	22.1	24.1	27.3	29.5	G/T
	120°	17.2	21.6	22.6	24.6	27.8	30.0	
	100°	17.9	22.3	23.3	25.3	28.4	30.7	
	80°	18.6	23.0	24.0	26.0	29.2	31.4	
	60°	19.4	23.8	24.8	26.8	30.0	32.2	
	40°	–	–	–	27.8	31.0	33.2	

Note: These figures are satisfactory for elevation angles of 20° or more. At angles less than 20°, the figures must be corrected for additional antenna noise temperature.
*Harris antenna

determined, it is necessary to select an antenna and LNA that will deliver the required level of performance. Typical G/T figures for several antenna sizes and LNA noise temperatures are listed in Table III. As can be seen, several antenna/LNA combinations can be selected that will provide the desired level of performance. For example, if the required minimum G/T is 24.4, the following combinations will deliver adequate performance:

- 5m antenna, 60°K LNA;
- 6.1m antenna, 120°K LNA;
- 8.8m antenna, 140°K LNA (actual requirement for G/T of 24.4 is 300°K).

The major consideration in making

WXIX-TV, Newport, KY

Satellite network emphasizes variety programming

A new TV network, the CBN Satellite Network has put together a cable TV variety format, including exclusive, first-run entertainment.

The network plans to have everything – from sports to stocks to soaps. There will be a new soap, a new morning show, a magazine show, children's shows, situation comedies, classic films, expanded news coverage, musical variety shows, "how-to" shows and hard-hitting documentaries.

EIMAC's 4CW300,000G Power Tetrode. A new generation of high-performance power tubes.

EIMAC's 4CW300,000G combines all the desired features transmitter designers look for: high peak plate current, low grid emission, low internal capacitances and low internal inductance. This is the first of a new generation of high performance power tubes for LF, HF, VHF and pulse service.

Laserfab pyrolytic graphite grids

The control grid and screen structures of the 4CW300,000G are precision-cut by a laser beam. Each element is monolithic and combines extremely low coefficient of expansion with low structural inductance. These features permit the 4CW300,000G to have a very high transconductance—10^6 micromhos—and allow efficient, high-frequency operation.

Rugged mesh filament

The EIMAC mesh filament provides exceptionally high peak plate current and permits low plate voltage operation. This leads to power supply economy, making the 4CW300,000G the economic choice for 300 KW AM broadcast service or long-pulse switch service, each of which demands a reserve of peak emission.

Improved anode structure

EIMAC's multi-phase cooling technique provides high plate dissipation to extract heat evenly and quickly from the anode, contributing to long tube life and operating economy.

EIMAC expertise

EIMAC's expertise in electron ballistics pyrolytic grid production, thermodynamics and circuit techniques combine to bring tomorrow's tubes for today's transmitter designs. More information is available from Varian EIMAC. Or the nearest Varian Electron Device Group sales office.

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Varian EIMAC
Application Engineering
Department
301 Industrial Way
San Carlos, CA 94070
Telephone: 415-592-1221, ext. 218

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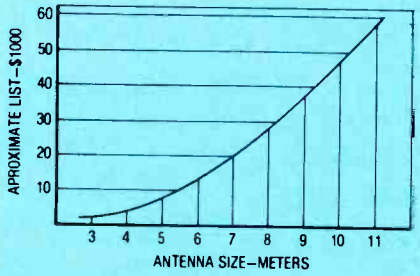

Figure 9. Typical list prices for antenna, mount and feed (not including installation).

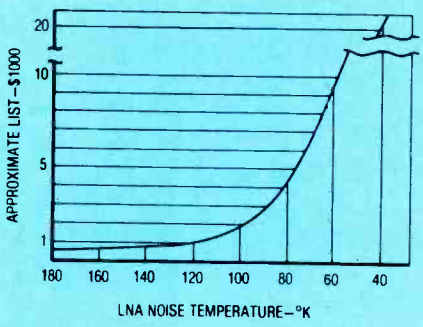

Figure 10. Typical LNA costs.

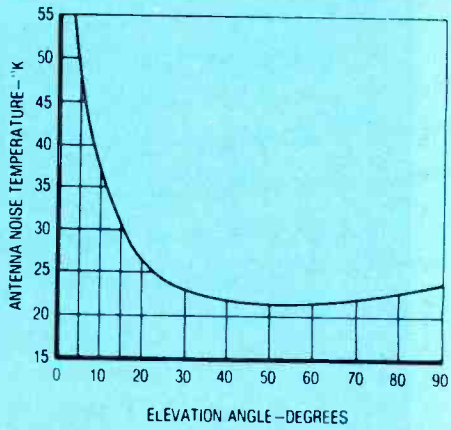

Figure 11. Antenna noise temperature, 6.1m Harris antenna receive-only feed.

Earth station

a choice between these systems is usually cost. Figures 9 and 10 indicate approximate list prices for antenna systems and LNAs.

Based on these prices, system costs for a typical antenna with dual LNAs, not including installation, receivers or accessories, would be:

- 5m antenna, 60°K LNAs . . . $28,000
- 6.1m antenna, 120°K LNAs . 16,000
- 9.0m antenna, 120°K LNAs . 55,000

Based on this analysis, the best selection for this application is the 6.1m antenna with 120° LNAs, based on first cost.

Another cost consideration is maintenance. LNAs are prone to fail from nearby lightning strikes, and replacement costs can be excessive with expensive low-temperature LNAs, which would also indicate that the 6.1m/120°K LNA combination is a good selection.

More about antennas

Gains of typical units are shown at the top of Table III. Gain is, of course, important in selecting an antenna. Another important consideration is the tendency of the antenna to pick up interfering signals from the side and back. Antennas differ in their ability to screen out these off-axis signals, and interference usually has the same effect as reducing antenna gain would have, because the carrier-to-noise ratio is degraded. Larger antennas usually have better rejection of off-axis signals. Foliage or buildings that shield the antenna from interference (but not from the desired signal) can be helpful in improving performance. For these reasons, ground-level mounting of antennas is often better than rooftop mounting.

TYPICAL VIDEO PERFORMANCE EVALUATION

- C/N = G/T + EIRP − 42.8
- S/N = C/N + 38.0
- G/T = G(ANT) − T(SYSTEM)
- T(SYSTEM) = T(ANT) + T(LNA) + T(MISC.)

More about G/T

Table III lists typical G/T values for many antenna/LNA combinations. Those values were calculated for an elevation angle of 20°, and are not accurate at lower elevation angles. The procedures in this section are for calculation of G/T of any system at any elevation angle, and may be helpful supplementary information for those investigating TVRO equipment performance.

Noise in and around the receiving system has the following major sources:

- Thermal radiation. All objects emit microwave noise proportional to their temperature and surface characteristics. The sky in the direction of the satellite has a certain effective noise temperature, for example, that contributes to the total noise energy from the ground and other objects nearby.
- Energy dissipated as ohmic losses in the feed system will also contribute to noise power. The combination of sky temperature, ground temperature, antenna pickup pattern and feed losses combine to produce a characteristic *antenna noise temperature*. A typical curve of noise temperature vs. elevation angle is shown in Figure 11. The curve shows noise temperature values for a selected 6.1m antenna. Other antennas with similar patterns will generally have similar noise temperatures.
- Unavoidable noise is generated by the LNA, especially in its early stages of amplification. As stated

Glossary

ANALOG—Describes a system or device in which signals vary continuously, instead of in steps. See "digital."

ANTENNA—A device that collects and focuses electromagnetic energy. This process results in an energy gain, generally proportional to antenna diameter.

AZIMUTH (AZ)—The horizontal pointing angle of an antenna measured clockwise in degrees from true north.

BASEBAND—An information or message signal whose content extends from a frequency near dc to some finite value. For voice, baseband extends from 300Hz to 3400Hz. Video baseband is from 50Hz to 4.2MHz (NTSC standards).

CARRIER—A high frequency radio signal that is modulated to carry information long distances through space.

C/N—Carrier-to-Noise ratio. The ratio of received carrier power to the noise level in given bandwidth, expressed in decibels.

CASSEGRAIN FEED SYSTEM—A radiating system that includes a primary reflector ("dish"), secondary reflector and feed horn. Named for Nicholas Cassegrain, a 17th

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Earth station

previously, the primary performance characteristic of an LNA is its *noise temperature* in degrees Kelvin.

- Additional noise is contributed by unavoidable impedance mismatches, by cable losses and receiver noise. In a carefully designed and properly assembled system, these problems are generally minor. A safe estimate of the noise temperature from these sources is about 8°K.

The system noise temperature is the sum of the antenna, LNA, and miscellaneous noise temperatures. For example, a selected 6.1m antenna with a 120° LNA, installed at an elevation angle of 15° would have a system noise temperature of:

$$T_{ant} + T_{LNA} + T_{misc} = T_{sys}$$

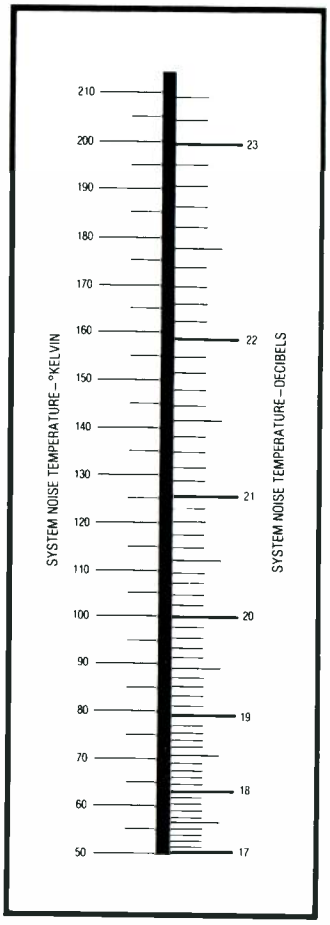
$$30° + 120° + 8° = 158°K.$$

To complete determination of G/T, convert the system noise temperature to decibels. The accompanying nomograph can be used for this conversion. For example, if system noise temperature is 158°K, then the temperature in decibels is about 22.0dB.

From the antenna gain in decibels, subtract the system noise temperature in decibels. The result is the system G/T. For example, using a 6.1m antenna at 15° elevation:

$$G_{ant} - T_{sys}(dB) = G/T$$

$$(46.5) - (22.0) = 24.5dB/K.$$



Nomograph for converting system noise from °K to dB.

Glossary continued

century French physician who invented a telescope using this principle.

CHANNEL – A segment of bandwidth that may be used to establish a communications link.

dB – Decibel. A term that expresses the ratio of two power levels.

DEMODULATE – A process in which information is recovered from a carrier.

DIGITAL – Describes a system or device in which information is transferred by electrical "on-off" or "high-low" pulses, instead of continuously varying (analog) signals.

DOWN-CONVERTER – A device that selects and reduces the frequency of a received signal, typically from RF to IF.

CONRAC

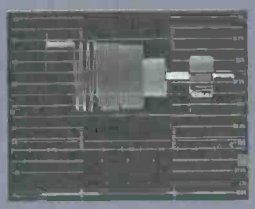
INNER VIEW 3:
A closer look at Conrac Monitors

Comb Filter Separator: Resolution Solution at 3.58 MHz.

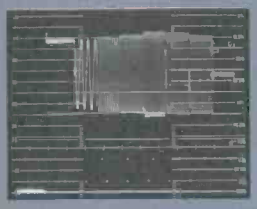
Conrac's Comb Filter Separator delivers the high resolution needed for today's high performance camera and taping equipment. It removes color information from the composite video signal without the luminance loss in the 3.58 MHz region produced by notch filters.

Conrac's Comb Filter takes advantage of spectrum interweaving to separate luminance from chroma, without reducing luminance bandwidth.

But the best part of Conrac's Comb Filter is that it gives you this improved picture clarity without the drawback of conventional comb filters. Because, unlike conventional comb filters which exhibit heavy dot patterns in the luminance path, Conrac utilizes non-linear techniques to virtually eliminate these patterns around vertical and horizontal transitions.



1. Multiburst test signal with conventional bandpass and notch luminance/chrominance separator.



2. Multiburst test signal with Conrac's Comb-Filter luminance/chrominance separator.

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Conrac Technology: Over 30 years of leadership.

Conrac's track record of technical innovations stretches back nearly three decades; and what we've learned since then goes into every monitor we make today. That is important to you because the more technology we pack into each monitor, the more performance you will receive from it.

Comb filter separator and computer-controlled quality are just two ways Conrac technology can save you time and money.

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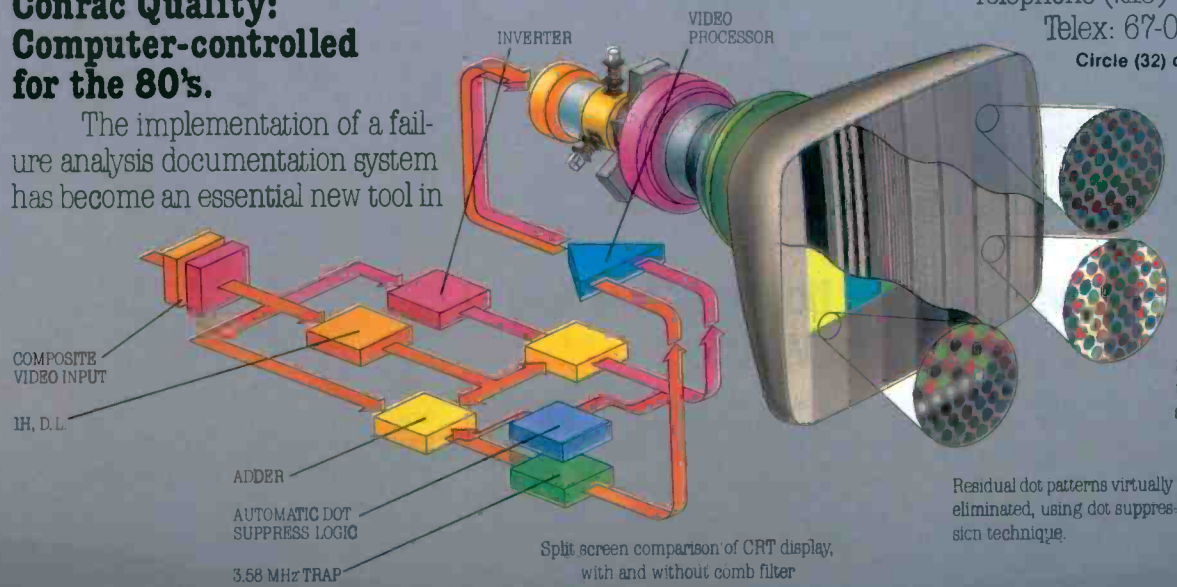


Split screen comparison of CRT display, with and without comb filter

1. Luminance resolution using the conventional notch/filter separator.

2. Luminance resolution using the comb filter separator.

Residual dot patterns virtually eliminated, using dot suppression technique.

Quality you can take for granted.

Glossary continued

DOWNLINK – The communications link from the satellite to the receiving earth station.

EIRP – Effective Isotropic Radiated Power. Power level of a signal leaving an earth station antenna or leaving the satellite antenna.

ELEVATION (EL) – The angle above the horizontal plane an antenna must be raised in order to direct it toward the satellite.

FEED – A device mounted at antenna focus that transfers signals between the antenna and associated electronic equipment.

FREQUENCY AGILITY – In a video receiver, the ability to tune to any satellite channel without changing crystals.

FREQUENCY COORDINATION – An exercise undertaken to determine which frequencies may be used in an area such that interference with existing systems such as terrestial microwave will be avoided.

FREQUENCY REUSE – A technique for transmitting separate signals in the same frequency band or in overlapping bands, by using different polarization for the two signals. Some satellites use right-hand circular and left-hand circular polarization for the signals; others use linear ("horizontal" and "vertical") polarization.

GAIN – Refers to the amplification abilities of a device. It is expressed as a ratio of output power to input power, usually in decibels.

GCE – Ground Communication Equipment. Refers to earth station electronic equipment.

G/T – Gain-to-Noise-Temperature ratio, expressed in decibels per one degree Kelvin. A figure of merit of an antenna and low noise amplifier; the larger the value of G/T, the better the receive capabilities of the earth station.

GEOSTATIONARY – Describes a satellite in orbit 22,300 miles above the equator and which revolves around the earth with an angular velocity equal to that of the earth's rotation about its own axis. The satellite's position relative to the earth's surface is constant, so little or no ground antenna tracking is needed.

HPA – High Power Amplifier. A device that provides the energy for carrier amplification necessary to transmit to the satellite.

IF – Intermediate Frequency. A frequency in a superheterodyne receiver or transmitter system that enables easier filtering, distribution, modulation and demodulation of a signal.

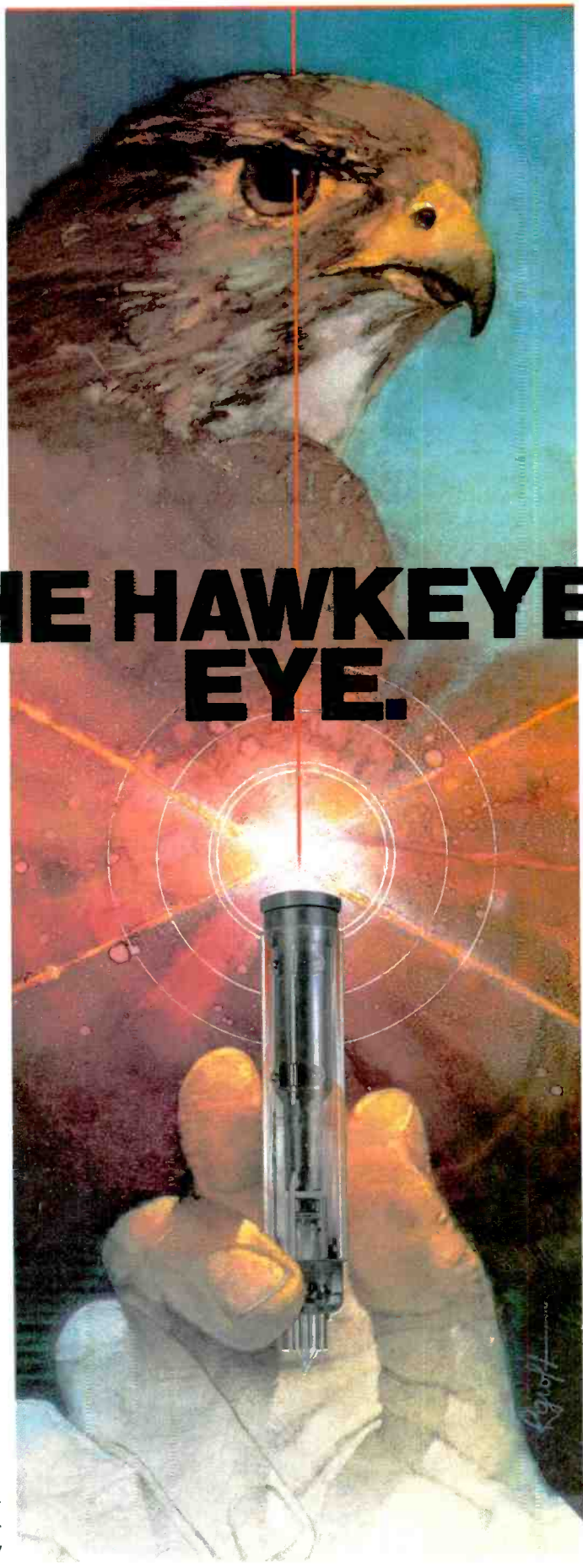
°K – Degrees Kelvin. Temperature above absolute zero; uses Celsius scale. Used as a figure of merit to express equivalent noise in amplifiers and other parts of satellite systems. The lower the temperature, the lower the noise.

LNA – Low Noise Amplifier. A device that amplifies the received signal at an earth station. The LNA is usually mounted on the antenna.

LOCAL OSCILLATOR – A device used to supply a stable single-frequency signal to an up-converter or down-converter. The local oscillator signal is mixed with the information-carrying signal to change its frequency up or down.

MODULATE – A process in which

INTRODUCING



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The SATICON tube offers outstanding resolution, and handles high-contrast scenes without unpleasant distortion or discoloration. Color pictures come through spot-free, without flare. For these and many other reasons, SATICON tubes are now used in over 50% of the new color cameras sold in North America and Japan.

On the basis of performance, reliability and general user acceptance, they will soon predominate in color television cameras worldwide.

SATICON tubes are now available as new or replacement equipment for most ENG, studio and remote cameras. For more information, please write RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17604. Telephone: (717) 397-7661. Or RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury - on - Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 D.F., Mexico.

RCA

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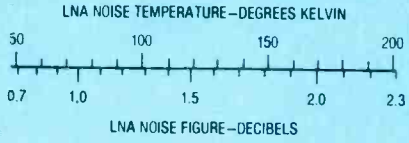
Glossary continued

message information is imposed on a carrier. This can be done by varying a carrier parameter such as frequency or amplitude.

MOUNT – Structure that supports an earth station antenna. Frequently used types of mounts are polar mounts, azimuth/elevation (AZ/EL) mounts, and wheel and track mounts.

MTBF – Mean Time Between Failures. A measure of reliability usually expressed as the average number of hours between one random failure and the next.

NOISE FIGURE – The ratio of the actual noise power generated at the input of the amplifier to that which would be generated in an ideal resistor. The lower the noise figure, the better the device. For conversion of noise figure to noise temperature, use the nomograph.



NOISE TEMPERATURE – Used to measure the amount of thermal noise present in a device or system. (The lower the noise temperature, the better the device.)

PAD – Foundation upon which the antenna is mounted; usually reinforced concrete.

PRIME FOCUS – The point toward which a main reflector directs and concentrates the signals it receives.

REDUNDANT – Refers to a complement of stand-by equipment that can be switched on either manually or automatically when a unit in use fails.

REFLECTOR – The antenna's main curved structure, or *dish,* that collects and focuses a signal onto either the secondary reflector (Cassegrain) or the feed (Prime Focus).

RF – Radio Frequency. Generally describes an electronic signal above the baseband or intermediate frequencies.

ROT – Receive-Only Terminal.

RX – Receive.

SIDELOBE – A spurious response of an antenna that causes signal radiation or pickup in an undesired direction. Excessive sidelobes reduce antenna efficiency and can increase interference from other communications systems.

S/N – Signal-to-Noise ratio. Ratio of the signal power to the noise power in a specified bandwidth, usually expressed in decibels.

TRANSPONDER – A microwave repeater (receiver and transmitter) in the satellite used to amplify and change frequency of a received band of signals. Domestic satellites employ either 12 or 24 transponders, which typically have a 36MHz bandwidth.

TX – Transmit.

UP-CONVERTER – A device that increases the frequency of a transmit signal, typically from IF to RF.

UPLINK – The communications link from the transmitting earth station to the satellite.

ZENITH – The pointing of an antenna at an elevation of 90°; the straight-up position.

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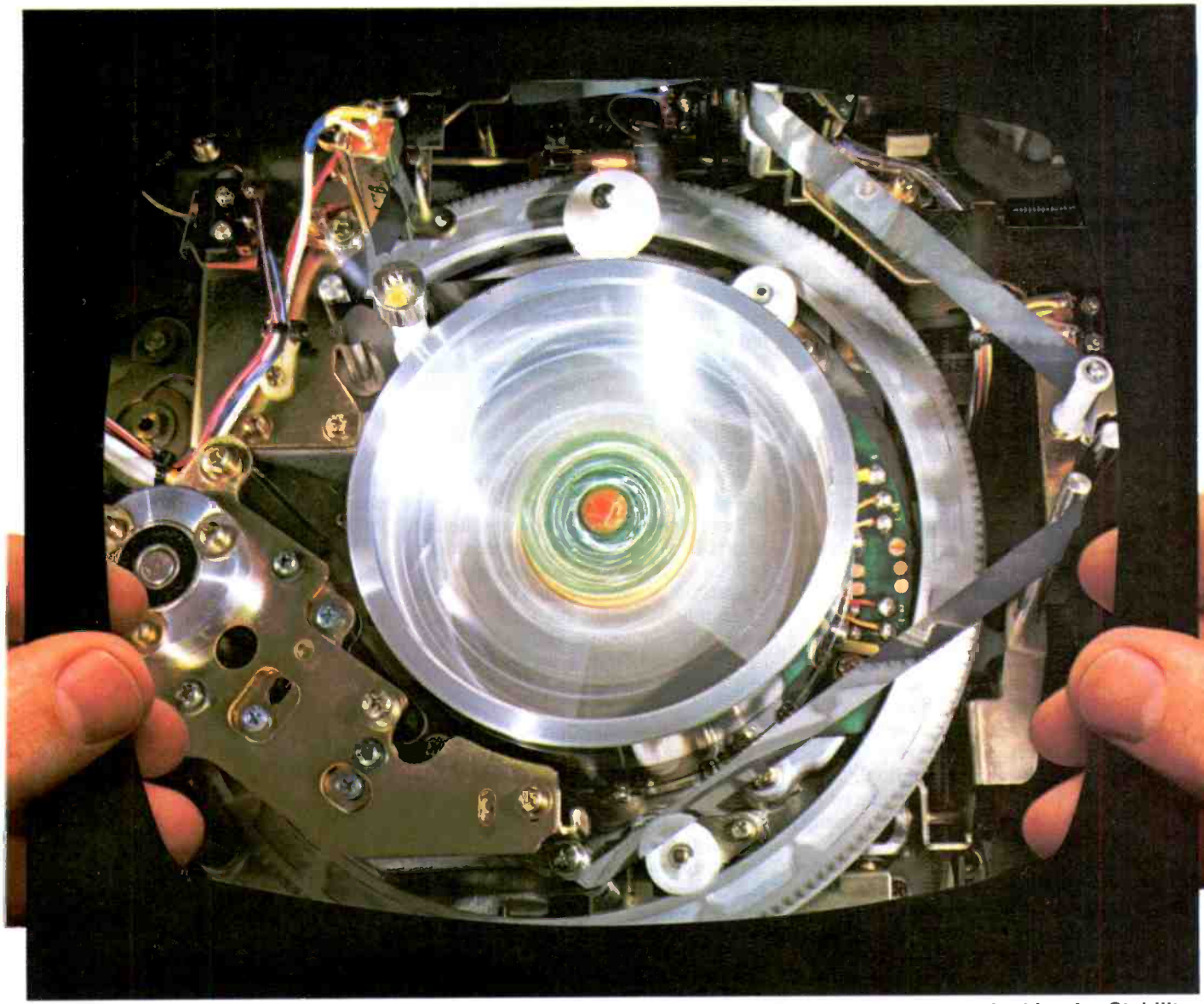

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Power and cooling loads for TV studios and control rooms

By Robert J. Nissen, vice president, Hubert Wilke Inc., New York, NY

"How much electrical power and how much cooling is required?" These are two critical questions that must be answered during the initial design stages of a TV studio complex.

Typically, calculations of power and cooling loads are made by an architect, electrical engineer or consultant, and are too often accepted without question. Because the determination of these loads has a direct impact on the cost and the production capability of the studio, it is important to understand how they should be calculated. If they are overestimated, construction costs could be exorbitant and acoustic criteria difficult to meet. If they are underestimated, production capabilities of the studio could be severely limited.

Calculation of studio power loads

Except for unusual circumstances, the amount of electrical power required for the studio itself can be assumed to be entirely imposed by the lighting system. The massive amount of power consumed by studio lighting normally far exceeds that required by miscellaneous electrical equipment used in the studio.

In order to calculate total lighting power, the desired lighting level in footcandles (fc) must first be determined. In the early years of television (circa 1939) more than 1000fc were required for black-and-white cameras using the iconoscope pickup tube. Subsequently, with the introduction of the image orthicon pickup tube, the required level was reduced to 300fc and, eventually, to about 100fc.

With the advent of color TV, the required level jumped back up to about 400fc. Over the years, advances in color camera technology have permitted the reduction of light levels to about 50fc or 100fc with the camera lens iris fully open. For most normal production work, however, camera lenses are set one or two stops from the open position to provide greater depth of field. Accordingly, there is general agreement among most lighting directors that an illumination level of 200 ± 50fc is appropriate for typical color studio production.

The almost universally utilized lighting source used in modern studios is the tungsten-halogen lamp, frequently referred to as a *quartz* lamp. The calculations that follow are based on the use of tungsten-halogen light sources. Other generically different light sources (specifically *discharge* lamps) are more efficient but none of them, as yet, have the simplicity of operation or flexibility of intensity control of the tunsten-halogen lamp.

Tungsten-halogen lamps in efficient luminaires will provide approximately 200fc of illumination when consuming 50W of power for each square foot of illuminated area. To put it another way, 50W of power is needed to illuminate each square foot of surface to a level of 200fc.

Net production area

After lighting level requirements are established, the amount of area to be illuminated in the studio must be determined. More often than not, a typical production set in a studio occupies only a small portion of the total studio space. But the *total* lighting power required must be based on the maximum floor area that could be, or might be, used simultaneously for multiple sets. This potentially available floor space is called the Net Production Area (NPA). One of the best ways of determining the NPA for a particular studio with particular production requirements is to sketch on the studio floor plan all production areas that *might* be simultaneously lit. The total square footage in these areas is the NPA. (Figure 1.)

Most typical production studios will have a Net Production Area that is approximately 40 to 70% of the total square footage of the studio (wall-to-wall). This percentage of net-to-gross area is called the NPA factor. Thus, for example, the hypothetical studio in Figure 1 has an NPA factor of approximately 55%. As a general rule, large studios have a smaller NPA factor than do small studios because large studios seldom require the entire possible production areas to be fully lit for simultaneous production.

Using the example of the 40' by 60' studio and assuming an NPA of 1300 square feet, the maximum lighting power required for the floor area is 65,000W (1300 sq. ft. x 50W/sq. ft.).

Background lit area

So far, only the illumination required on the floor area has been determined. The next step is to calculate the additional amount of illumination required for the large vertical elements at the back area of the sets. Typically these scene backgrounds consist of set walls or cyclorama drapes.

To calculate the lighting power re-

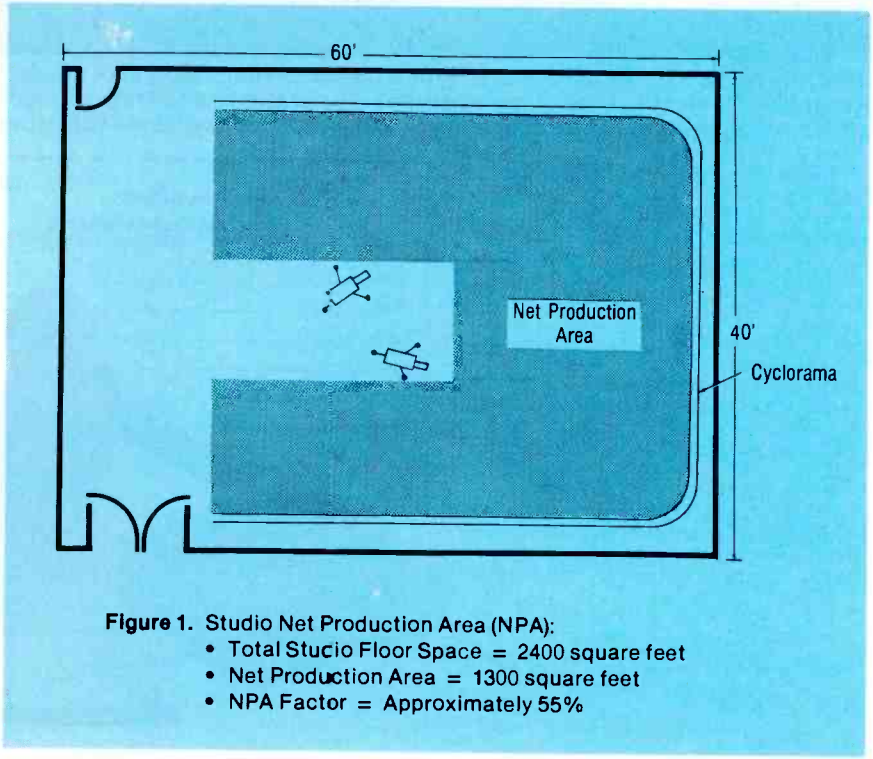


Figure 1. Studio Net Production Area (NPA):
- Total Stucio Floor Space = 2400 square feet
- Net Production Area = 1300 square feet
- NPA Factor = Approximately 55%

Nissen has a 38-year background in the communications industry. For 25 years, he was associated with radio and TV broadcast stations in various engineering and management capacities. For the past 13 years he has been engaged in consulting and design activities in the TV field and has designed more than 170 TV facilities during that time.

Hubert Wilke Inc. is an international A-V communications consulting firm with offices in New York, Los Angeles and London.

MARQUEE 2000
HIGH QUALITY CHARACTER GENERATION

MADE AFFORDABLE BY B.E.I.

FONT LIBRARY:
A wide range of character styles and sizes is available for the "2000", including a selection of language characters.

Fonts are being added in a continuing basis, and we will be happy to create and supply special fonts to customer specifications.

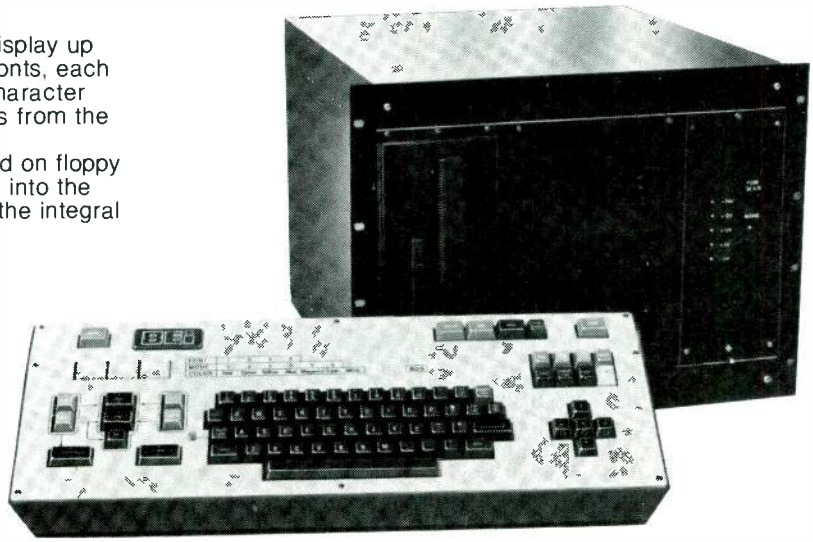
FONT STORAGE:
The "2000" will display up to four standard fonts, each selectable on a character by character basis from the font memory.

Fonts are stored on floppy discs and entered into the font memory, via the integral disc drive unit.

INTEGRAL FLOPPY DISC STORE: As well as carrying out the various font-loading functions, the integral floppy disc store provides fast memory access.

FONT COMPOSE UNIT (optional): The camera, Font Compose Unit provides the operator with the ability to create his own unique character sets, logos and graphic shapes.

RS-232-C INTERFACE:
A standard feature of the "2000" is its ability to receive asynchronous data from external data processors and computers, via its RS-232-C interface, 20mA current loop, or TTL level input.



COMPACT SIZE:
The "2000" mainframe, which includes the power supply and disc drive unit, measures only 19″ (483mm) wide x 14″ (356mm) high x 18½″ (470mm) deep, and weighs only 61.5 pounds, making it ideally suited for use in a mobile unit.

INTERNAL COLORIZER:
Both background and text can be separately colorized by the internal colorizer in red, green, blue, cyan, magenta, yellow, white and black. Background color can be changed for each row, and text color can be changed for each word. An NTSC encorder is required.

EDGING:
Text, including logos, etc., can be displayed with either surround edging, drop-shadow edging or no edging on a line by line basis, each selectable from the keyboard.

BEI BESTON ELECTR

DOUBLE LOGOS:
A feature of the "2000" is its ability to display rows of characters immediately to the right of the logo or graphic symbol. Double logos are associated with 2 rows of characters.

LOGOS:
Logos and graphic symbols can be created to special order from customers' artwork.

CHARACTER RESOLUTION:
High-speed circuitry enables the "2000" to display characters having start-stop increments of 31.25 nanoseconds.

INTER-CHARACTER SPACING: In order to display captions of correct density and weight, each character is assigned a unique spacing element, ranging from 500 nano-seconds to 8 microseconds, in 31.25 nanosecond steps. In addition to this, individual characters can be shifted to the left in 125 nanosecond increments to achieve true character overlap.

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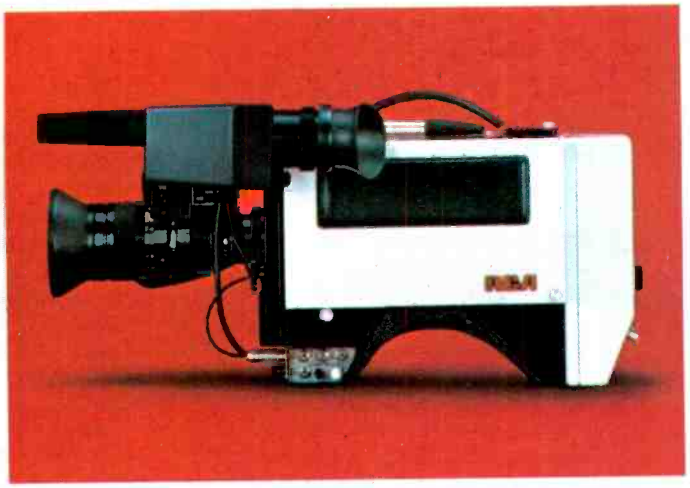

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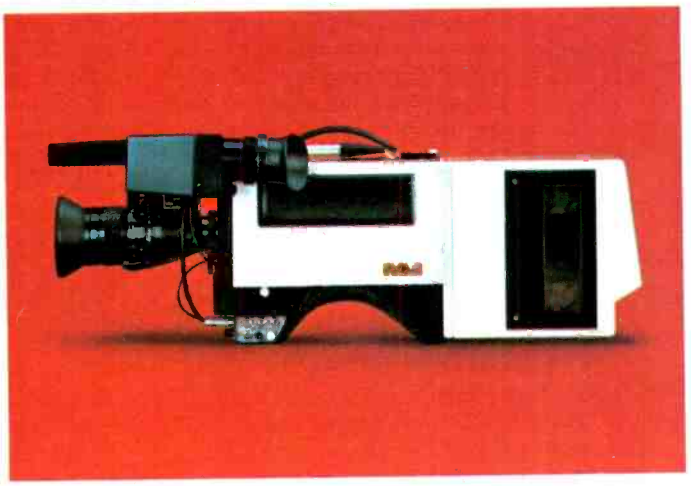

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quired for the background, the square footage of all background surfaces that might be simultaneously lit must be determined. Depending on the production requirements of the studio, this is *not* necessarily the entire background or cyclorama area of the studio.

The lighted background square footage figure is then multiplied by 50W per square foot for the additional power required. If the planned lighting techniques for the studio dictate the use of multiple colored lighting on a white cyclorama (to achieve color "painting" of the background with light mixing), the figure of 75W per square foot should be substituted. This increased power per square foot is required due to the inefficiency of color filtered illumination.

Using the 40' by 60' studio again as an example, and assuming that the largest background area to be lit at any one time is, say, 13' high by 70' long, lighting power for an additional 910 square feet must be provided. If no unusual color painting for the entire background area is contemplated, multiply 50W per square foot by 910 square feet for a lighted background load of 45,500W.

Therefore, the total maximum lighting load for our hypothetical 40' x 60' studio would be 110,500W (65,000W for the Net Production Area plus 45,500W for the lighted background area).

In summary, the formula for calculating the maximum lighting power load for a studio using tungsten-halogen lighting is:

Estimated Maximum Lighting Power (Watts) = NPA (sq. ft.) x 50(W/sq. ft.) + Lighted Background Area (sq. ft.) x 50 or 75 (W/sq. ft.).

It must be remembered that the resultant figure is the *maximum* possible lighting power available and does not (and should not) represent the amount of power used for typical productions. This maximum power figure is used for three purposes: (1) to size the power service feeders; (2) to design the dimmer system; and (3) to design the studio cooling system.

Calculation of control room power loads

Unlike studio power calculations, there are no reliable guidelines that equate control room power requirements to control room square footage. Nothing can substitute for an item-by-item listing of the power requirements of each piece of equipment that will be installed. As will be discussed later in this article, it is also essential to know this total amount of actual power consumed in the control room in order to properly calculate cooling loads.

In determining the total maximum power load, consideration must be given to equipment that may be added in the future. Because relatively small amounts of power are required for TV equipment, the cost of oversizing the power feeds and the breaker panel serving the control room is usually small.

Power for control room equipment must be obtained from power buses that are isolated from heavy intermittent loads to minimize transient surges and long term voltage variations. TV studio complexes have at least two systems that draw an inordinate amount of power on an intermittent basis. These are the studio lighting system and the air conditioning system. It is essential that the power for these two systems be isolated from the power feeds to the control room equipment.

Consideration should be given to providing power regulators for all control room equipment power. Power regulators will not only provide additional isolation from heavy intermittent loads within the building, but will also mitigate the problems associated with power grid *brownouts*.

HVAC considerations for the studio

The demands imposed on the heating, ventilating and air conditioning system (HVAC) in a TV studio are numerous, stringent and unique.

These unusual requirements are not well understood by many charged with studio planning and design, including many otherwise competent HVAC engineers. As a result, there are plentiful examples of studios which, for the lack of proper air conditioning, are woefully inadequate for optimum TV production.

HVAC systems for the studios must: (1) provide for normal heating and cooling of the space as if it were a room without a specialized function; (2) remove the extraordinary amount of heat generated by the studio lighting; (3) be responsive to a wide range of heat removal conditions ranging from no lighting to full capacity lighting; (4) provide heat to the studio when the outside temperature is low and when the studio lights are off; (5) add or remove moisture to or from the air when humidity conditions are beyond the desired limits; (6) provide even distribution of the cooling throughout the studio, or in certain cases, provide specialized, localized cooling for hot spots; (7) provide low velocity air movement in the studio both for the comfort of personnel and so as not to produce movements of cyclorama drapes in the set; (8) incorporate ductwork and diffusers that do not interfere with scenery, rigging and lighting systems; (9) frequently be capable of 24-hour operation separate and apart from the other HVAC systems in the building; and, finally, (10) and perhaps the most important, accomplish all of the above with the minimum addition of acoustic noise.

It is beyond the scope of this article to provide guidelines that will satisfy all of these requirements. There are simply too many design approaches and engineering tradeoffs that must be considered for different sizes and types of studios.

However, because the proper design of the HVAC system must start with, and be based on, the amount of heat generated by the lighting, it is essential that this cooling load be accurately estimated.

Studio lighting heat gain calculations

Incandescent light sources are very inefficient devices in terms of converting electrical power to light energy. So inefficent in fact, that it may be assumed that *all* of the electrical power being used by the lights is converted to heat.

Heat is normally defined in terms of British Thermal Units (BTU). One BTU is the amount of heat energy required to change the temperature of one pound of water one degree Fahrenheit. For those working in metric units, one BTU is equal to 0.252 kilocalorie.

Electrical power (in watts) is directly analogous to heat power (in BTU/hour). The conversion formula is:

1W = 3.4 BTU/hour
or
1kW = 3400 BTU/hour.

Another unit of heat power used by air conditioning engineers is the *ton of refrigeration*. One ton of refrigeration is the cooling effect obtained by melting one ton of ice in 24 hours. This unit originated in the early days of air conditioning when actual blocks of ice were used in cooling systems. If one desires to use "tons" rather than "BTU/hour," the conversion formula is:

1 ton of refrigeration = 12,000 BTU/hr
or
1 ton of refrigeration = 3.5kW.

Therefore, to determine the amount of heat in BTU/hour generated by the lighting, multiply the number of

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kilowatts by 3400. Or, to determine the amount of heat in tons generated by the lighting, divide the number of kilowatts of lighting by 3.5. Thus, for example, if studio lights are consuming 25kW of power, the air conditioning system will have to remove 85,000 BTU/hour of heat (25 x 3400) to maintain the non-lit temperature of the studio. 85,000 BTU/hour is slightly more than seven tons of cooling.

Design heat load

The next question to be answered is how much lighting heat will have to be removed to maintain appropriate studio temperatures. If the maximum possible lighting power figure is used, the HVAC system will be overdesigned and inordinately expensive. Good engineering practice and economics require, therefore, that the HVAC system be designed to remove less than the maximum possible heat load. This reduced amount of heat is called the *Design Heat Load.*

There are several reasons why it is possible to design a TV studio HVAC system for less than worst case conditions. The first reason is that the studio will not use the total possible power available except under extremely unusual conditions. (If maximum power use occurs frequently, it simply means that the original power calculation was incorrect). A second reason is that the lights in a studio are not normally activated except during set-up, rehearsal and production times. This intermittent use permits the HVAC system to "catch up" during nonlit times. A third reason relates to studios that have a generous ceiling height above the lighting grid where heat can build up for a time without adversely affecting the temperature at the floor level.

Therefore, to determine the amount of lighting heat for which the HVAC system should be designed, a Cooling Load Factor (CLF) must be applied. The CLF is a numerical value (always less than 1.0 in a TV studio) that is multiplied by the maximum possible cooling load to determine the design heat load. Some HVAC engineers refer to the CLF as a *diversity* factor.

A studio that will have a heavy production schedule with long shooting times and frequent use of simultaneously lit multiple sets must be designed with a high CLF. On the other hand, a studio that will have short production times and will seldom use a significant amount of its total lighting power may be designed with a low CLF.

HVAC Cooling Load Factors for typical corporate or broadcast studios usually range from 0.4 to 0.6 (40% to 60%).

The determination of the value of the CLF requires a fair amount of educated guesswork and reliance on previous studio designs that have proved proper in the field. The reason why the CLF is such an "iffy" thing is that production requirements vary greatly from studio to studio.

Table 1 enables the reader to determine the CLF for a studio. The total Factor to be used in calculating the design heat load is the sum of the three Cooling Load Factors selected from the three columns.

As an example: (1) assume that 60% of the Net Production Area is used for typical productions; (2) that these productions will normally take about two hours; and (3) that the space above the lighting grid is 20% of the total ceiling height. The total CLF is: 0.25 + 0.10 + 0.17 = 0.52. This factor is then multiplied by the heat gain that would result if the maximum capacity of the lighting system were used.

Accordingly, we arrive at the formula for the calculation of the amount of lighting system heat gain for which the HVAC system should be designed:

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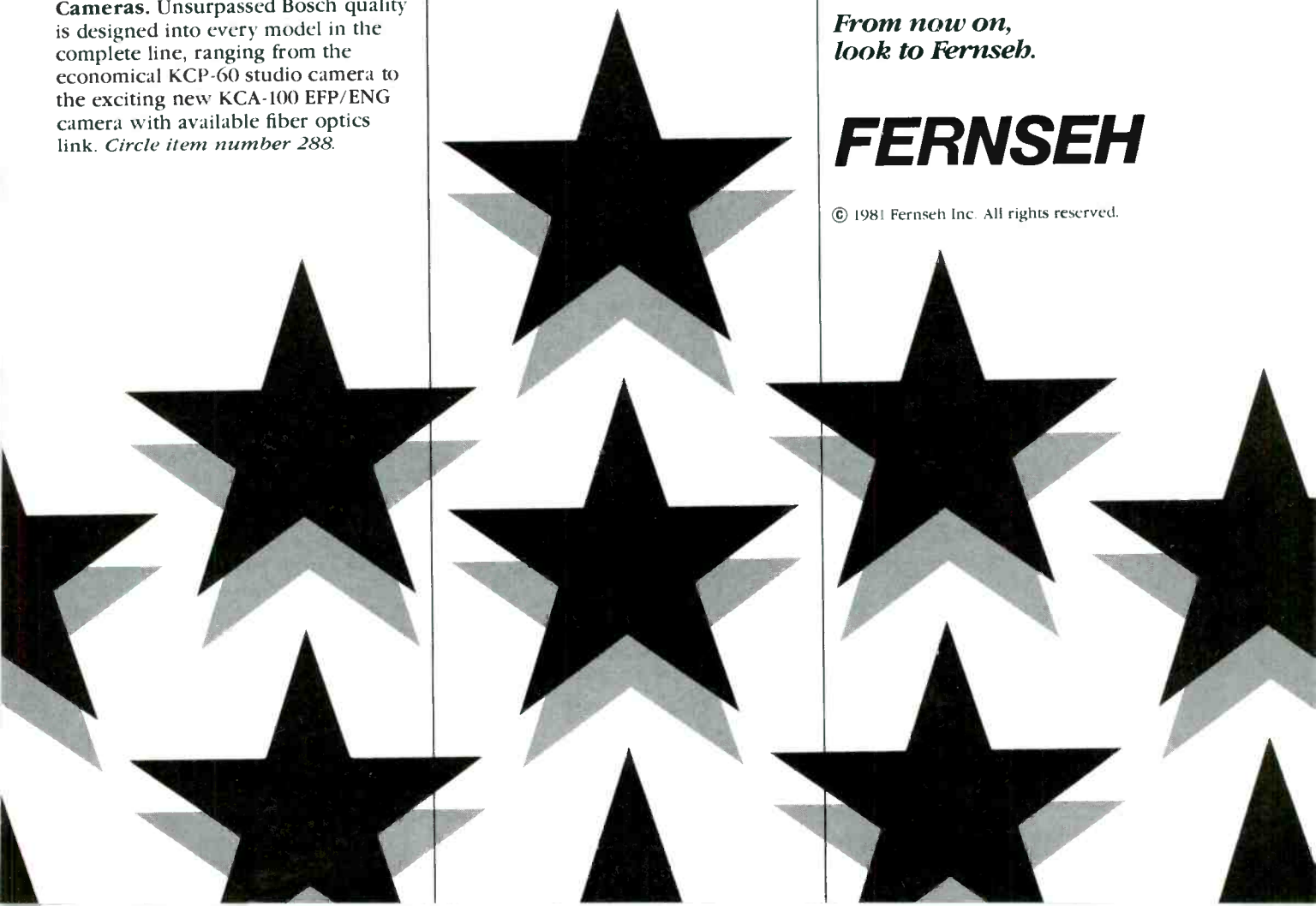

Table 1. HVAC cooling load factors (CLF). Total CLF equals the sum of the three selected factors.

Percent of NPA Used for Typical Production	Cooling Load Factor #1	Estimated Hours of Continuous Lighting Use	Cooling Load Factor #2	Percent of Total Ceiling Height Above Lighting Grid	Cooling Load Factor #3
30%	0.10	1	0.05	10%	0.20
40%	0.15	2	0.10	20%	0.17
50%	0.20	3	0.15	30%	0.14
60%	0.25	4	0.20	40%	0.11
70%	0.30	5	0.25	50%	0.08
80%	0.35	6	0.30	60%	0.05

Lighting Heat Gain in BTU/hour = Maximum lighting power (kW) times 3400 (BTU/hour/kW) times cooling load factor.

The following example is for a studio with a maximum lighting capacity of 75kW and a CLF of 0.50:

75(kW) x 3400 (BTU/Hour/kW) x 0.5 = 127,500 BTU/hour.

The HVAC engineer now uses this lighting heat gain figure *plus* heat gains from solar loads, fresh air intake and personnel to design the HVAC system.

HVAC considerations for the control room

The demands imposed on the design of the HVAC system for a TV control room are far different and less difficult to satisfy than those for a TV studio. The most apparent difference is that there is no extraordinary amount of heat generated in a control room as compared to that generated by studio lighting. The second difference is that the heat generated in a control room is usually rather constant because, in normal operation, the same amount of equipment is operating at all times.

The calculation of heat gain from equipment, therefore, becomes a simple matter of taking the total wattage of all equipment to be installed (and an estimate of wattage of equipment that may be installed in the future) and multiplying the total kilowatts by 3400 (BTU/hour/kW). Cooling load factors are not normally used when calculating control room heat gains because equipment heat loads do not vary appreciably.

Thus, the heat gain formula for control rooms is:

Equipment heat gain (BTU/hour) = Total equipment load (kW) times 3400 (BTU/hour/kW).

To this figure, the HVAC engineer must add the heat gains from solar loads, fresh air intake, personnel and operational lighting.

In addition to normal concerns for personnel comfort, the HVAC engineer must be aware of special considerations imposed by equipment in a control room. These relate primarily to temperature and humidity.

Although solid-state equipment emits little heat, it is highly susceptible to high ambient temperatures. Accordingly, it is imperative that all control room areas are provided with separate and independent control of temperature.

The necessity for proper relative humidity in control rooms also relates to technical requirements. A low relative humidity aggravates static electricity discharge problems that can be disasterous to solid state components. A high relative humidity can cause formation of thin layers of moisture on equipment components and result in breakdowns.

If videotape equipment is located in the control room, tight control of relative humidity is particularly important to avoid videotape dimensional changes that can occur with variations in relative humidity. If these dimensional changes are large enough, videotapes may be unplayable. Videotape head wear and tape clogging are both influenced by relative humidity.

The following temperature and humidity ranges have been found appropriate for both human comfort and proper equipment operation in control areas: The ambient room dry bulb temperature should be capable of adjustment over the range of 68°F to 75°F and should be held within three degrees of any selected temperature. The relative humidity should be held within 40% to 55% for the above temperature ranges. □

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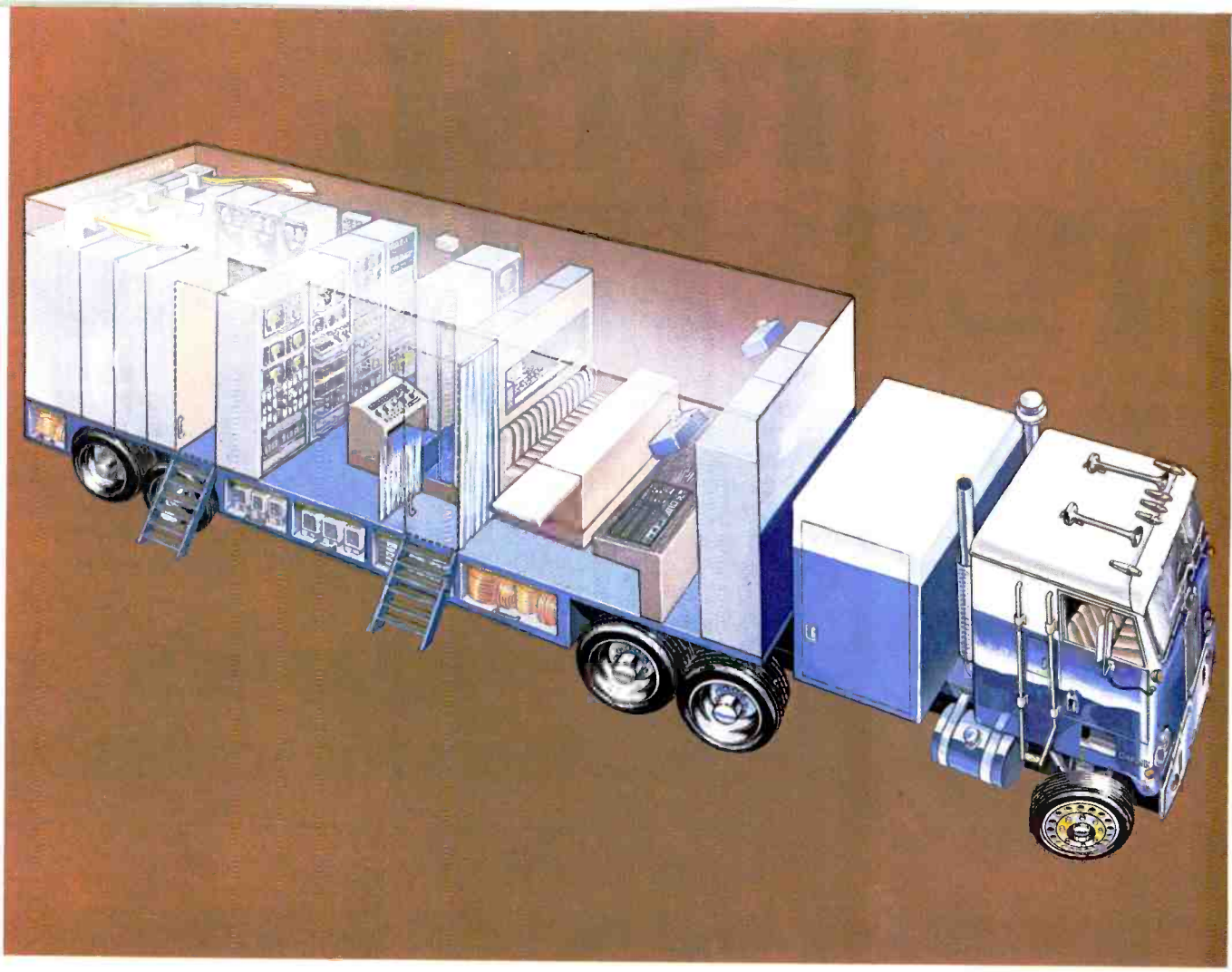

The mobile video production van

By Robert L. Manahan, director of marketing, Compact Video Sales Inc., Burbank, CA

Editor's Note: The cover this month shows a mobile video production van, the Compact Video model C-42 system, equipped with a transportation earth station to provide direct satellite communications. This article describes the company's rationale behind designing and building mobile video production vans for broadcasters, with special emphasis on the Compact 40 used by several networks.

Although mobile TV vans look deceptively simple on the outside, design engineers must consider maximum space usage for people, equipment and storage. Also, the mounting of all equipment must be designed for ease of access and maintenance.

Compact Video Inc. has been a pioneer in the field of such mobile video production facilities for more than 10 years. Compact Video mobile units and studio installations are designed with engineering aspects of utmost importance, yet factors such as operator comfort and space usage must also be considered, especially in mobile units, because of the unique design and construction challenges that they create.

Those challenges have been met by Compact Video in the building of mobile location vehicles for TV stations, producers, networks and cable systems. These vehicles range from the sophisticated C-40 40-foot trailer to the economical C-17 ENG/EFP van built on a Ford Econoline chassis. On the cover of this issue is shown the C-42 Transportable Earth Station for live, 2-way satellite communications.

The people-oriented attitude of Compact Video is demonstrated by the design concepts incorporated into its mobile units. Maximum production crew comfort is provided to encourage the highest efficiency for long periods of time—from eight to 24 hours if necessary.

Functional layouts

Floor plans provide individual operating areas for functions such as VTR, audio, mixing, camera control and production. These areas can be isolated if needed. Control of outside light and noise is accomplished by the use of curtains and sliding doors.

The mechanical construction of a mobile unit is similar for both large and small vans. Compact Video uses commercially available trailers or box vans for most installations. Insulation and interior treatment is done in-

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Rear view of van approximately two weeks into construction. Note special level landing gears in place.

The subfloor is rewelded for added strength.

Internal walls are sprayed with acoustical material to deaden sound.

Video van

house, with design and installation of materials supervised by the project engineer.

Because TV production vehicles are heavy, reinforcement is often required in the running gear and the suspension system of the unit. It is essential to observe the weight ratings on all chassis to ensure that the manufacturer's warranty is not voided.

Some vans require installation of a partial or full subfloor to accommodate wiring and cable runs. With headroom at a premium, the subfloor depth is usually limited to three inches. In addition to providing cable access, the raised floor allows a better

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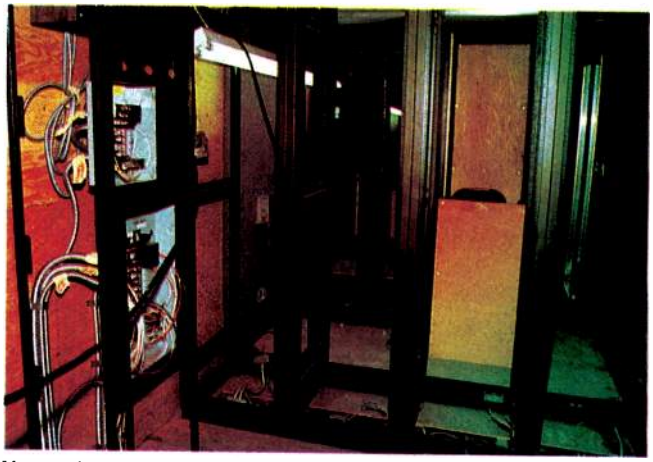
Raised subfloor provides space for wiring of systems.



Near midpoint of construction, power wiring and racks are installed. The power system is custom designed.

Video van

viewing angle to the monitor wall for the production team.

Interior treatment of a Compact Video mobile unit begins with spraying internal walls with a sound-deadening material. Insulation is then added between upright members on the walls. That, in turn, is covered with a layer of plywood. High quality industrial carpeting—in a neutral color—finishes the walls, floor and ceiling.

The environmental control system is important because TV production vans must perform in all kinds of weather conditions. In all but the smallest vans, dual air conditioning systems are used. These air conditioners are heavy-duty industrial units equipped with a hot gas bypass to prevent compressor cycling during operation.

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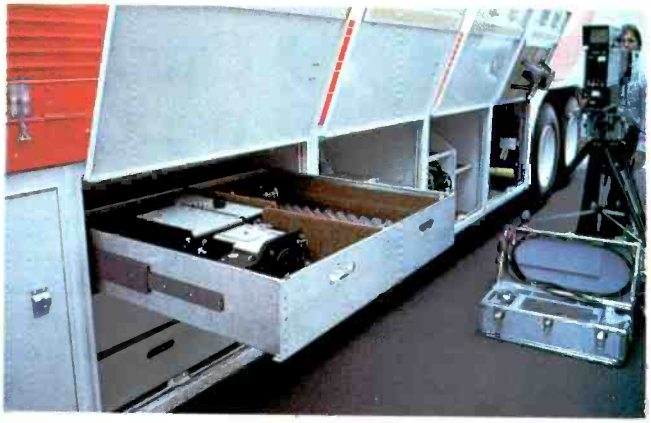

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	Average No. Copies Each Issue During Preceding 12 Months	Single Issue Nearest To Filing Date
A. Total No. Copies Printed (Net Press Run)	37,400	37,900
B. Paid Circulation		
1. Sales through dealers and carriers, street vendors and counter sales	–	–
2. Mail subscriptions	519	521
C. Total Paid Circulation	519	521
D. Free Distribution (including samples) by mail, carrier delivery or other means	36,319	35,846
E. Total Distribution (Sum of C and D)	36,838	36,367
F. Office use, left-over, unaccounted spoiled after printing	562	1,533
G. Total (Sum of E and F should equal net press run shown in A)	37,400	37,900

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CAMERON BISHOP

Video van

regulation. Housekeeping power supplies the air conditioning and lighting systems where regulation is not so critical. All ac wiring is run in conduit.

Compact Video also manufactures silent generators that can be mounted on a tractor. Use of one of these power plants eliminates the need to rely on shore power. The larger vans provide both front and rear access to the power connections. Thus, long power cables that make setups unwieldy can be avoided.

User needs

During the initial design stages of a project, it is essential to discuss the user's exact needs and operating philosophy, as well as the type of equipment to be employed. Good communications allow the manufacturer to customize every facet of the vehicle.

A typical example is the layout of undercarriage storage compartments. These storage compartments extend the full width of the trailer and open from either side. Special care must be given to the waterproofing of these compartments and doors because they are exposed to harsh conditions. Slide-out trays can be built to house specific equipment such as cameras and lenses and to allow quick, visual inventory before leaving a production site.

The production area comfortably seats up to eight people. In addition to the production switcher and the monitor wall, wiring and console space is available for both font and slow motion operators.

It is recommended that a permanent telephone system be installed in the larger units. The RTS Systems Inc. intercommunication system allows for operation of the phone lines through its master station as well as through the TELCO-provided wall-mount units. The production area also contains the heart of the RTS Interrupted Feedback System.

The C-40 contains a complete audio production facility, including extensive patching and audio processing equipment. The typical console contains 24 inputs, and both 8-track and stereo outputs.

The video control area has sufficient seating for three in addition to a senior video position. The senior video concept allows one operator to control as many as eight cameras during a shoot.

The VTR/terminal area will accommodate up to five videotape recorders and slow motion controllers, as well

EXPECT THE UNEXPECTED

Digital introduces the DPS-175 Test/Calibration Generator.

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The DPS-175 contains every standardized test signal plus the conventional signals for studio and transmitter systems. It even has the zone plate 3-dimensional Fresnel pattern. The simple 3″ x 4″ keyboard lets you punch up the specific test signals, by number; allows you to display sequences of test signals; and offers many other control functions. Including the control of novel moving patterns.

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Our digital signal generation is in component format. Separate luminance and chrominance signals created by a microprocessor for ultra-precision.

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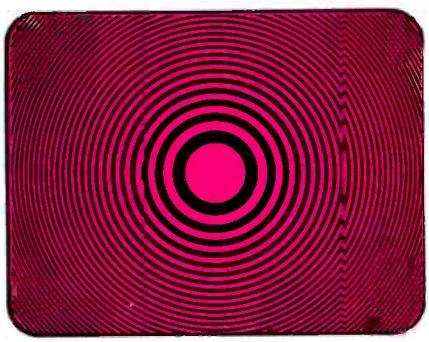

The computer-designed DPS-175 is the new standard against which all test/calibration generators will be judged.

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If you would like further information on the new DPS-175, or on any of our DPS-100 Series products, call your dealer. Or get in touch with us directly.

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DIGITAL

For additional information call:
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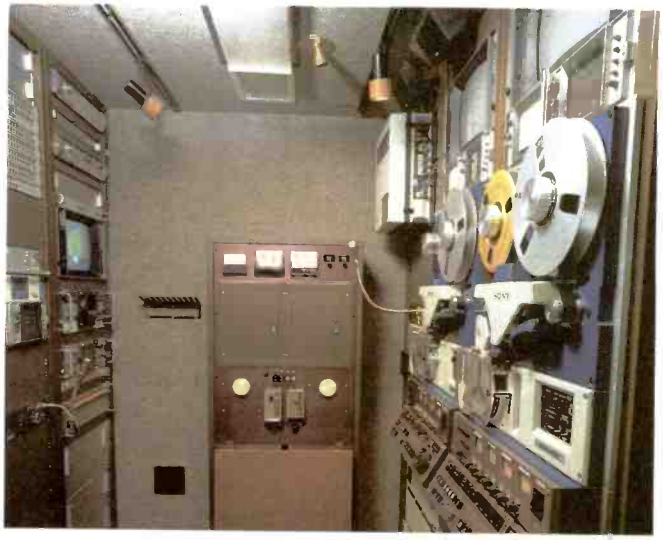
The audio booth (foreground) is a stand-alone unit but interconnects to the production area (background).

The videotape area faces the video terminal space. It contains a breaker box and custom-designed tilt-out transport mounts. Each machine has full monitoring capability.



The video terminal area contains all video patch panels and routing systems, including control panels for generators and disc drives. In effect, it is a master control area of the production van.

The video operations area can accommodate three persons, but the design permits 1-person control of the entire operation if required.

After about six months of construction, the completed mobile production unit is ready for field operation.

Video van

as the video patching and test equipment necessary for operation of the system. This area is, in effect, the master control for the mobile unit.

The creation of space efficiency, comfort and function is the challenge that must be met by any builder of mobile TV facilities. The completed C-40 is a technologically advanced mobile remote facility capable of handling video production jobs quickly and efficiently. □

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Circle (53) on Reply Card

SMPTE panel examines HDTV

By Blair Benson, engineering consultant, Norwalk, CT

Flaherty: HDTV will be expensive—for broadcasters, a reinvestment; for filmmakers, a new investment.

Coppola: HDTV provides significant improvement in resolution and contrast over present broadcast standards.

Sugimoto: Once the public has seen HDTV, they will want it because of the greater detail and sense of reality.

The SMPTE New York Section hosted an audience of more than 350 on Sept. 9 at CBS' Broadcast Center for a discussion of high-definition television (HDTV) by a noteworthy panel of experts in engineering, research and program production. The meeting, although locally sponsored, took on national significance because of the great interest in the subject and the distinguished panelists present.

Moderated by Joseph Flaherty, Engineering and Development vice president of the CBS Television Network, the panel consisted of Francis Ford Coppola, well-known for his innovative use of electronic techniques in film production; Dr. Richard Green, CBS Technology Center scientist; Executive Producer Glen Larson; Dr. Stephen Lukasik, FCC chief scientist; Renville McMann, president of Thomson-CSF Labs US; Dr. Kern Powers, RCA's vice president of Research and Engineering; and Dr. Masao Sugimoto, manager, systems research at NHK. During the discussion, at the request of the moderator, the panel was joined by Donald Fink, renowned for his work in the development of NTSC Standards (among his many other engineering achievements), and presently the chairman of the SMPTE high-definition study group.

Joe Flaherty opened the discussion with an outline of the technologies that must be studied in the course of the development of HDTV standards. He classified these broadly into the areas of: production and signal generation; distribution by broadcast transmission, cable, satellite, cassettes and disc; and reception and display.

Problems facing standardization

Standing in for Joseph Polonsky of Thomson-CSF in Paris who was unable to attend, Renville McMann discussed some of the problems to be faced in standardization, and in transmission and display. He said that any standard would be a compromise, arrived at by careful consideration of all requirements and estimates of future technology, and should be relevant for at least two generations.

A major consideration and possible limitation in transmission will be the requirements of wider bandwidth. Current allocations are inadequate for over-air transmission. In fact, to permit multichannel satellite transmission, some form of digital signal bit-rate compression will be required. This poses the question regarding distribution; will cable systems be using fiber-optics or will direct broadcast satellites (DBS) be used to beam signals to the viewer's homes?

In order to use the full capabilities of HDTV, developments are needed in picture/display equipment, particularly if the 3:4 aspect ratio is to be abandoned for wider screen displays. This may well result in the first use of HDTV being in the motion picture industry, rather than in TV broadcasting.

HDTV needed for electronic cinematography

On the production front, Francis Ford Coppola opened his remarks with a review of the TV system techniques used in the production, by his Zoetrope Studios, of the film *Apocalypse Now*. The editing decisions are made using ½-inch Beta videotape cassettes to produce an edited cassette, the equivalent of a film "workprint." This tape then serves as the film editor's guide in assembling and editing the film takes. He pointed out that videotape editing is slowed by the lack of random access, which would permit immediate playback of the edits in real time.

Also, he emphasized the need for a high-definition TV system to eliminate the need for release on 35mm film. For this purpose he considers that Sony and NHK systems, provide the necessary five times improvement in resolution and contrast over the present broadcast standards.

In support of Coppola's views, Glen Larson, executive producer of Glen Larson Productions in Hollywood, stressed the need for TV engineering development in HDTV, and particularly to achieve the higher contrast "film look." Larson criticized American manufacturers for not pioneering in HDTV development, as had been done in the past by RCA in color TV and Ampex in videotape. He added that only CBS is giving full backing to engineering advances, and these are coming from Japan—for example, Sony's reported expenditure of $200 million on HDTV.

continued on page 114

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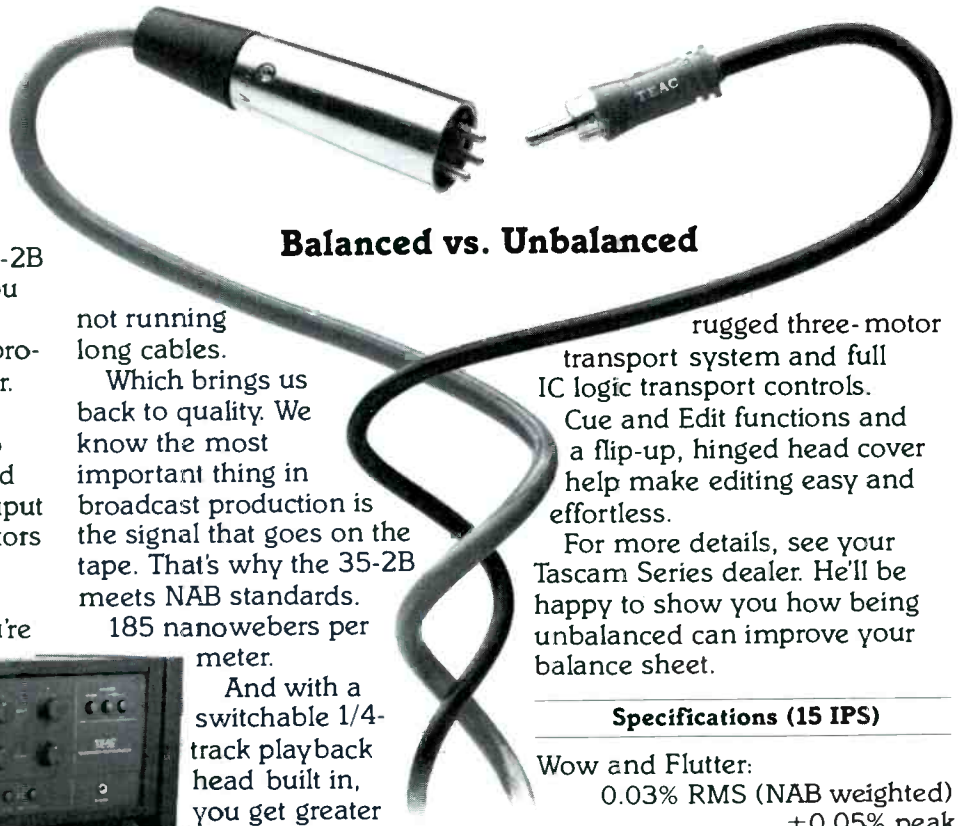

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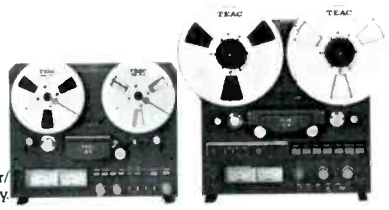

The 32-2B and the compact 22-2 recorder/reproducers can save you even more money.

Circle (54) on Reply Card

Computers simplify program scheduling and machine control for OEB

By Willis I. McCord, director of engineering, Ohio Educational Broadcasting, Columbus, OH

The Ohio Educational Television Network operates 15 hours every day, year round using computers to maintain a rigorous schedule that provides for the program requirements of 12 public broadcast stations throughout the state. There are more than 3000 miles of duplex microwave that carry the program signal from the Network Operations Center (NOC) in Columbus, OH, to the various affiliated stations. Data carried on the microwave subcarrier channels provide the interconnection between user stations and network computers for traffic control. Presently NOC is providing more than 50% of the program schedule aired by the affiliated public broadcast stations, which totals approximately 90 events daily.

There are two computers in operation at NOC in Columbus. One is devoted to program traffic and the other is assigned to automated machine control. The Data General mini processors, Nova 2 with 32Kword memory and Nova 3 with 48Kword memory, each supplemented with a 10 megabyte rigid disc system, are adequate to present operational requirements. CRT terminals, high-speed printer and machine control data are 4800 baud rate and data carried on the microwave are 300 baud rate.

Traffic computer

The traffic computer system provides the affiliated stations with the capability to access an on-line data base of available programs, of which there are approximately 5000. Programs, when entered in the availability file, are maintained by the traffic computer until manually deleted. Or, if a date of recording is indicated, the computer will automatically delete the program two weeks from that date.

Stations using a Texas Instrument Silent 700 terminal enter requests for programs that are stored in individual station files. They can access availability files by the typing code of program, for example, *ELC Electric Company*. The computer will then print out all available *Electric Company* programs indicating the date program was recorded, length of program, the number of times the program was used and number of copies made. New availabilities can be added and merged with existing files.

All users may request a printout of the availability file qualified by program code and/or utilization date. Scheduling may be made up to 35 days in advance. Changes, corrections, additions or deletions to the schedule can be made by affiliates up

COMMAND CODE INDEX

OHIO NETWORK CENTER
AUTOMATION DATA STRUCTURE

BCD Latch Controls

1XX	Channel A	BCD
2XX	Channel B	BCD
3XX	Channel C	BCD
4XX	Channel D	BCD
5XX	Channel E	BCD
6XX	Channel F	BCD
7XX	Channel G	BCD
8XX	Channel H	BCD

900	Start VT1
901	Start VT2
902	Start VT3
903	Start VT4
904	Start VT5
905	Start VT6
906	Start VT7
907	Start VT8
908	Start VT9
909	Start Flying Spot Scanner
90A	Stop VT1
90B	Stop VT2
90C	Stop VT3
90D	Stop VT4
90E	Stop VT5
90F	Stop VT6
910	Stop VT7
911	Stop VT8
912	Stop VT9
913	Stop Flying Spot Scanner
914	Record VT1
915	Record VT2
916	Record VT3
917	Record VT4
918	Record VT5
919	Record VT6
91A	Record VT7
91B	Record VT8
91C	Record VT9
91D	Record VT10
91E	Start F 1A
91F	Start F 1B

Machine Controls

920	On F 1S
921	Start F 2A
922	Start F 2B
923	On F 2S
924	Show F 1A
925	Show F 1B
926	Show F 1S
927	Change F 1S
928	Show F 2A
929	Show F 2B
92A	Show F 2S
92B	Change F 2S
92C	Stop F 1A
92D	Stop F 1B
92E	Off F 1S
92F	Stop F 2A
930	Stop F 2B
931	Off F 2S
932	Start Audio Cart

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to 24 hours before scheduled day for the event. After that time, NOC can make such changes up to one minute before event time.

A composite schedule is recompiled during the execution of the off-line period at 8 p.m. daily. The computer compiles, on the disc, 30 days of composite schedule. It also prints on the high-speed printer a hard copy composite schedule for the next broadcast day, which the engineering staff uses to determine and note machine assignments. Provision is made to transfer the current day's schedule to the automation (machine control) computer. The composite schedule for the current day is available to affiliated stations on request. Past event schedules are retained by traffic computer for a 2-day period and may be called up for review if needed.

The traffic computer accommodates requests from affiliates for NOC to make off-line recordings and indicates how many copies are required in order to accommodate the requested playback schedule. The computer alerts traffic operations of conflicts in scheduling time or overloading of available tape recorders by printed notation on hard copy composite.

CRT terminals for both computers are located at NOC. Traffic has one CRT and engineering has the CRT for the automation computer. The CRT keyboards are standard ASCII with RS232C interface. A monitor on the traffic computer TTY Port is used to observe activities of 10 locations to determine who is using the system and what task they are performing: print availabilities; enter schedule; print schedule; send message; print a composite.

Automation computer system

The automation computer takes charge of all outgoing lines of the video/audio routing switcher, executing the proper commands from a schedule to perform signal routing. Machine control accommodates nine quadraplex tape recorders, two color film islands and a flying spot scanner. Its functions include:

- Selecting proper recorder or film island;
- Setting mode playback/record;
- Starting machine with preroll;
- Starting film projector;
- Flipping multiplexer mirrors;
- Changing slides;
- Inserting video/audio ID;
- Switching program to line;
- Stopping machines at predetermined time;
- Switching up color bars or color black.

The automation computer can store future events for a 30-day period, totaling approximately 3000 individual programs. Changes that have been made in daily schedules are reflected in a revised composite schedule that is called over from the traffic computer each day. Operators have the option of viewing any portion of the current schedule or future events. This is accomplished in the bottom split of the CRT screen without affecting on-line automated operation. The upper split of CRT displays eight events; an asterisk

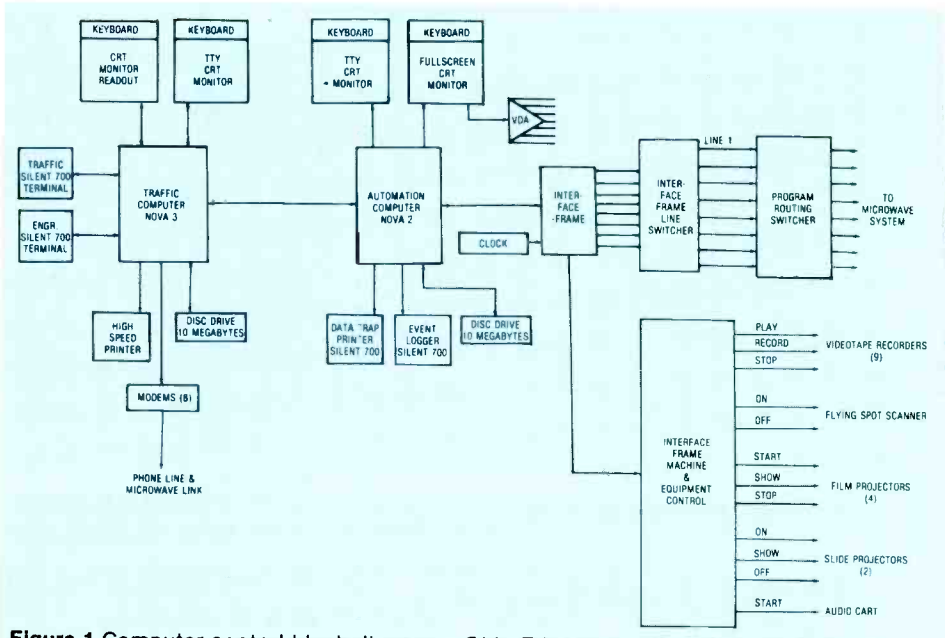

Figure 1 Computer control block diagram—Ohio Educational Broadcasting Network.

EYE-OPENERS

Just when everyone had their eyes wide open to the outstanding line of Ikegami broadcast and production color cameras, Ikegami introduced its color and B&W monitor line, engineered with the same innovative technology as its cameras. A great tradition of eye-opening continues with precision, quality and beautiful images.

The Ikegami color monitor line consists of the High Resolution Series RH Color Monitors and the High Performance Series 8 Color Monitors. The High Resolution Series RH Color Monitors are available in the 14" TM 14-2RHA and the 20" TM 20-8RH. Both provide precision color reproduction at 600 plus lines for professional studios, control rooms, remote vans, etc., and feature a high resolution CRT with High Density Dot Matrix, a switchable comb filter in the decoder, and the AFPC (Automatic Frequency Phase Control) system to maintain exceptional color reproduction. Both models are rack-mountable, with the TM 14-2RHA featuring plug-in circuit boards for easy maintenance.

The High Performance Series 8 Color Monitors are available in the 14" TM14-8RC, 20" TM20-8R and 25" TM25-8. The Series 8 monitors offer high quality color reproduction, a Shadow Mask Dot Matrix CRT, Pulse Cross Circuit, Active Convergence Circuit, low power consumption, and more.

The B&W Monitors are engineered to the same exacting Ikegami standards and are available in Triple 5", Dual 9", 5", 9", 12", 17" and 20" sizes.

Ikegami's Eye-Openers are available at most dealers. For details and additional information contact: Ikegami Electronics (USA) Inc., 37 Brook Ave., Maywood, NJ 07607, (201) 368-9171; West Coast: 19164 Van Ness Ave., Torrance, CA 90501, (213) 328-2814; Southwest: 330 North Belt East Suite 228, Houston, TX 77060, (713) 445-0100; Southeast: 522 So. Lee St., Americus, GA 31709 (912) 924-0061.

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OEB --TV COLUMBUS, OHIO SATURDAY 07/25/81 EASTERN STANDARD TIME

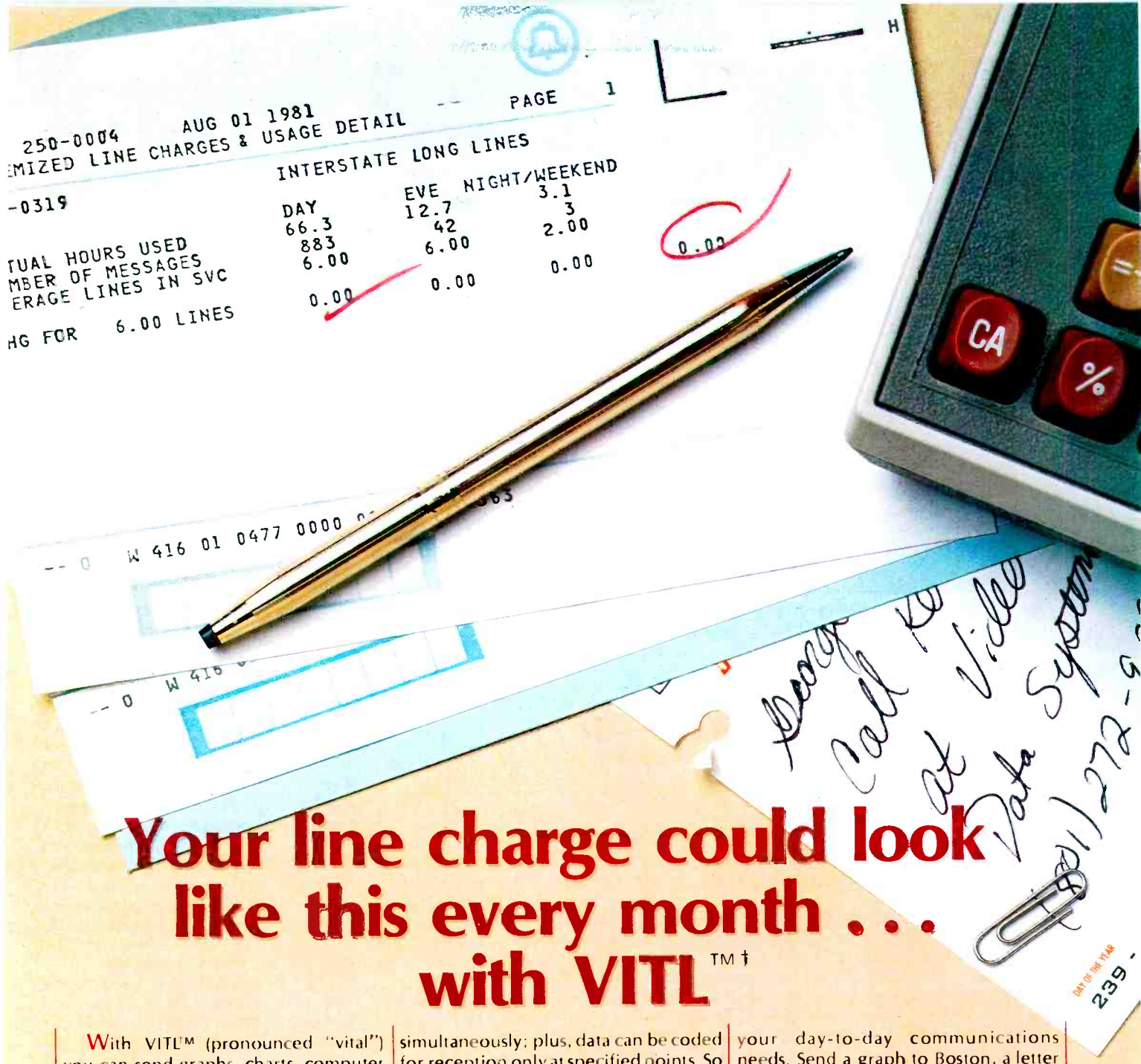
PAGE # 2

TIME	DUR	SRC	ID	RD	ORG	PR.	CODE	DESCRIPTION	S	CARRYS
900:01	28:46	VT3			PB1	CVG	614	VICTORY GARDEN		7
900:04	28:50	VT7	K1		CET	DOL	108	DOLLAR STRETCH		3
930:01	28:44	VT6			PB1	HTH	223	HERES 2 HEALTH		3
930:01	28:45	VT2			PB2	ELC	74	ELECTRIC CO.		8
900:01	58:46	VT4			PB1	SOC	446	SOCCER/GERMANY		4
900:01	58:53	VT8			PB2	SES	1486	SESAME STREET		2
1000:01	28:38	VT1			PB1	VBT	103	VIC BRADEN		4
1000:01	28:47	VT5			GTE	JUL	208	JULIA & MORE		3
1030:01	29:03	PB1		V9	PB1	TOH	109	OLD HOUSE		
1100:01	28:46	VT7			PB1	LMA	229	LAWMAKERS		7
1100:01	29:16	PB1		V3	PB1	RTA	109	ROMAGNOLIS TABL		
1130:04	28:31	VT8	K1		OEB	WWS	3	W DCARVER WKSH		3
1130:01	28:46	VT4			PB3	ETS	184	EUROPEAN T.V.		7
1130:01	29:00	PB1		V6	PB1	JUL	109	JULIA & CO.		
1200:01	28:43	PB1		V9	PB1	HTH	225	YOUR HEALTH		
1200:01	29:05	VT2			PB3	INK	203	INT L. KITCHEN		3
1200:01	58:46	VT1			PB4	SPA	139	SPORTS AMERICA		7
1230:01	28:46	PB1		V3	PB1	CVG	615	VICTORY GARDEN		
1300:01	25:30	PB4		V6	PB4	BBM	130	BIG BLU MARBLE		
1300:01	28:39	VT7			PB1	OVR	4072	OVER EASY		8
1330:01	28:02	VT8			PB1	LAQ	104	LAP QUILTING		2
1300:01	58:46	VT5			PB1	MPT	112	MASTERPIECE THE		4
1400:01	51:00	VT2			PB4	CLC	110	CLASSIC COUNTRY		2
1400:01	51:00	PB3		V9	PB3	ASI	110	AMERICA SINGS		
1330:01	12841	VT4			PB1	MAB	108	MATINEE/BIJOU		7
1400:01	58:45	VT7			PB1	NOV	808	NOVA		8
1400:01	58:46	VT3			PB1	EAP	3003	EVENING/POPS		4
1400:04	58:52	VT1	K1		OUB	RAM	113	RAMBLIN		3
1500:01	28:51	VT2			PB1	SOB	109	SOUTHBOUND		
1500:01	58:45	VT6			PB1	NOV	808	NOVA		8
1500:01	59:00	VT5			PB3	LFR	108	LIVE/RICHMOND		2 4
1500:01	59:00	VT8			PB3	LFR	104	LIVE/RICHMOND		3
1600:01	28:46	VT4			PB1	SOB	108	SOUTHBOUND		7
1630:01	27:50	VT6			PB1	MRC	503	MARK RUSSELL		2
1600:01	58:46	VT7			PB1	SOC	446	SOCCER/GERMANY		4
1630:01	28:48	VT3			PB1	TOH	108	OLD HOUSE		7
1630:01	28:58	VT5			PB1	VIK	103	VIKINGS		1
1600:01	12803	VT1			PB1	MAB	109	MATINEE/BIJOU		2
1730:01	28:41	VT8			PB1	SNP	337	SNEAK PREVIEWS		3
1700:01	58:46	PB1		V9	PB1	SOC	447	SOCCER/GERMANY		7
1730:01	28:51	VT2			PB1	SOB	109	SOUTHBOUND		
1800:01	28:46	VT4			PB3	TOM	103	TOM COTTLE SHOW		3
1800:01	28:46	VT3			PB1	RTA	108	ROMAGNOLIS TABL		2
1800:01	53:00	VT7			PB4	CLC	119	CLASSIC COUNTRY		6
1830:01	28:50	VT5			PB1	OUC	111	OUC---CURTAIN #3		3
1900:01	28:48	PB1		V8	PB1	OUC	135	OUC--REBECCA 3		2
1830:01	59:20	VT6			PB1	SSR	1	SILENT SPRING		
1900:01	54:05	VT2			PB3	CGS	228	CREATURES GR/SM		4
1900:01	58:45	VT1			PB1	NOV	808	NOVA		2 8
1930:01	28:54	PB1		V9	PB1	TOM	104	TOM COTTLE SHOW		1 3
2000:01	28:46	VT5			PB1	SOB	108	SOUTHBOUND		
2000:01	28:58	VT3			PB1	VIK	103	VIKINGS		6
2000:01	53:00	VT7			PB4	CLC	119	CLASSIC COUNTRY		4
2000:01	58:47	VT6			PB1	COS	103	COSMOS		1

OEB --TV COLUMBUS, OHIO SATURDAY 07/25/81 EASTERN STANDARD TIME

PAGE # 3

TIME	DUR	SRC	ID	RD	ORG	PR.	CODE	DESCRIPTION	S	CARRYS
2030:01	29:24	VT2			PB3	LOO	103	BLUEGRASS		7
2000:01	59:35	VT4			PB2	LAA	103	MAKE MUSIC		6
2000:01	11808	PB4		V8	PB4	FOX	118	FOX MUSICALS		3
2100:01	28:46	VT5			PB1	LMA	229	LAWMAKERS		
2130:01	28:41	VT7			PB1	SNP	337	SNEAK PREVIEWS		6
2100:01	58:46	VT3			PB1	EAP	3003	EVENING/POPS		6
2100:01	59:07	VT1			PB1	MYY	109	MYSTERY		3
2200:04	57:55	VT4	K1		OUB	RAM	108	RAMBLIN		1
2230:01	28:41	VT7			PB1	SNP	337	SNEAK PREVIEWS		7
2200:01	58:49	PB1		V9	PB1	ACL	409	AUSTIN CITY LIM		2
2200:01	59:07	VT2			PB1	MYY	109	MYSTERY		
2200:01	10000	PB1			CET	CET	60	PASS THRU/CET-0		8
2200:01	11808	VT8			PB4	FOX	118	FOX MUSICALS		34
2200:01	12546	VT6			CET	FOX	117	FOX MUSICALS		6
2300:01	58:32	PB2		V5	PB2	JNW	303	JAMES MICHNERS		1
2300:01	58:46	VT3			PB1	ACL	408	AUST/CITY/LIMIT		2



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The operator keys commands into the automation system in the master control room. Inset shows a typed CRT display of an event schedule.

Computers/OEB

before an event indicates it is in preroll lockout so that changes can no longer be made.

Programs originate from TV tape recorders, film chain, satellite earth terminals and affiliated stations. Provision is made for full network interconnect between stations and for pass-through from one station to another. Information presented on the CRT for use of operating personnel consists of the on-line events plus 25 upcoming events, which includes such information as:

- Time of program start in hours and minutes;
- Duration of program in minutes and seconds;
- Title of program;
- Program source;
- Tape machine or film island number;
- Stations to which program is fed;
- Time to next event in seconds;
- Remaining duration of program decreases in 15 second increments.

The automation computer operating through an interface unit provides the hexadecimal code required for machine function and the binary coded decimal code that controls the program routing switcher. If an event is scheduled to start before a previous event has cleared, the upcoming event will be switched on time, terminating the program feed in progress. IDs are inserted in first three seconds, program video and audio being held until three seconds after scheduled start time.

An example of one rigorous event:

9:54 computer prerolls VTR
10:00 holds program video and audio takes 3 seconds ID from flying spot scanner break from program audio to cart tape
10:04 return program video and audio to line.

Verification of systems performance

Automation control pulses are logged on a data trap printer for check on computers operation. After completion of an event, full information regarding that event is printed out on an event logger. This includes the same information that appeared on the daily schedule and is used for documentation.

The computers are also capable of compiling statistical information, for example:

- Total time any one source has been on-line;
- Total time any specific line has been fed;
- Machine usage per machine playback hours, record hours total of each;
- Number of times any program has been requested;
- System usage by tasks for each terminal end.

The automation system interfaces with the master control routing switcher and remote control machine start panels in a manner so as not to inhibit the manual operation of the NOC facility should the automation computer fail. This is not true of the traffic computer; should it crash, OEB would be obliged to obtain affiliates' program schedules by other methods. Fortunately, computer and/or microwave outages have been infrequent and of relatively short duration. Plans for future expansion include additional VTRs to meet the anticipated increase in program schedule. This will result in expansion of the computer system, incorporating many new features and a reasonable degree of redundancy.

Personnel requirements for computer operation

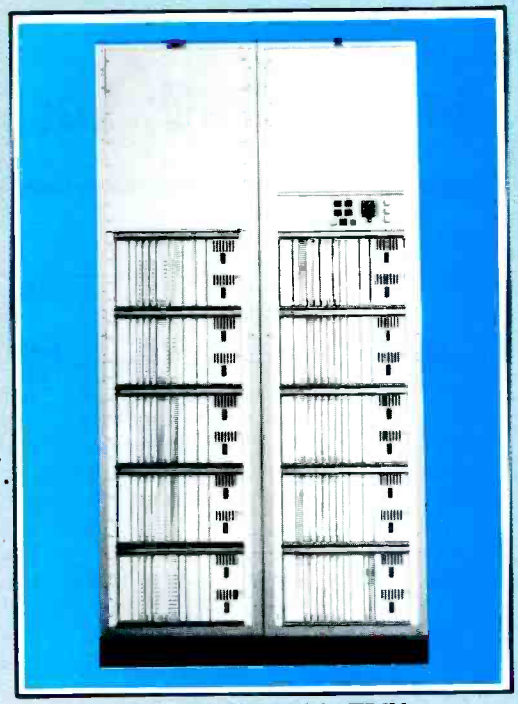
At least two operators man each shift at NOC, with a supervisor overseeing activities of the day shift. During the second shift, a senior operator acts in the capacity of supervisor. The operators assign machines for each event by entering the machine number into the computer. With the machine in local mode, the operator loads tapes, optimizes heads and cues program for proper preroll. The operator then delegates the machine to computer control.

The program/traffic department then pulls the tapes required for each day and arranges them in order of use on a cart. The cart is moved into the operations area in close proximity to VTRs. Before each shift, operators check the computer clock referenced to WWV and/or PBS and correct the clock for synchronization. Operators also handle last minute schedule changes and special requests for program feeds or recordings. Operators are always ready to assume manual control of machines or the routing switcher should program difficulties and/or computer failures occur.

The computer systems described have been in operation at the Ohio Educational Broadcasting Network Operations Center for more than six years with a reliability factor, including equipment failure and human error, in excess of 99%. Considering the sophistication of this system, which requires a minimum of maintenance, the performance to date has been most satisfactory. □

OUR SWITCHER SPECS SPEAK FOR THEMSELVES

Following is a summary of test data compiled from the final test measurements made on a 50-input by 50-output audio/video switching matrix sold to Capital Cities' Houston outlet KTRK-TV. We invite comparison of these test results with our published specs and with the published specs of routing switchers manufactured by others.



50 x 50 KTRK MATRIX

KTRK TEST DATA BREAKDOWN

	Worst	Mean	95th Percentile	Published Spec
VIDEO				
Crosstalk @ 3.58 MHz	−63	71.1	65	−60 dB
Diff Gain	.05	.042	.05	0.1%
Diff Phase	0.1	.056	.08	0.12°
Diff Delay	1.0	.89	.95	±1°
Freq Response	.05	.02	.05	±.12 dB
Hum & Noise	−79	−84.6	−80	−75 dB
Gain Uniformity, All Paths	.017	.006	.017	±.07 dB
Input Return Loss	46	51.2	46	40 dB
Output Return Loss	45	48.8	46	40 dB
AUDIO				
Crosstalk @ 20 KHz	−80	−84.7	−81	−75 dB
Hum & Noise	−88	−91.8	−90	−85 dBm
THD 30 Hz - 20 KHz				
@ 0 dBm	.017	.011	.015	0.1%
@ +24 dBm	.24	.13	.17	0.5%
Gain Uniformity, All Paths	0.1	.044	.09	0.2 dB
Common Mode Rejection	80	88.3	83	70 dB

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Satellite ENG: Local news is not local anymore

By Gary J. Worth, president, Wold Communications, Los Angeles, CA

Editor's note: These are excerpts from a speech given by Gary J. Worth, president of Wold Communications, to the Radio-Television News Directors Association on Sept. 19, 1981 in New Orleans, LA.

Those of us who have had the privilege of buying a new house recently have learned very quickly the meaning of the two words "creative financing." But, as all news directors and station managers know, financial creativity also plays a big part in the management of news department budgets.

Local news just isn't local anymore, and large expenditures for ENG cameras, vans, microwave and helicopters are evidence of this. ENG crews gradually have been traveling farther and farther away from their stations. First, in those early experimental weeks, it was barely around the block. Then it was across the county line; now it's across the country. A few weeks ago, in fact, WCCO radio even sent its 2-man morning anchor team to London for live pre-event coverage of the Royal Wedding.

Since the advent of portable ENG cameras several years ago, going live clearly has been where it's at. And now, with today's satellite technology, stations are able to go live from virtually any location. Where a permanent satellite uplink isn't available, a transportable one can be brought in to do the job.

The construction and installation of permanent satellite uplink facilities has proceeded nowhere as rapidly as in the nation's capital. Just a few

Wold Communications transportable satellite uplinks atop garage opposite Madison Square Garden. Units were used by networks, station groups and local broadcasters to transmit live and tape feeds from the 1980 Democratic National Convention.

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months ago—at the time of the hostage return and the inauguration of President Reagan—the only fixed uplink in Washington belonged to PBS. Now, in addition to PBS—Mutual, Storer, CTM and Wold all have permanent Washington uplinks.

The ease and economy of getting live and same-day feeds out of Washington, combined with an awareness of ever-increasing viewer expectations, has prompted numerous local stations to establish Washington news bureaus. In fact, so many local reporters are in Washington now that overcrowding in the Senate and House hearing rooms, and on the sidewalks in front of the White House and Capitol, has become a major problem.

Since the 1980 political conventions, many stations have found transportable satellite uplinks to be an economical means of providing up-to-the-minute localized coverage of national events: coverage that just isn't available from any other source.

The local angle—that's what stations such as WAST, Albany; KSTP, St. Paul; KCST, San Diego; WTVT, Tampa; and WHIO, Dayton, were after when they made their decision to use a transportable earth station to cover the return of the hostages. All had been following the families of hostages in their areas and none of them thought they'd get enough localized coverage from the networks.

The Reagan Inauguration was another event with local significance for which stations from around the country used a transportable satellite uplink. KXAS, Dallas, was in town to cover the Texas angle—people such as Vice President Bush and Senator John Tower. KOVR, Sacramento, which for years had covered Reagan in the governor's office, also was on hand, as was WCVB, Boston, and many others.

Were these two events to take place today, a transportable unit wouldn't be needed, because there is now a preponderance of fixed uplink facilities, in Washington. But for events occurring outside Washington—and yes, this does happen on occasion—a transportable earth station is the most convenient, economical and efficient way of getting your story back home to your viewers.

Transportable earth stations are available from several companies. In addition to Wold Communications, PSSC, Southern Satellite Systems, WTCI and Compact Video all lease them. There are, however, differences in rates, type of equipment, services provided and response time, (how long it takes for the unit to reach its destination).

Basically, the transportables can go anywhere. The only restrictions on where they can be parked are that they must have a clear, unobstructed view of the satellite and they can't interfere with any local terrestrial microwave. As far as lead time is concerned, the only limiting factor is on-the-road travel time. The Wold transportables are based both in Washington and Los Angeles, so the maximum travel time to any event should be a day—two at the most. Other companies have units in Denver, Tulsa, Las Vegas and Los Angeles.

Many of you may be sitting here thinking, "This is for the big guys. There's no way *my* station can afford to do this." So let's explore the cost factor.

For a single customer using the transportable for one day, the rate is $8000. Additional days cost $1000 each. There is also a charge of a dollar per mile for transportation to the event and an hourly charge for transmission, which can range from $150 to $250, plus the satellite time. Lower rates are available for multiple uses scheduled in advance.

A more cost-effective way to take advantage of satellite transmission via a transportable uplink is to share one with other users. This is how many of the stations covering the inauguration and hostage return cut their transmission costs. For the inauguration, users paid a flat $2500, which also entitled them to use the uplink for several days before the event. The only extra charge was transmission and satellite time—billed at $250 per quarter hour.

Whereas the inauguration involved only one venue, most stations covering the hostage return wanted to feed from both Andrews Air Force Base and the Capitol. Because of the extra microwave involved—and because several days of satellite time had to be reserved and no one knew exactly when the hostages would be coming back—each station was charged a flat rate of $2750, instead of the $2500 charged for the inauguration. Transmission and satellite time was $250 per quarter hour.

These are representative rates, and they don't depend on how many stations use the transportable unit at a given event. If you want to know how these rates compare with Bell's: Local temporary microwave alone will cost $2400 for the first day, plus construction if their new tariff is approved. The new tariff, which comes off a five-month suspension in October and which likely will be approved, will increase Bell's rates for construction, local loops and interexchange facilities, too. In other words, the new Bell tariff will make transportables even more cost-efficient.

Beyond cost, transportables have the advantage of easier, more convenient access and—had they been available back then—would have avoided the nightmare that faced reporters trying to get their feeds out of Three Mile Island. And for radio stations, the 15kHz satellite signal represents a dramatic improvement in audio quality over 5kHz landlines, which rarely are available anymore. □

WAST-TV Albany, NY, sent a crew to Washington to provide live coverage of the hostage return. A last-minute decision came when a local congressman, center, secured a VIP pass for an Albany girl, right, who had drawn local interest by wearing a yellow bracelet throughout the hostage ordeal. Feeds were transmitted via a Woldcom transportable uplink.

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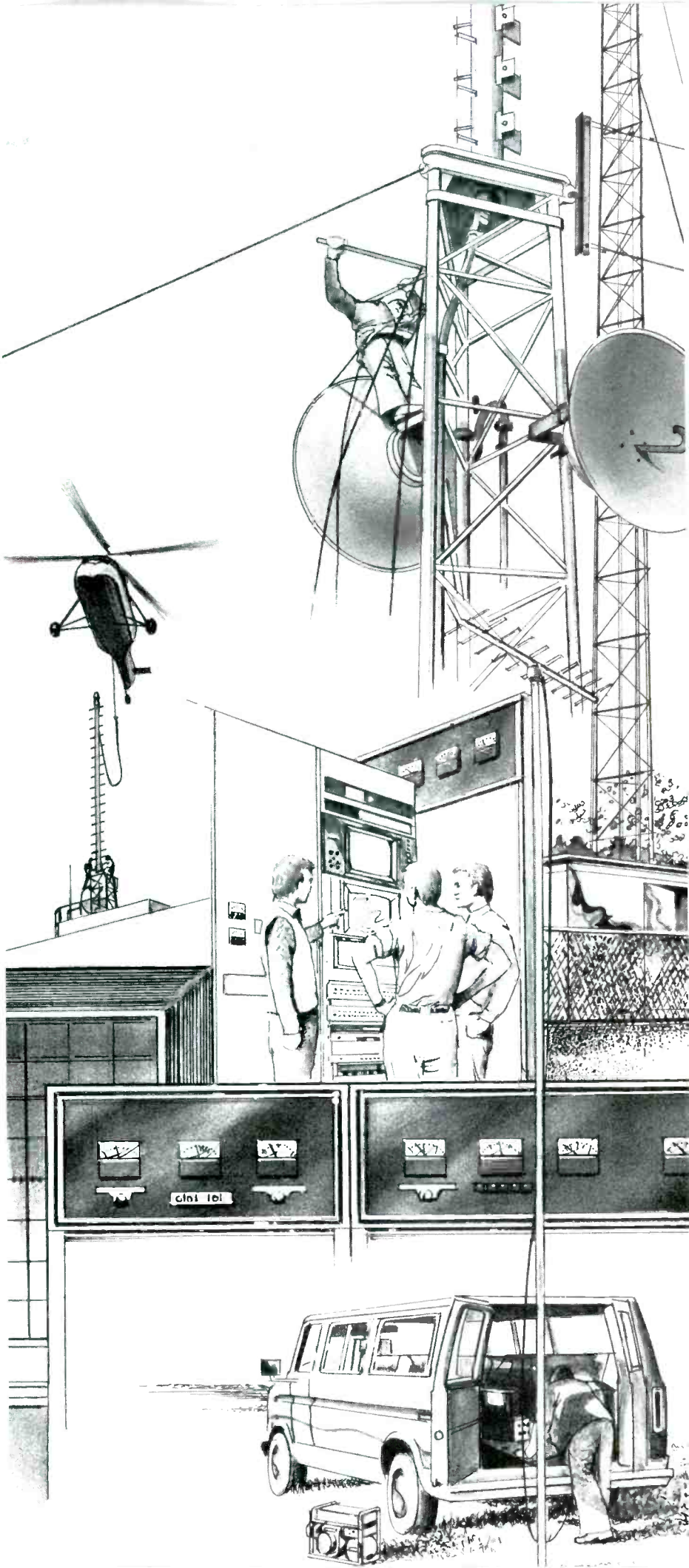

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A satellite overview

The broadcaster and the bird

By Dennis Ciapura, general manager of telecommunications, Greater Media, East Brunswick, NJ

The same satellite communications technology that was a broadcasting special event a few years ago is common broadcast engineering practice today. The elimination of FCC licensing for non-common carrier downlinks and the introduction of low cost 5-meter TVROs will make having downlinks a practical reality for virtually all TV stations.

By the mid '70s, the 5-meter TVRO was the CATV standard downlink system. Addition of a new wave of broadcast 5-meter downlink requirements resulted in an expanding hardware industry with pressures to reduce costs.

Now that TV broadcasters have learned how to use satellite technology, we see a new trend toward the design and installation of higher performance systems. Today, a fully motorized, remote-controlled and frequency-synthesized 7-meter TVRO can be purchased at a lower cost than the 5-meter fixed downlink of a few years ago. The incremental increase in cost for a good system has become so small that when site preparation costs are taken into consideration, it makes sense to buy a high performance system.

There has also been a revolution in LNA design and production. Simple, inexpensive, solid-state LNAs now exceed the performance of the older, sophisticated parametric amplifiers. The new devices are more reliable besides costing a fraction of what the older units did. It is this LNA revolution along with the low cost antenna systems that make the satellite business a lot of fun. Not so long ago, cost restraints had engineers carefully designing systems that stayed just

above threshold; a 46dB video signal-to-noise ratio was acceptable. Now we look for a much better gain/temperature with video signal-to-noise ratios of more than 55dB and 4-5dB of margin above threshold.

Local TV coverage

Satellite remotes have become a way of life at the more aggressive news departments. It is not too unusual to find a local station sending ENG crews to another city to produce a satellite-sending news remote of special interest to the folks back home. In cities where common carrier video facilities such as the Western Union and Greater Star Link earth stations exist, a telephone call is all that is needed to arrange for the space hop back home. Many news departments at network-affiliated stations are finding that their own satellite coverage adds greater depth and meaning to what they get from the network because the same news item is covered with a hometown perspective.

Satellite radio

A new era of radio program distribution is evolving. Since the inception of radio networks, it has not been possible to distribute wideband audio on a nationwide basis at reasonable cost. Audio networking became synonymous with 5kHz response. This meant that music specials had to go out on tape or disc, and regular music programming was out of the question.

All of this is about to change. ABC, CBS and NBC are scrambling to get all digital audio distribution network on line. With digital techniques, 15kHz stereo circuits with signal-to-noise ratios of more than 65dB and negligible distortion are at last a reality. UPI, AP and Mutual have had SCPC satellite distribution systems in place for a couple of years now. Several new music syndicators have begun transmission via SCPC and audio subcarriers on satellite video. However, the new digital audio networks really herald the en masse debut of satellite radio.

Most of the companies distributing network programming via satellite feel that the radio stations should own the dish and LNA, while the networks retain control and ownership of the inside receiving and demuxing equipment. This would simplify matters if digital networking occurred. The networks would take care of the hardware installed at the station and that station could reimburse the network as part of the affiliate's agreement.

This situation makes sense because the stations will want the flexibility of changing affiliates occasionally and to use their dish to pick up off-network special programs from other syndicators. The station would need to own and control its satellite antenna, but each programming supplier could supply the appropriate inside equipment for reception of its product.

It would be nice if all satellite radio services wind up on the same satellite, but it seems unlikely to happen for two reasons. First of all, so much of the existing bird's capacity is already tied up with other services (video and message). It would be difficult to find enough space for all existing and planned audio services on the same satellite. Secondly, it would be impossible to coordinate the activities of so many different companies and efficiently schedule the required transponders without moving a lot of prior users, leaving unused space indefinitely. This is an expensive proposition.

It looks as though the radio dish will be jumping around from bird to bird. One possible solution that the radio

industry might organize and promote would be the launch of an all-radio satellite. This would be an unwieldy venture at best, because each participating co-venturer would want a transponder at a rate less than or equal to his present situation. This service would probably have to sell at a different rate for different users, because everyone is presently paying a different fare. A low uniform rate would solve that problem, but the economics of a space launch in today's financial environment would make that a difficult objective to achieve.

AT&T is currently working on its own satellite network for both video and audio. Ordering a satellite link will soon be as simple as ordering an AT&T longline. Although the AT&T satellite networking display at the 1981 NAB Convention in Las Vegas was impressive, FCC approval of the necessary tariff provisions was not forthcoming. That demonstration actually showed what AT&T *would* do in the near future, rather than what is available now.

NBC recently announced that it would be the first TV network to employ the AT&T satellite distribution system. This is really no news to many affiliates who thought it had actually become a reality before last year's NAB. However, the tariff had not been approved.

The forecast has now improved and if the quality of the satellite network is as good as everyone expects, it should be a big hit in the industry.

If you are wondering what's going to happen to the terrestrial networks, remember that wideband channels are super-trunked-data transmission conduits. In this age of ever-expanding message transmission requirements, no transmission medium is likely to be nonproductive for long.

All in all, an extremely exciting decade is ahead for broadcasters and people who run the birds. The telecommunications industry is now heralded as *the* growth business of the '80s and broadcasters will play a significant role in that growth process.

Before high performance systems were developed, live TV was the norm. Today we see very little live television and most of us (those not involved in sweating bullets on the production end) delight in the treat of an occasional live program. Who knows, some day perhaps we will feel a little nostalgic as the character generator declares live *via terrestrial*. □

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Circle (67) on Reply Card

SCA technology: Broadcasting digital data

By Brent Sylvester, director of engineering, Radio Data Systems Inc., Salt Lake City, UT

Digital transmission over SCA channels will play a major role in the new information vending industry. The SCA generator that used to feed Montovani into elevators and offices is now sending a digital signal into brokerage offices, banks and grocery stores.

Technological advances have almost eliminated any degradation problems that may have existed during earlier audio transmission over SCA channels.

Since the first digital SCA broadcast in 1975 over WCLR-FM, Bonneville International's Skokie/Chicago station, about 100 FM stations have increased their SCA revenues by switching over to digital signals.

All seven Bonneville FM stations broadcast digital SCA services for Radio Data Systems Inc. The digital data is used by commodity brokers and hedgers to obtain instantaneous commodity information; by banks to prevent fraud; and by supermarkets and merchant wholesalers for fraud control and price changes.

So far, experience with digital SCA transmission has eliminated the fears and complaints expressed by engineers about SCA channels in the past. Citing problems of crosstalk, lowered headroom, and reduced range for the main channel, SCA transmission had not been worth the bother to many engineers.

But times have changed. Technical advances have improved the SCA signals in these areas and made it an attractive and profitable opportunity for FM stations.

Crosstalk

An example of the problem with SCA was evident when listeners called up complaining of hearing undertones of Muzak mixed in with their rock-and-roll. No crosstalk problems have been experienced with the digital SCA signal. Figure 1 shows an actual test at KSFI-FM, Salt Lake City, which indicates that the data signal is well below -60dB in the stereo region of the baseband. In digital broadcasts since 1975, and now extending to a national SCA network, not one listener complaint about datastream interference with the main channel has been received by a Bonneville station.

The digital signal, being a pulse-code modulated datastream of many time-multiplexed channels, does not leak through the way background music systems can.

The only problems of interference have been experienced with the main channel leaking into the SCA, rather than the reverse. In these cases, there is usually a problem with the setup of the transmitter, exciter or stereo generator.

Another problem that has plagued SCA users in the past has been the "beat" note. This is caused by spurious signals that can be present in the output of the stereo generator or SCA generator (usually the 3rd and 4th harmonic of the pilot beating against the 67kHz subcarrier). Getting rid of the "spurs" is the first step toward getting rid of any beat tones or beat frequency products and optimizing the main channel modulation. Figures 2 and 3 also show an actual test at KSFI-FM. When compared to Figure 1, it should be noted that no additional spikes are generated when the data signal is added to the carrier.

When a beat note problem was encountered at WCLR-FM in Chicago, Radio Data Systems brought in an audio spectrum analyzer to fine tune

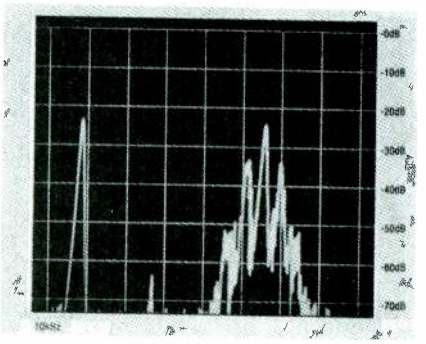

Figure 1. Baseband spectrum modulated with pilot, 38kHz and SCA. The SCA is modulated with visual signal (referenced to 100% modulation).

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Circle (70) on Reply Card

the stereo and SCA generators, nulling out the spurious signals. At the same time, using the audio spectrum analyzer to clean up the system, a small increase in headroom was created, which gave a generally superior sound. As demonstrated here, the use of the SCA actually resulted in an improvement in signal quality.

As a result of this and other experiences in various markets, it is the policy of Radio Data Systems to take its own testing equipment into stations in which they are proposing to lease an SCA, and to help the station engineer optimize his facility in this manner. Also, they will return as necessary to ensure maintenance of a high quality signal.

Headroom

With an average of less than 10% SCA injection, there is a loss of roughly 8/10 of one decibel of dynamic range on the main channel. Although a modulation loss of less than one decibel may be measurable, it is inaudible, and the gain in dynamic range from the use of modern processing techniques can easily exceed that. The idea that a less than one decibel drop is going to make the station significantly less loud or hurt its market position has not proven to be the case. Bonneville stations run their SCAs full time and still maintain their market positions, particularly in the Beautiful Music sector, where a good clean signal is vital. It is possible to use any audio processing, or no processing, or run the SCA at 10% injection, and still have the cleanest signal in the market.

Range

Many engineers believe a 10% average SCA injection will result in a 10% reduction in signal strength or range. It is believed also that SCA operation causes a significant loss in effective power. However, an examination of the change in power distribution due to the SCA will show differing results. The SCA causes a set of sidebands to appear on either side of the main carrier. (The second and higher order sidebands have a negligible power contribution in this situation.) The amplitude of the sidebands can be found by taking a Bessel function of the modulation index. For 10% injection (7.5kHz deviation), the Amplitude Ratio (A) is:

$$A = J_1(7.5\text{kHz}/67\text{kHz}) = 0.05582$$

The ratio of power in each sideband to total transmitter power is the square of the amplitude ratio. The total power in the two SCA sidebands (P_s) relative to total transmitter power (P_t), therefore, is given by:

$$(P_s/P_t) = 2A^2 = 0.006232.$$

Thus, only about 1/160 of the available power is used in the SCA sidebands.

In practice, station power and SCA operation are largely unrelated. The question of whether or not the station can be received at a particular receiving site depends on the ratio of received signal strength to the quieting threshold of the FM receiver. Changes in power affect that ratio; addition of an SCA does not. Therefore, the use of an SCA does not affect signal reach. If the station can be heard without SCA injection, it will still be heard just as well with SCA injection. The little that is given up is modulation, not carrier power, and it is carrier power that is responsible for getting the signal to the listener.

Experience has shown that running an SCA requires tighter engineering standards, which are not hard to meet and, when met, give a cleaner and more competitive signal on the main channel.

The benefits of digital SCA broadcasts do not go only to the customers of the SCA service. With a multitude of data channels available, Radio Data Systems' engineers are now addressing the possibility of returning metering and other data from the transmitter for station use in auto logging and control systems.

The added hardware for digital SCA broadcasts—an incoming line and modem, and a transmit controller to provide the digital signal—so far have proven to be no problem at all, requiring virtually no maintenance or attention by the station engineering staff.

After six years of development, digital SCA broadcasts are a painless reality. It is not an experimental technology, but one that is proven. The bugs have been worked out in the lab, rather than on the air. SCA offers a new source of income to station owners and may help add a third law to the unwritten axioms of broadcasting: When the ratings go up, it *just may* be the engineering. □

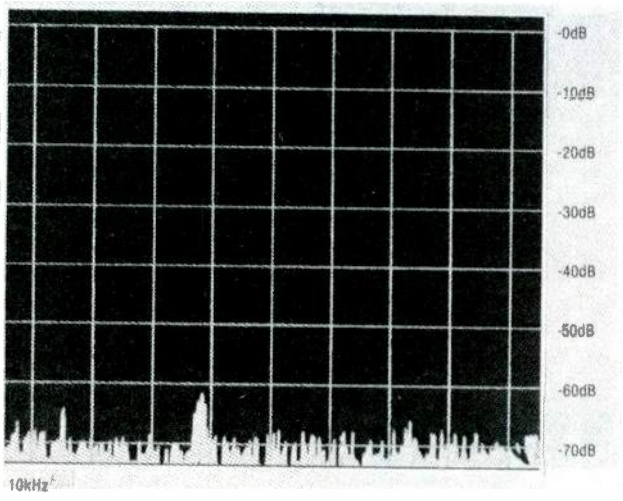

Figure 2. Baseband spectrum, no modulation (referenced to 100% modulation).

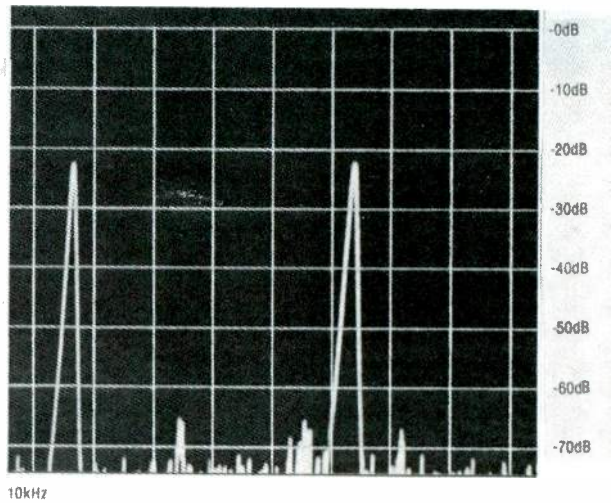

Figure 3. Baseband spectrum, modulated with pilot, 38kHz and unmodulated 67kHz SCA (referenced to 100% modulation).

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TVRO satellite receiving antenna source guide

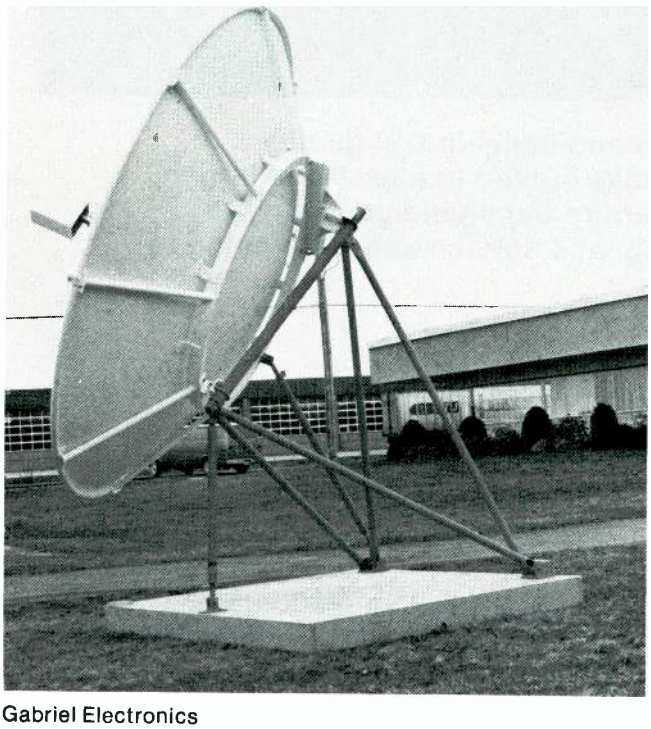
By Carl Bentz, technical editor

In 1962 the Telestar satellite was placed into orbit around the earth. From a low orbital altitude (100-150 miles), Telestar was used for satellite relay of TV signals using tracking antennas. The low altitude with high orbital velocity reduced its usefulness, because only a small portion of the orbital path was visible to earth stations for an extended period of time. However, the project did prove the feasibility of the satellite relay station concept.

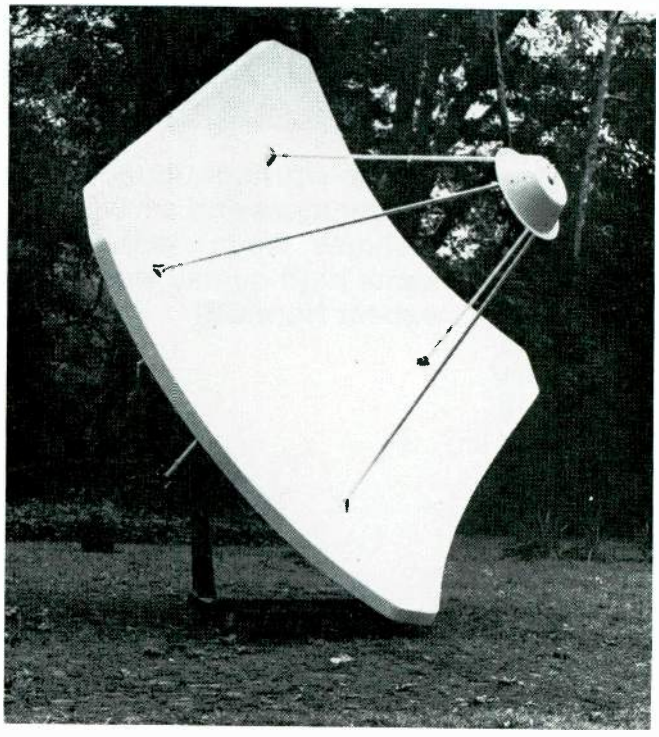
In 1963 the Syncom experiment by Hughes Aircraft put a satellite into geostationary orbit at approximately 22,300 miles above the equator. Traveling at the same angular speed as the earth's surface rotation, the earthbound signal beam covered a predictable, specified area. Communications with the satellite were simplified because *fixed* antennas could be used for both transmit and receive functions. Small rockets on the satellite provided housekeeping control (location correction) as the geostationary satellite technology evolved. Currently a life span of seven years is common for such satellites, dependent upon the need for housekeeping fuel expenditures. Power for the electronics is provided by solar panels with backup batteries. These batteries are needed because of the daily eclipsing period, which lasts less than two hours.

Today the arc considered usable for American communications satellites has become crowded. Spacing between *birds* has been set at a minimum of 4° to avoid undue and excessive interference between the units. Operating in two frequency bands (6 and 14GHz earth transmit, 4 and 12GHz earth receive), numerous services are handled by these satellites. The multiple transponders are frequency spaced and use vertical and horizontal, as well as circular polarization to separate signals that include data, voice and TV transmissions.

Distribution via satellite was at first used mainly by cable TV systems. Network television got into satellite transmission distribution in March 1978 when the Public Broadcasting Service (PBS) initiated its satellite interconnect system. That system now reaches 268 affiliate stations; most of them are using receive only terminals. Full-time leasing of three transponders on the Westar I satellite allows PBS to offer delayed program transmission across the United States, thus reducing individual station videotape machine wear and tear, yet placing a program in the right time frame for a particular area. With a primary uplink just outside Washington, DC, additional materials may be beamed up from other uplinks scattered around the country. Mobile transmit units may be moved to other locations as required by programming materials. Three additional frequencies are occasionally leased for the PBS operation when special material (for example, teleconferencing, sports coverage or Congressional coverage), might interfere with information normally carried on the regular transponders. The system has been



Gabriel Electronics



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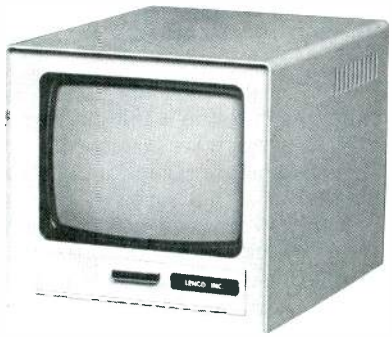
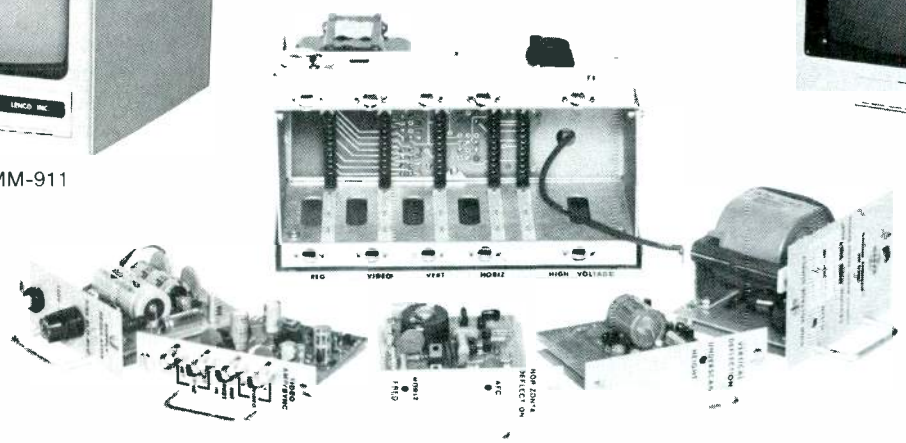
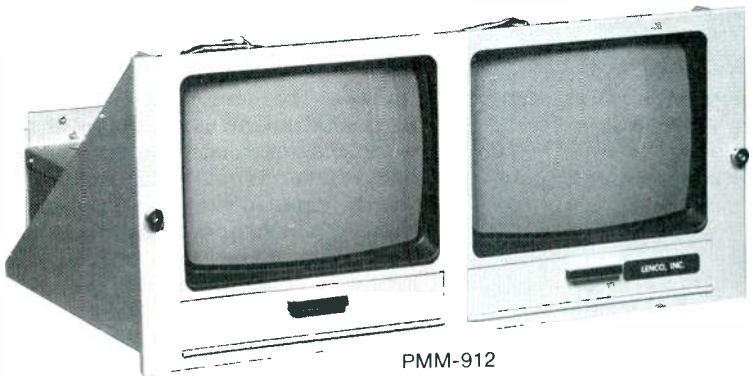


PMM-911

PMM-942



Modules



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Circle (72) on Reply Card

Source guide

In an effort to provide information about purchase of earth station antennas, the following table indicates some of the systems available from manufacturers.

Check List / Company	Model	Transmit/ Receive	Receive Only	Diameter (meters)	Frequency (GHz) Uplink	Frequency (GHz) Downlink
Andrew Corp.(250) (Notes 1,2)	ESA12-46	X	...	12	6	4
	ESA12-46HP	X	...	12	6	4
	ESA12-46CP	X	...	12	6	4
	ESA10-46B	X	...	10	6	4
	ESA10-46HP	X	...	10	6	4
	ESA5-46B	X	...	4.5	6	4
	ESA5B-4	...	X	4.5	...	4
	ESA5A-4HPA	...	X	4.5	...	4
	Various	X	...	Various	14	12
Anixter-Mark(251)	HES-4012OSD	...	X	3	...	4
	HES-40200SD	...	X	5	...	4
California Microwave(252) (Note 3)	SAT4	...	X	1.2	...	4
	SAT6	...	X	1.8	...	4
	SAT10	...	X	3	...	4
	SAT15	...	X	4.6	...	4
	C6040	X	...	10, 11, 12	6	4
Compact Video(253) (Note 4)	C-42	X	...	5	6	4
Compucon Inc.(254)	Consultants	...	...	...	...	...
COMSAT(255) (Note 5)	MBTA	X	...	5-10	6, 14	4, 12
Comsearch Inc.(256)	Consultants	...	...	...	...	...
Dalsat(257)	...	...	X	10, 4.5, 3, 3.6	...	4
	...	X	...	4.5, 5	6	4
Downlink(258)	Skyview I	...	X	8'	...	4
	Skyview I	...	X	12'	...	4
Fairchild(259)	SDX	X	...	5, 9	6	4
Fort Worth Tower Co.(260)	FWT-5	...	X	5	...	4
	FWT-3.5	...	X	3.5	...	4
	FWT-7	...	X	7	...	4
Gabriel Electronics(261)	ES-10	...	X	3	...	4
	ES-12	...	X	3.7	...	4
	ES-16	...	X	4.9	...	4

Note 1: HP configurations exceed US and CCIR pattern recommendations for greater frequency coordination in frequency-congested areas.

Note 2: CP configurations are specifically designed to use with Intelsat Satellites.

Note 3: All sytems designed to handle program audio material; also SAT6, SAT10, SAT15 designed for data transmission; C6040 handles data, program, audio or television.

Note 4: Mobile uplink/downlink system with Scientific Atlanta 5M parabolic antenna.

Note 5: COMSAT: The multibeam torus antenna MBTA can be used for transmit/receive operation with up to seven satellites simultaneously.

found to be more reliable and of higher quality than the previous interconnect used by PBS via terrestial microwave and telephone line circuits.

NBC, CBS and ABC have used satellites for program material transfer from their East and West Coast headquarters, as well as distribution. Several organizations now transmit commercial materials to specified stations for recording and subsequent distribution to user stations.

Nearly every day newspapers in communities served by CATV systems proclaim a new service to CATV subscribers via satellite. The effects of satellite relay of television has had effects in many areas, cutting into the local broadcasters' revenue, as well as the income of movie houses. As equipment for the 12/14GHz spectra and beyond come into play, with direct broadcast (DBS) and possibly high-definition television (HDTV) services, many developments are yet to come.

One of the unbelievable aspects of satellite transmission is that the signal quality, having traveled more than 45,000 miles before reception, is often better than a signal received from a station only 10 miles away. That quality is the result of technologies that have improved the noise figures of amplifying devices. Thanks to space research and the need for communications across millions of miles distance (such as the recent Voyager passes near Saturn), the equipment for satellite TV use is capable of far more than is required. For example, the following is a typical situation involved in receiving a signal.

The uplink transmitter is used with a high gain directional antenna to focus the signal on the satellite locale. The satellite transponder, however, is expected to cover a rather large footprint (the area covered on earth by a usable signal level). Directivity of the antenna is broad and power output from the transponder cannot be massive. There are, after all, up to 24 individual channels on many of the birds. Suppose that the output power level is in terms of 5W. Remember that the inverse square law applies to transmitted radio-frequency signals. Then the signal that reaches the receiving antenna reflector may well be in the -120dB mV range. (0dB mV is considered a good range for regular TV reception, while -15dB mV often is a totally unacceptable signal.) The design of the antenna must play a ma-

Company (Check List)	Model	Transmit/ Receive	Receive Only	Diameter (meters)	Frequency (GHz) Uplink	Frequency (GHz) Downlink
Gardiner Communications (262)	1300 Series	...	X	3	...	4
	1561	...	X	5.6	...	4
H&R Communications (263)	10	...	X	3	...	4
	13	...	X	4	...	4
	16	...	X	5	...	4
	20	...	X	6	...	4
	12'	...	X	12'	...	4
Harris Corp.(264)	5241 Fixed	X	...	6.1	6	4
	5242 Mobile	X	...	6.1	6	4
	5251	X	...	9	6	4
Holzberg(265)	NEC-790	...	X	1.2	...	12
Hughes(266)	SVRT	...	X	4.5, 5,6	...	4
Jenel Corp.(267)	Consultants	...	...	...	...	...
Ken Shaffer Group(268)	Consultants	...	...	...	...	...
Microdyne(269)	Satro 5M PR-16.4	...	X	5	...	4, 12
	Satro 7M PR-23	...	X	7	...	4, 12
	12' PR-12	...	X	3.36	...	4, 12
Microwave Associates Communications (270)	3700-4.6	...	X	4.6	...	4
	...	...	X	7	...	4
	...	X	...	10	6	4
Microwave General(271)	A-1000	...	...	3	...	...
	A-1200	...	...	12'	...	...
	A-1350	...	...	4	...	...
	A-1644	...	...	5	...	...
	A-1970	...	...	6	...	...
	MX400	...	X	...	...	4
National Microtech Inc.(272)	...	...	X	...	...	4
Pinzone Communications (273)	System	...	X	4.57	Prodelin	4
Prodelin(274) (Note 6)	#138-	...	...	5	6	4
	#137-	...	...	4.6	6	4
	#136-	...	...	3.7	6	4
	#135-	...	...	3	...	4
	#134-	...	...	2.4	...	4
	#133-	...	...	1.8	...	4
	#132-	...	...	1.2	...	4
	#207	...	...	4.6	14	12
	#206	...	...	3.7	14	12
	#205	...	...	3	14	12
	#204	...	...	2.4	...	12
	#203	...	...	1.8	...	12
	#202	...	...	1.2	...	12

Note 6: Antennas only, no LNAs included.

Source guide

jor role in system gain. Parabolic and spherical reflectors have dominated the antenna field for several years, providing gains in the 50dB range. Newer reflector concepts are emerging—toroidal and circular—for multiple satellite reception simultaneously. In every case, the high directivity concentrates on the satellite location, thus excluding a great deal of thermal space noise that would otherwise degrade signal quality.

Beyond the primary reflector a Cassegrain or Gregorian system of elements is employed depending on where the input window to a low noise amplifier (LNA) is located. Passive gain provided by the reflector system has increased the signal into the -70dB mV area for application to the LNA. Using devices such as GaAs FETs, the LNA increases the signal level still more for application to a receiver. In the receiver, frequency selectivity comes into play. Satellite receivers may be fixed tuned (one channel) or frequency-agile across the applicable band. Most are remote controlled. The choice depends on relative costs and need of multiple channels of satellite signals vs. multiple land-based signal-handling facilities. The receiver, within several frequency conversions, provides a proper video and audio signal for application to an STL/TSL link or distribution amplifier at the programming switcher location.

As with any purchases, many questions should be considered before investing in satellite reception equipment. The antenna site should be capable of allowing proper satellite viewing (from approximately 85° to 135° west longitude, with elevation requirements becoming particularly important as one's location moves toward northern latitudes. To decrease the possibilities of interferences from other radio services, the receiving antenna is often located at a remote location with a hardwired link to the studio. A slight depression could be an ideal location for the site, but any shading of the antenna from the satellite, whether by trees or structural materials, should be avoided. Some sheltering from winds could save the antenna system from weather-related damage. A good mounting base with a cement foundation is needed to support the dish. Power should be available for operation of the electronics, as well as motorized pointing adjustments. City zoning ordinances should be considered before site selection is completed.

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Source guide

Antenna selection is also multifaceted. The diameter of the antenna is determined by the service it provides. Generally the larger diameter systems (up to 11 meter) are preferred for TV signal reception for broadcast purposes. The larger diameter, however, does not automatically mean higher gain. Reflector and placement designs will determine the passive gain figures. The smaller-sized dishes are typically used for data communications and voice grade circuits. The decision ranges from 3 to 11 meters. The entry window to the LNA system is also dependent on the design and gain needed. Polarization, whether vertical or horizontal linear or perhaps circular, is determined by the transmitter polarization on the satellite. Some systems may operate with combined linear polarizations. Typically one direction is used for data communications requirements with an orthogonally-oriented polarization for TV uses.

Regulations have eased immensely in regard to licensing of earth stations, particularly in the receive-only service. The FCC is still interested in knowing of new installations and requires certain information before operation. That requirement is far greater if the antenna is involved in receive and transmit service. The prospective earth station antenna user is directed to check with the nearest FCC field office before making final plans.

Check List / Company	Model	Transmit/Receive	Receive Only	Diameter (meters)	Frequency (GHz) Uplink	Frequency (GHz) Downlink
Satellite Communications Network(275) (Note 7)	Simulsat	...	X	16X18	...	4
Scientific Systems Corp.(276)	Turnkey Installations	...	X	3.7	...	4
Scientific Atlanta(277)	8006	...	X	3	...	4
	8005	X	...	4.6	6	4
	8008(LS)	X	...	5	6	4
	8101-5.5	X	...	5.5	14	12
	8010	X	...	7	6	4
	8101-7.7	X	...	7	14	12
	8002A(HP)	X	...	10	6	4
	8007	X	...	11	6	4
Third Wave Communications (278)	TVRO-1	...	X	12'	...	4
United States Tower Co.(279)	Spherical 810	...	X	12'X12' 60'X72'	...	4
	MLF4	...	X	4	...	4
	MDF5	...	X	5	...	4
	MDF6	...	X	6	...	4
	3.4M	...	X	3.3	...	4
Winegard Co. Satellite Communications Div.(280)	SC5010	...	X	10'	...	4
	SC5011	...	X	10'	...	4
	SC5012	...	X	12'	...	4
	SC5013	...	X	12'	...	4
	Mobile available	...	...	...	...	...

Note 7: Simulsat is designed for operation in receive-only from 14 different satellites.

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Glossary of Terms

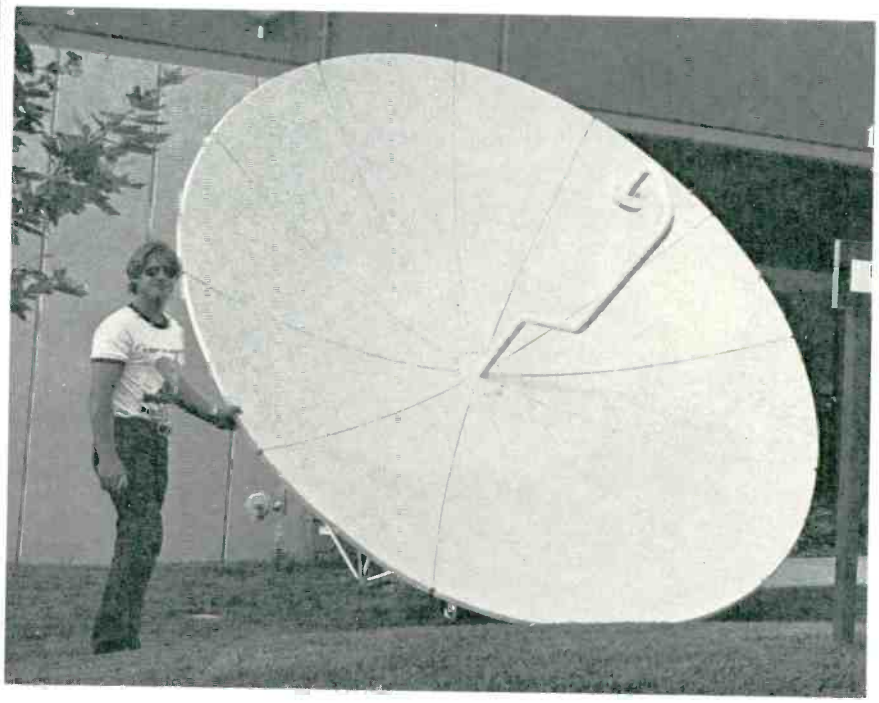
C/I: Carrier to Interference

The ratio in (decibels) of the level of the received carrier above total interfering radio frequency sources such as: (1) satellites other than one desired; (2) terrestrial microwave; and (3) terrestrial radar. Minimum ratio should be 18dB (a received carrier approximately 63 times that of received interfering signals).

C/N: Carrier-to-Noise

The ratio (in decibels) of the desired carrier received to noise detected at the same frequency. Sources of noise may result from: (1) atmospheric absorption; (2) rain attentuation; (3) pointing accuracy of the satellite and earth station antennas; (4) polarization; and (5) satellite and earth station equipment degradation.

Other elements that degrade the signal are: (1) thermal noise (due to motion of electrons, defined by Boltzmann's constant at -228.6 dBW/K); (2) path loss (in geostationary satellite work this loss is ap-



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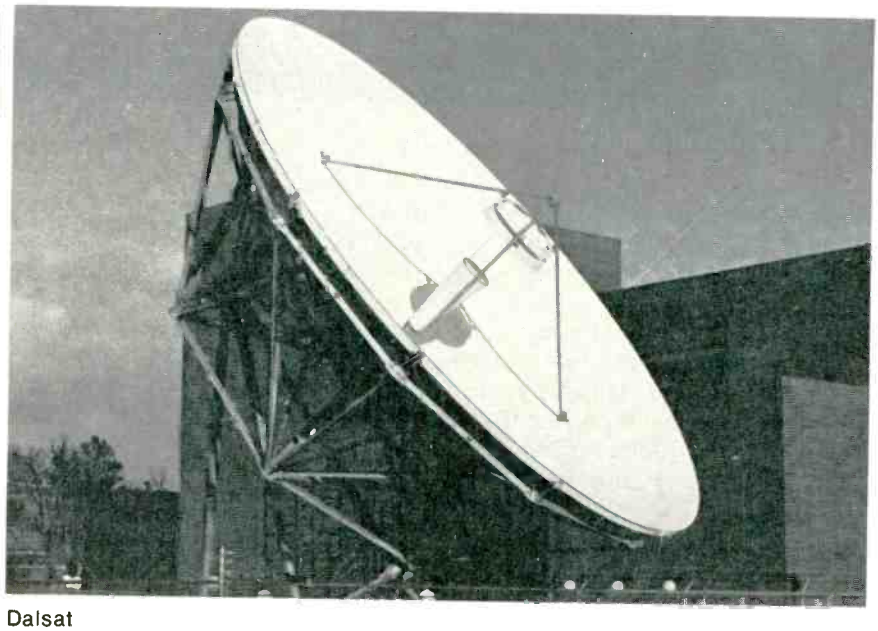


Dalsat

proximately -200dB); and (3) noise bandwidth with noise increasing with bandwidth).

The greatest factor, by virtue of weakening of the received signal after 22,000 miles through space is approximately -198dBW (about 10-18W).

T: System Temperature

In degrees Kelvin (K), system temperature is derived by adding: (1) antenna temperature—consisting of line, sky, ground, rain temperatures—to (2) Low Noise Amplifier (LNA) temperature (K). Typical values—30K for antenna temperature, 100K for LNA temperature.

G/T Figure of Merit

Figure of merit relates the performance of a receiving station (satellite or earth) by considering: (1) carrier-to-noise ratio; (2) FM threshold characteristic of the receiver; (3) free space bars; (4) transmitting and EIRP; (5) bandwidth; (6) thermal noise; and (7) system losses. An average G/T for a small TVRO would be about 23 (dB/K).

EIRP: Effective isotropically Radiated Power

An isotropic antenna is a theoretical radiator with a gain of 1 or 0dB. It radiates equally in all directions. Antennas are passive devices and have no way to creating gain except through directivity.

Isotropic radiators are almost impossible to construct.

However, effective isotropic radiated power is the transmitter power times antenna gain (above isotropic, or dBI) less any transmission line loss.

FM Threshold

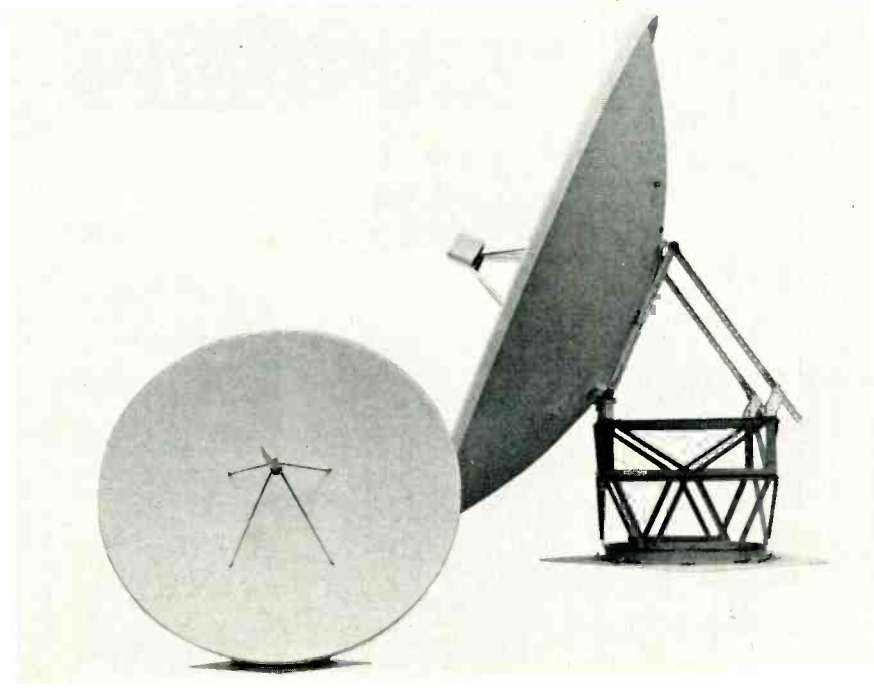
The signal capture point of a receiver. There are two thresholds to consider:

1. Noise Threshold—the point where, for every 1dB increase in the carrier-to-noise ratio (C/N), the signal-to-noise ratio increases by 1dB. This normally occurs above a C/N of 10dB on most receivers.
2. Improvement Threshold—a point close to the noise threshold where the signal-to-noise ratio takes a sharp jump, at least 30dB.

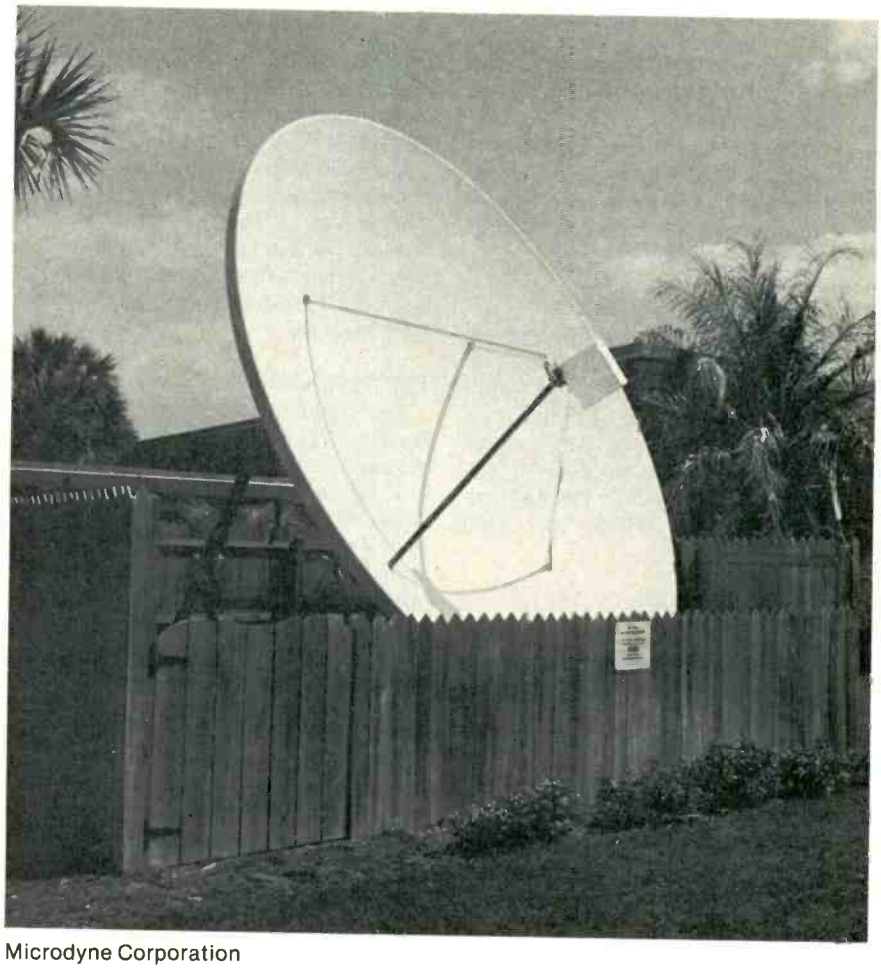
Beyond the Improvement Threshold, the signal-to-noise ratio improves 1dB for every increase of the carrier-to-noise ration of 1dB until the receiver is saturated—that is, the mapping of C/N and S/N is no longer increasing on a one-to-one basis.

C/T: Carrier to Thermal Noise Power

Power measurement will increase



Microdyne Corporation



Microdyne Corporation

Satellite Communications Network

or decrease with bandwidth. The C/T measurement enables calculation of absolute power regardless of bandwidth. It is related to the carrier to noise measurement by the addition of the logarithmic functions of bandwidth and Bolztmann's constant to C/N.

TVRO: TV Receive-Only Earth Station

Receiving satellite TV signals requires a sophisticated system of microwave equipment called a TVRO, that features:

1. Low Thermal Noise – accomplished In some cases by thermoelectric or cryogenic cooling.
2. High Gain – acommplished by using Gallium Arsenide field-effect-transistors, stripline circuits, and parametric amplification.

LNA's are sold with varying gains and noise temperature ratings, e.g. 40K at 55dB to 200K at 42dB, each to fit a particular TVRO application.

ELEV: Antenna Elevation Angle

Depending on the location of the satellite on the geostationary arc and the geographical location of the antenna, the vertical *look angle* or *elevation* will change. Because the location of most of the communications satellites above the equator is between longitudes 90° and 137°, most Eastern US and Canadian stations look to the Southwest, and most West stations look toward the South. Since the orbital location from 90° and 137° appears as an arc above the horizon, the vertical elevation (look angle) will be slightly different for each earth station, varying from 15° to 45°.

Because transmission through more of the earth's atmosphere, stratosphere, and ionosphere (static cover) encounters more thermal noise, higher elevation angles are preferred.

AZ: Antenna Azimuth

Depending on the location of the satellite, on the geostationary arc and the geographical location of the antenna, the *horizontal bearing* or *azimuth* will change. Because the location of most of the communications satellites above the equator is between longitudes 90° and 137°, most Eastern US and Canadian stations look to the Southwest and most West stations look toward the South. Since the orbital location from 90° and 137° appears as an arc above the horizon, the horizontal bearing (Azimuth) will be slightly different for each earth station. □

An in-depth study and analysis of the satellite earth station market

In the mid-1970s, there were fears in some quarters that a profitable market for satellite transmission would never develop domestically, and that the prospect of unused transponder capacity would overhang the entire telecommunications transmission market. The opposite has happened. When RCA's third satellite was lost in space in late 1979 there was near panic on the part of some potential satellite users—demand for satellite channels had already outstripped supply. And the growth in satellite usage was coming not only from the telecommunications industry, but also—in fact most strongly—from the pay TV, cable TV and newswire companies.

Now that the first Satellite Business Systems bird has paying customers, and Comsat pushes rapidly ahead with its Direct Broadcast Satellite (DBS) plans, the satellite earth station market is booming. But with the prospect of strong competition and deep price cuts in some sectors of the market, where are the opportunity areas for the next few years? International Resource Development Inc. has completed an in-depth research report analyzing each sector of the satellite earth station market, and forecasting the probable growth of the market over the next 10 years. The report (#174) costs $985.00, and an abbreviated table of contents follows.

The report contains these 10 sections:

1.) Executive Summary;
2.) The Future Market for Earth Stations;
3.) Projected Earth Station Markets Through 1991;
4.) An Overview of Satellite Systems;
5.) Earth Station User Requirements;
6.) The Technology of Earth Stations;
7.) How Real Is DBS?;
8.) Satellite Teleconferencing Services;
9.) Supplier Industry Structure; and
10.) Leading Equipment Suppliers.

Section 2 reviews the technological and political framework in which satellite transmission has developed, and analyzes the way in which satellites compete with other forms of medium-distance and long-haul telecommunications. A detailed analysis, segment by segment, of a dozen different segments of the satellite earth station market is presented in *Section 3*, which includes a discussion of the requirements of the cable TV market, the newswire, government, marine, hotel/motel, time-sharing and other segments. Current shipment levels and the value of shipments are identified in each case, and projections are provided through

1991 for each of the segments.

In *Section 4* the current and planned future commercial satellites in the United States are identified and discussed, and a brief overview is provided of overseas countries and their use of Intelsat and domestic satellites for domestic traffic.

Section 5 discusses the different needs of different categories of satellite earth station users, and reviews the probable trend toward higher frequency satellite transmission and what this will mean to earth station users.

The technology of satellite earth stations is covered briefly in *Section 6*, which describes the configurations of different types of earth stations and explains the operation of the receiving and transmitting circuitry.

Direct Broadcast Satellites, which carry TV signals directly to home earth station antennas, are reviewed in *Section 7*. Until recently viewed as unlikely because of political (overseas and United States) and technological constraints, DBS is rapidly emerging as a probable entrant to the US video scene in 1985 or 1986. Fueled by Comsat's ample cash and credit, the most ambitious of the DBS plans seems to be on the way toward implementation, and others are close behind. The implications of this are considered, and projections are provided of the probable earth station market potential for DBS.

Section 8 reviews current activities in the market for teleconferencing services and the role played by transportable earth stations in that business.

Section 9 analyzes the present supplier industry structure in the earth station market, and includes estimates of the market shares of each of the leading suppliers of earth stations.

A discussion of the present possible future market positioning and strategies of the principal earth station vendors is provided in *Section 10*, which includes an exhaustive list of suppliers of earth stations and components, identifying the nature of the earth station involvement of each.

The team that produced this study has been involved in several earlier analyses of the satellite communications market, both for custom studies for suppliers in this marketplace and for previous IRD multiclient research reports.

International Resource Development Inc. (IRD) is an independent consulting firm, specializing in the measurement and analysis of technological and financial-services markets. IRD reports have been purchased by several thousand government and commercial organizations for every major country in the world.

For more information, contact International Resource Development Inc., 30 High St., Norwalk, CT 06851; (203) 866-6914. □

Univision: A new Spanish-language TV Network

Univision, a new worldwide Spanish-language TV network has been formed by representatives of Televisa, S.A. (Mexico), Radiotelevision Espanola (Spain) and the SIN National Spanish Television Network (United States).

The new network will be made available to 270 million people in 20 Spanish-language countries with an estimated 35 million TV homes.

Programs will be produced in Spain, Mexico, Latin America and the United States and offered to transnational advertisers. Programming will commence on an occasional basis as a first step toward regularly scheduled network programs, uniting all Spanish-language countries into a single global marketing entity.

The premiere Univision transmission was a 7-hour *Hispanic Day Special*, originating live from New York City, beginning at 12 noon/EDT Oct. 11. The first four hours covered a new and expanded version of the annual Hispanic Day Parade. Pele, the world-renowned soccer star from Brazil, was honored as Grand Marshal.

The parade was followed by a 3-hour musical extravaganza live from Madison Square Garden, hosted by Raul Velasco, a TV personality in the Spanish-speaking world. Velasco lined up top names from Spain, Mexico and other Latin countries to appear in the all-star musical, *Gran Fiesta en El Madison*.

This year, for the first time, the governments of Spain and the Latin-American countries sent bands, floats, dance troupes and marching groups to participate in the Hispanic Day Parade, *Desfile de la Hispanidad*, which took place on Fifth Avenue.

Televisa, Radiotelevision Espanola and SIN carried the entire 7-hour transmission live. The Latin-American nations carried the 3-hour musical.

Univision programming carried nine minutes of commercial time per hour for transnational advertisers. Commercials were uplinked from New York with provision to cut in a local version in any country when necessary.

Pele, recently honored as sportsman of the century, was named Grand Master of Desfile de la Hispanidad, the parade that commemorates the discovery of America.

Raul Velasco, Mexico's celebrated writer, journalist and TV personality played host to the big show in "El Madison," a 3-hour extravaganza featuring Spanish stars. The show was broadcast live by Univision via international satellite to Spanish language countries.

DESFILE de la HISPANIDAD

History of the Desfile de la Hispanidad

In the spring of 1965, the Federation of the Hispanic Societies of New York met to create an annual Hispanic-American parade that would reaffirm the historic significance of North America's discovery by Christopher Columbus under the sponsorship of Spain's Catholic monarchy. In August of that year the Hispanic Societies formally created a parade committee

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Univision

and agreed to "celebrate Columbus Day in the city of New York with a Hispanic-American parade on Fifth Avenue, paying homage to 'Mother Spain,' and honoring all Hispanic nations united by language, culture and traditions." The parade also would promote friendship and understanding among all the people in the world, regardless of their origin or beliefs.

The Hispanic Day parade (now officially called Desfile de la Hispanidad) has been aired locally in New York via SIN Network affiliate WXTV, Channel 41, since 1972. This year, the SIN National Spanish Television Network and the Parade Committee decided to consolidate their efforts to make this year's parade a monumental unification of the Spanish-speaking world accomplished through the use of modern technology. The parade was telecast live network-wide and worldwide via international satellite, as the premiere transmission of Univision.

The parade traditionally commences at 44th Street in Manhattan and proceeds up Fifth Avenue to 72nd Street, pausing at the Presidential Tribunal at 68th Street. Among the countless international personalities who have been honored in the past as Grand Marshal of the parade are the Duke de Veragua, Herman Badillo, Cantinflas, Ima Sumac, Ambassador John Davis Lodge, Maritza Salayero, Miss Universe 1979 and Raul Velasco.

Virtually every Spanish-speaking country is represented in the annual parade with bands, floats, dance troups and marching groups. This year, for the first time, official participation was confirmed by the governments of 20 Spanish-language nations.

Through the years the Parade Committee has been acutely aware of its Hispanic mission and has worked enthusiastically toward the implementation of its original objectives. Today, the parade is one of several activities that can be credited to the committee. The organization also sponsors a literary competition, a Hispanic-American fair, a beauty pageant, a Hispanic-American Mass at St. Patrick's Cathedral, sports competitions among Hispanic youth and a ceremony dedicated to the Consular Corps called "Salute to the Americas." □

station-to-station

Maintaining chopper pulse accuracy

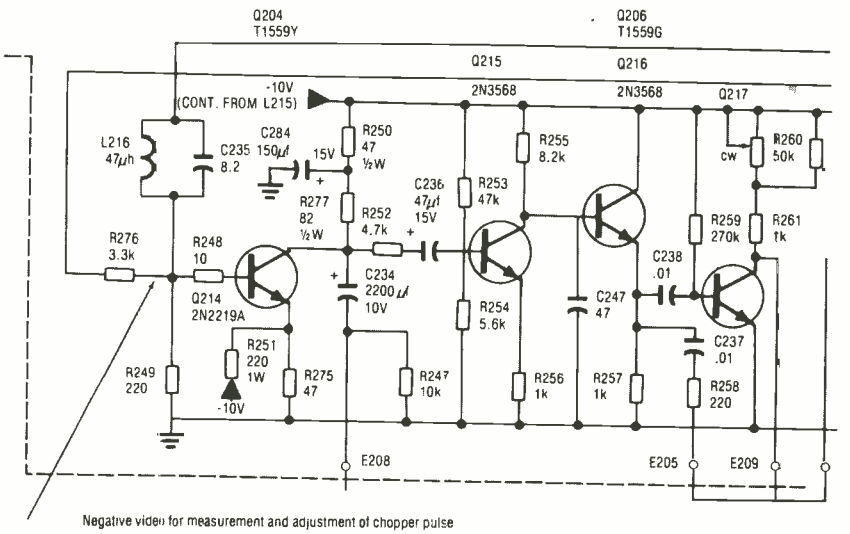
By Robert Banks
Chief Engineer
KBAK-TV, Bakersfield, CA

The Telemet 4501 precision TV demodulator is widely used for transmitter monitoring in both UHF and VHF stations. Stations using this instrument should be aware, however, that the amplitude of the zero carrier reference or *chopper pulse* is adjustable and can exhibit long-term drift. Even a small amount of error will almost certainly result in an FCC citation for improper depth of modulation.

Recently, several stations in California have received violation notices for improper visual modulation. In nearly every case, the cause was an inaccurate chopper pulse. The problem was described to me by an FCC inspector as being *chronic* among 4501 users.

Although adjustment of the pulse is unclear in the earlier versions of the service manual, a Telemet service bulletin describes a rather simple method of measuring and adjusting the pulse. The manufacturer recommends using a dc-coupled oscilloscope with the trace referenced to chassis ground. Scope the signal at the juntion of R276, R248 and R249 on the IF amplifier board. Video with positive-going sync will be displayed. The peak of the chopper pulse, displayed as negative going, should have the same dc level as chassis ground. It can be adjusted with R245.

Portion of IF amplifier board Telemet 4501 TV demodulator.



Negative video for measurement and adjustment of chopper pulse

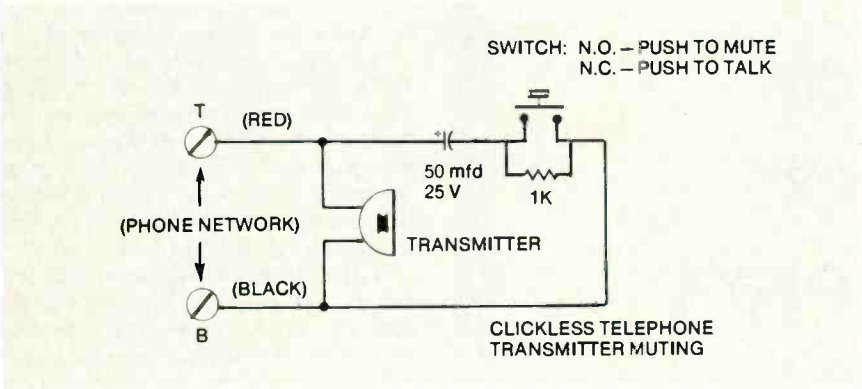
Because this test procedure requires removing the unit from the rack and removing the top cover with the instrument operating, we made one simple modification to facilitate routine measurement. We disconnected the signal to the video test point on the front panel, because it is not normally used. We then ran a wire from the test point to the junction of R276, R248 and R249. We can now measure negative video at the video test point without removing the unit from the rack. Conveniently, there is already a ground test point directly above it.

With this modification, accuracy of the chopper pulse can be verified quickly and easily on a regular basis.

Clickless telephone transmitter muting

By Charles L. Lewis
Chief Engineer
WHSL Radio
Wilmington, NC

The push-button transmitter muting circuits so often used in newsroom telephone handsets have a tendency to produce pops and clicks when activated. The simple circuit presented here neatly eliminates this problem.



Spectrum analyzer measurements

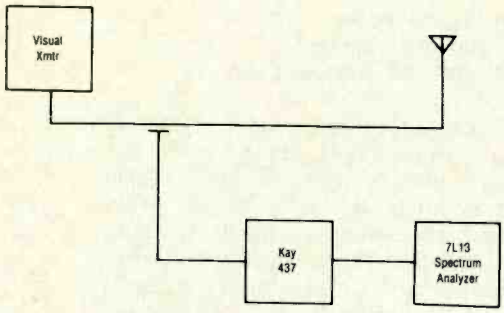
By Clyde A. Parker
Engineering Manager
WOKR-TV13, Rochester, NY

This procedure is used at WOKR-TV for measuring two FCC TV parameters using a Tektronix spectrum analyzer: (1) Reference white level of luminance signal at visual transmitter output, measured below peak carrier as an absolute value to check demodulator calibration. Measurement used VITS as reference white of luminance signal; (2) TV aural transmitter subcarrier injection level necessary to modulate carrier 10%.

VITS reference white measurement

To increase accuracy of measurement, a Model 437 Kay Elemetric 50Ω attenuator with a manufacturer's rated accuracy of 0.5dB was used, thereby limiting measurement error to a single device. The Kay attenuator was placed in line with the directional coupler RF pickup to the spectrum analzyer (see block diagram).

FCC Rules and Regulations Section 73.682 (a) (13) states: "The reference white level of the luminance signal shall be 12.5 ± 2.5% of the peak carrier level." Converting these



Block diagram.

Station-to-station

parameters to decibels below peak carrier (tip of sync):

12.5% below peak carrier	= 18.06dB
12.5% + 2.5% below peak carrier	= 20.00dB
12.5% – 2.5% below peak carrier	= 16.48dB

The 7L13 spectrum analyzer was connected in line with Kay attenuator to an RF directional coupler on the output line of the visual transmitter. The analyzer frequency was tuned to visual carrier at 3MHz resolution, zero span. With analyzer in 2dB/Div. display mode and 20μs Time/Div., the visual carrier was expanded to display a horizontal video signal presentation.

The spectrum analyzer vertical position and amplitude were adjusted to an arbitrary level with tip of sync resting on a graticule line with VITS luminance reference level at an approximate full scale amplitude. Kay attenuator switches were subsequently switched in until VITS reference line was resting on graticule line previously occupied by the tip of sync. Reference white level of luminance below peak carrier is the total of switched in attenuation on the Kay attenuator.

Aural subcarrier injection level measurement

FCC Rules and Regulations Section 73.1570(b)(ii) states in part: "TV stations transmitting multiplex signals on the aural carrier for telemetry, or subscription TV service, must limit the modulation of the main carrier by the arithmetic sum of the subcarriers to not more than 10%.

WOKR uses a 39kHz aural subcarrier as a back-up for receiving remote control data at the studio control point. Because the modulation index for 10% modulation produced by a 39kHz subcarrier is 0.0641, the modulated signal is narrow band FM, and only first sideband components need be considered. Using Bessel Factors for determining the amplitudes of center and sideband frequency components, a spectrum current ratio of 31.2 between modulated carrier and first sideband levels was calculated. Therefore, 10% modulation is attained when 39kHz sideband amplitude is 29.88dB below modulated main carrier amplitude.

The spectrum analyzer was connected in line with the Kay attenuator to an RF directional coupler on the output line of the aural transmitter. The analyzer was tuned, with the following front panel settings, for approximate full-screen display of carrier and 39kHz sidebands:

- 50kHz/div.
- 30kHz resolution
- 300Hz filter in
- 5ms time/div.

Analyzer display vertical centering was adjusted to overlay a maximum amplitude point of 39kHz sideband on a convenient graticule line. Kay attenuator was adjusted until maximum amplitude point of the main carrier was positioned on graticule line previously occupied by 39kHz sideband peak amplitude. Kay attenuator switched in total attenuation of 29.88dB indicates 10% main carrier modulation by the 39kHz subcarrier.

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For more information, contact Gould Inc., Instruments Division, 3631 Perkins Ave., Cleveland, OH 44114. For brochure, call 800/ 331-1000. In Oklahoma, call collect 918/664-8300.

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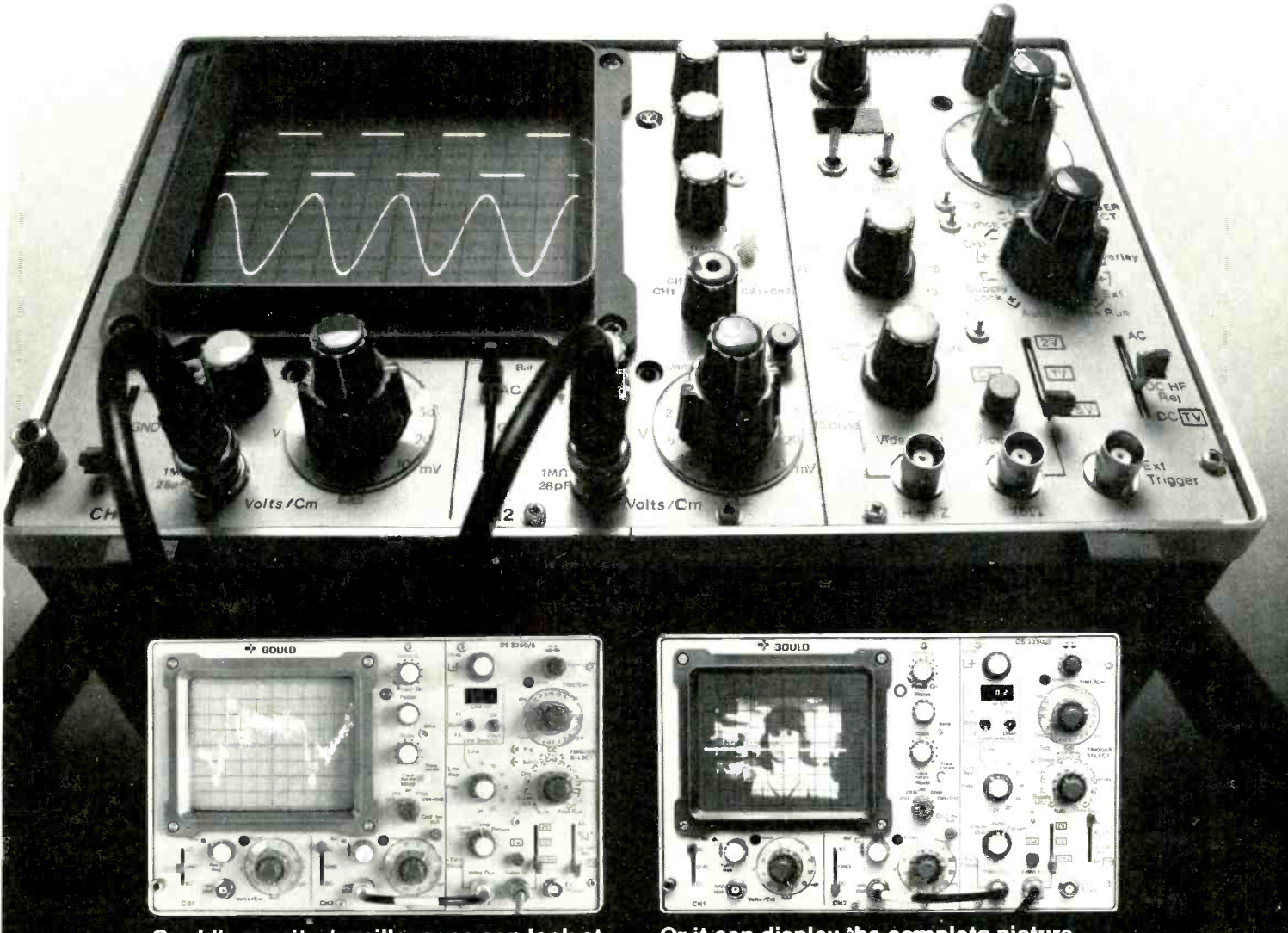

Gould's monitor/oscilloscope can look at a video signal line-by-line.

Or it can display the complete picture, with a bright line indicating the line under examination.

Circle (95) on Reply Card

HDTV

continued from page 70

On the question of cost for the adoption, Flaherty commented that, although broadcasters and film producers will be faced with sizable expenses, the broadcasters will be experiencing a *reinvestment*. On the other hand, for the film industry it will be an initial investment in new hardware, an important financial consideration.

FCC spectrum allocation/ problems and regulatory position

Lukasik emphasized the seriousness of the problem of spectrum availability. Broadcast channels are not available, nor are satellite channels, unless bandwidth-reduction techniques can be employed. The development of 18GHz technology will be necessary to accommodate the 100MHz or greater bandwidth required.

In regard to regulation, the FCC will permit, not mandate, HDTV, and will rely upon industry volunteers to develop the necessary standards. He added that the HDTV standards and implementation must be studied under the context of the broad subject of information transmission.

Transmission, distribution and reception

Green pointed out that, in addition to storage-type distribution on videotape and disc, a transmission technique must be available that permits terrestrial delivery of programs by both broadcast and cable. To date the transmission techniques have been extremely wasteful of spectrum because they are intended to permit the use of the lowest cost receivers and display devices. The high degree of redundancy in the TV picture signal opens the way for bandwidth reduction, particularly by the use of low-cost frame stores in home receivers.

In regard to the home receiver, Powers predicted a marked improvement in receiver performance through the use of frame-store comb filters costing no more than $5, and using 30Hz read-in and 60Hz read-out to improve picture quality.

HDTV development and implementation, however, will require a large investment over the next 5-10 years by industry in production/post-production and transmission facilities, and receiver tooling and components. The major expense for the receiver industry will be in the wide-screen display. He suggested that first HDTV may be used as a production tool for the cinemaphotographer.

Although not scheduled to appear on the program, Donald Fink joined the panel at the request of Joe Flaherty. In concurrence with Powers, Fink commented that the motion picture industry can provide a marvelous test bed for HDTV. From the information and experience gained, the best techniques and system parameters can be selected, and within the framework of the SMPTE organization, a standard can be developed that will be as long-lasting as NTSC.

He further suggested, in view of the direction in digital TV development, that we may want to consider only a component system, rather than composite. Powers questioned the need to eliminate composite transmission, considering the excellent results possible with frame-store comb filters, combined with the continuing reduction in cost of frame stores.

NHK: How, why and when

Sugimoto described the NHK high-definition wide-screen system and reviewed the research that was conducted in arriving at the standards finally selected for their wider audience-reaction tests. NHK has found present-day technology satisfactory for HDTV with stereo sound. Delivery to homes in the future by satellite, cable, film and tape seems promising. Once the public has been exposed to HDTV, they will want the service because of the greater detail, the larger wide-screen picture, and greater sensation of reality. The public expects HDTV in five years, a time schedule that is technically feasible.

The future for high-definition television

The ambitious program sponsored by the New York SMPTE section left the audience with the distinct impression that there has been a dramatic increase in interest by industry and the public alike in high-definition television, and that the technology is available. As a result, we may see an acceleration in the development of universal standards for HDTV and a new, improved TV service to be adopted in the not too distant future. □

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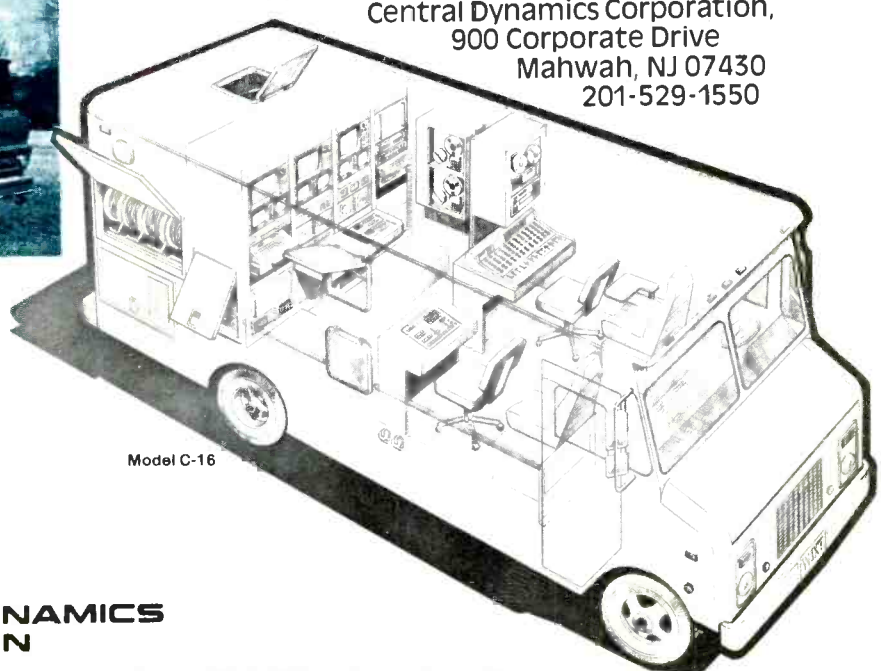

Model C-16

A-10: 10-11' production area, 1-2 cameras, 1 portable VTR, audio mixer, video switcher, audio cart recorder, and ancillary equipment

B-14: 12-14' production area, 2-3 cameras, 1 studio VTR, audio console, production switcher, audio cart and reel/reel recorder, intercom, and ancillary equipment

C-16: *See illustration to right.* 16-18' production area, 2-4 cameras, 1-2 studio VTR's, other equipment similar to B-14

D-22: 18-24' production area, 3-6 cameras, 1-3 studio VTR's, A/V routing switcher, 2 audio cart recorders, telephone system, other equipment similar to B-14

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people

Moseley Associates Inc. has announced the appointment of **Robert Dunbar** to the position of quality assurance manager. Dunbar has a wide background in quality control management.

Bernard Thyssen has been appointed to the position of director of operations for the CATV Division of GTE Products Corporation. Thyssen will have responsibility for manufacturing, materials, product support engineering, product assurance and facilities.

Edward J. Manzo has joined Dynair Electronics Inc., manufacturer of broadcast-quality TV switching and distribution equipment, as manager of their Northeastern region. Manzo recently held a similar position with Audiotronics Video Display Division.

Roy Romijn, former marketing head for System Concepts Inc., has been appointed vice president and manager, special projects for the company. Romijn will concentrate initially on the direction of a marketing program for System Concepts' Quantavision multichannel TV information display systems.

COMSAT General TeleSystems recently announced the appointment of **Victor Schendeler** to the position of vice president, manufacturing operations. In his new position Schendeler will be responsible for all TeleSystems' manufacturing functions including procurement, manufacturing engineering, manufacturing planning and control, production, and test operations.

G. Terry Godwin has been named regional sales manager for C-COR Electronics Inc. Godwin will handle sales for C-COR in Montana, Idaho, Wyoming, Utah, Colorado, Kansas, Nebraska and New Mexico. He will sell C-COR's complete line of cable TV equipment, including broadband distribution amplifiers, main line passives and line extenders.

Bradley E. Hubinek has been promoted to sales development and training manager for Belden Corporation's Electronic Division. Hubinek will coordinate training and recruitment activities, as well as direct Belden's College of Wire Knowledge for electronic distributor sales and service personnel.

Joseph L. Scheuer has recently been elected president and chief operating officer of Chyron Corporation (OTC-NASDAQ). Leon Weissman, former president, will continue as chairman of the board and chief executive officer. Scheuer had been executive vice president of the company and, before that, a vice president since February 1976.

Rupert Neve Inc. has announced the appointment of **David A. Purple** to the position of regional sales manager headquartered in Nashville, TN. Purple will be responsible for sales operations in the Southeast, parts of the Midwest and parts of the Southwest with emphasis on broadcast sales.

Strategic Inc. has announced the appointment of **Marsha F. Adams** as director of the Audio/Video Services Group. Adams will be responsible for research and marketing of

impact analyses and report services pertaining to the production, post-production, transmission and delivery of new information and entertainment services for the cable, broadcast, industrial/professional and consumer market.

Panasonic has announced the appointment of **Neil Blatt** to the position of national marketing manager, Technics Division, Panasonic Consumer Electronics Group. Blatt will be responsible for the overall sales and marketing efforts of the Technics high fidelity audio equipment, as well as assisting in the general operation of the division.

Audiotronics Corporation has announced the appointment of **Christopher Cummins** as sales manager, Video Display Products, Audiotronics European Operations. Cummins will be responsible for developing a broad market for Audiotronics video display products in Europe.

Dennis Baker has been named Eastern region sales manager for the Broadcast Electronic Systems Division (BESD) of Toshiba America Inc. Before joining Toshiba, Baker operated his own video consulting firm.

Harold F. Jones has been named national sales development manager for Ampex Corporation's Magnetic Tape Division. Jones will concentrate on the broadcast market for magnetic tape products and will coordinate new sales programs with the division's field sales organization.

Bruce Blair has been appointed to the new post of vice president of Research and Development, Electronics Division, Lenco Inc. Blair, formerly president of Mustang Electronics of Irving, TX, joined Lenco Inc. in 1971.

R F Technology Inc. has announced the appointment of **Charles E. Bobbins** as operations manager. The company also announced the appointment of **Gerald Homer** as Midwest regional manager.

Telcom Inc. has appointed **Robert L. Richmond** as senior vice president and general manager of Domestic Communications.

Robert L. Manahan has been named director of marketing for Compact Video Inc.'s manufacturing group. Manahan will direct marketing for all manufacturing group subsidiaries including Compact Video Sales Inc., RTS Systems Inc., and Skirpan Lighting Systems.

Rita Terdiman has been appointed director, Advanced Technology, for Warner Amex Cable Communications. Terdiman will be responsible for planning, designing and implementing company-wide information systems capabilities.

McMartin Industries Inc. has announced the appointment of **John T. Beatty, Jr.** and **Ronald J. Mitchellette** as members of the firm's board of directors. Beatty currently serves as first vice president for Smith Barney, Harris Upham & Company Inc. in Chicago. Mitchellette serves as assistant vice president and an officer in the Central Commercial Finance Division of Walter E. Heller & Company in Minneapolis. □

new products

Multi-track recorder

Fostex Corporation of America has introduced the model 250 Multi-tracker, a 4-track cassette recorder with a 4 x 2 mixer built-in. The 250 Multi-tracker provides full multi-track recording and mixing facilities in a single compact housing that weighs 19 lbs. It allows recording on any one track or all four simultaneously.

The 250 features instant punch-in and punch-out capability for each channel and can accept an optional

footswitch for the same function. A digital tape counter with large LED readout comes with memory to permit automatic return to any pre-designated spot on the tape.

Circle (189) on Reply Card

Stereo monitor

C. N. Rood of The Netherlands has announced the introduction of the SMD-203 Stereo Measuring Decoder (stereo monitor).

To measure deterioration in transmission systems that exhibit the quality of the SC-200 Series Stereo Generators, the measuring instrument must not have errors that effect the measurement. The SMD-203 has very low distortion and high channel separation. Specifications include: left to right level difference, greater than or equal to 0.1dB; left to right crosstalk, greater than or equal to 60dB; distortion, less than or equal to 0.1%; signal-to-noise-ratio, greater than or equal to 80dB; and SCA rejection, greater than or equal to 74dB.

Circle (223) on Reply Card

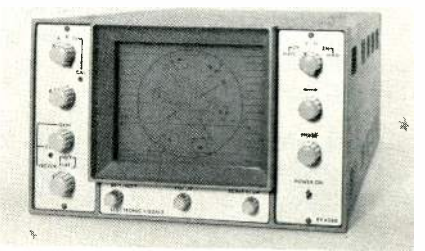
Panner

From *Audio and Design Recording Inc.* comes Panscan to automate pan effects and add dimension to the sound image. The mono mode allows placement within the stereo aural field while the stereo mode cross-pans for image reversing effects. Pan action can be initiated by a variety of rhythms, even an external signal. Depth of the effect is adjustable from 0 to -35dB with respect to the other channel. A 10k Ω input impedance and 1Ω output impedance interfaces into existing systems to provide 0 to -1dB variation from 20Hz to 25kHz, referred to 1kHz. Distortion is reported better than 0.1% at + 15dBm. A noise figure of -80dBm is measured band limited at 25Hz and 25kHz. The system is unity gain with clipping level at + 20dBm output into a 600Ω load. Controls allow selection of pan speed and depth, image offset, internal and external triggering, as well as auto or manual triggering, image freeze, trigger counter set, counter threshold level and system bypass. Rear panel connections are available for trigger input and trigger output. Levels are metered with a 20-segment LED bargraph. Counter information is registered on a 10-segment LED bargraph.

Circle (227) on Reply Card

Waveform/vector monitor

The EV4060 Color Signal Monitor has been introduced by *Broadcast Video Systems Ltd.* and incorporates full waveform and vector monitoring facilities in a single unit. It measures 5¼" high by 8½" wide and is designed to fit beside any rack-mounted picture monitor that has a mounting for an accompanying waveform monitor. The EV4060 features A-B video inputs (en-



coded) with a buffered video output, built-in calibrators, full sweep rates, and high brightness trace.

Circle (201) on Reply Card

10kW transmitter

Acrodyne has introduced a 10kW VHF highband transmitter, the model TT-3500 VH, which has solid-state drive power exceeding 200W. The transmitter uses Hypervapotron® cooling of a single tetrode output stage. Hypervapotron was chosen to provide a quiet, compact system with significant overload capability. All other circuits are broadband solid-state. Visual and aural signals are combined at lower levels and

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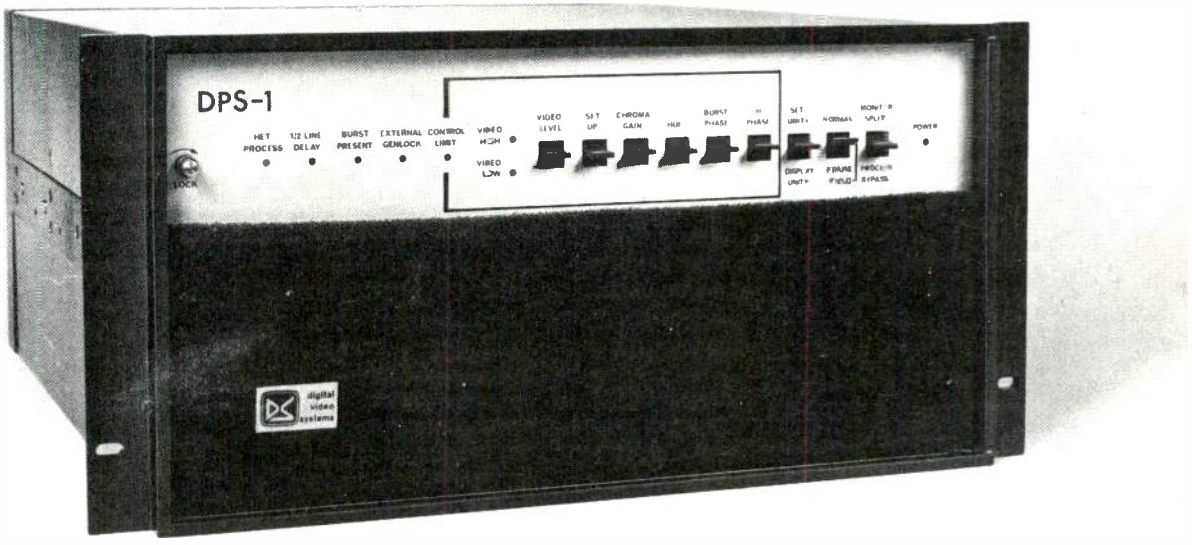

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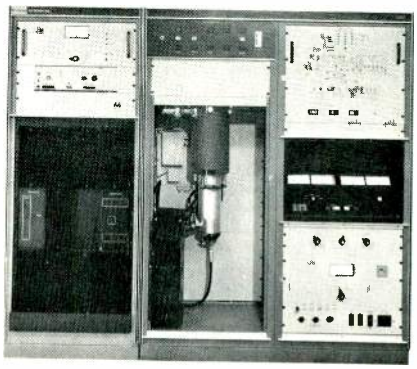


amplified together in the output stage. Intermodulation generation in the transmitter is far below usual acceptance requirements. The tetrode final stage uses a coaxial cavity and has an instantaneous bandwidth exceeding twice the signal bandwidth. Thus, tuning is non-critical and stable over long periods.

Circle (222) on Reply Card

Stereo equalizer

Orban has announced the availability of the new 674A Stereo Equalizer. The 674A is a split-stereo version of the 672A Equalizer. It features eight bands, graphic-type EQ controls, and continuously variable center frequency and bandwidth in each band. Wide-range high- and low-pass filters with 12dB/octave Butterworth slopes follow the EQ section, which can be used as independent, tunable 2-way electronic crossovers. The 674A offers

the features of two complete mono 672A's in the same panel space. Ganged controls allow 1-hand stereo operation. Each of the eight bands tunes over a 3:1 frequency range and offers 16dB boost or cut with reciprocal curves. The high- and low-pass filter sections are continuously tunable over 100:1 frequency range in two decades. Each section is independently switchable. The input is electronically balanced; the output is unbalanced with a balanced option available. Nominal output level is +4dBm with the maximum output level before clipping being greater than +19dBm. Total noise at the output is less than -78dBm, giving a dynamic range of greater than 97dB. THD and SMPTE IM are both less than 0.08% at +18dBm out.

Circle (225) on Reply Card

Digital reverb system

URSA Major Inc. has introduced a new digital reverberation system, the model 8X32. The new unit produces a wide range of natural and artificial reverberation effects suitable for studio, broadcast, live performance and other applications in which clean, high quality sound is important. The microprocessor-based front panel has a separate LED read-out and control for each adjustable reverberation

parameter. The 8X32 also features a bank of 32 non-volatile storage registers that allow users to store and recall 32 complete reverb set-ups and to edit them at will.

Four basic programs are available with the 8X32 ranging from a small, fast-diffusing *Plate* to a large, echoing *Space* simulation. Within each of these programs, 16 decay times can be selected, and the level (eight steps) and delay time (approximately 6-9mS in 16 steps) of both the early reflection pattern and the initial reverberation may be independently controlled. The system has a bandwidth of 8kHz and a dynamic range of 80dB. Controls and displays are available on the front panel, in a remote unit suitable for use on consoles, or both.

Circle (202) on Reply Card

Reverberation system

The XL-121 is the latest addition to the XL—Series of Master-Room reverberation systems by *MICMIX Audio Products Inc.* The new monaural system uses the same technology (patent pending) as its predecessors, the XL—305 and

XL—210. The XL—121 is designed to interface with virtually any audio equipment. The preamp gain control allows the unit to accept a low level musical instrument output such as a guitar, or higher level signals associated with recording and sound reinforcement consoles. The output

continued on page 122

feedback

Figures left out

To the editor:

Thank you for your engineering review of the PRC '81 conference in the July 1981 **BE**, titled "Part 1 PRC '81: A Conference Replay." Although your recap of Bob Gonsett's FM performance seminar on FM intermodulation interference provided some interesting insights, your failure to include the two charts (referred to as Figures 1 and 2 on pages 60 and 62) in the article hindered a full understanding of the lecture.

Jerry Kupfer
Director of Engineering
Inner City Broadcasting Corporation
New York, NY

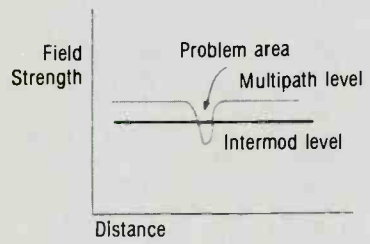


Figure 1

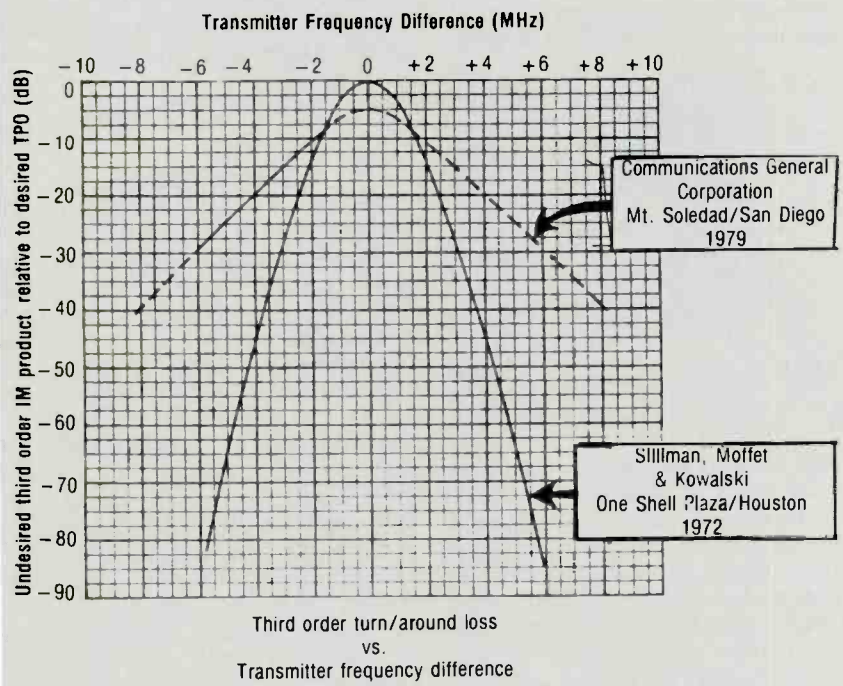


Figure 2

Figures 1 and 2 were inadvertently left out of "Part 1 PRC '81: A Conference Replay." Figure 1 shows how the signal levels of the stations might be viewed if measured over a distance. Note that the multipath results in a notching of the signal strength of the primary station, in this case, station A. Figure 2 shows a graph developed to plot turnaround loss vs. frequency for a station.

Alerting frequency error

To the editor:

On page 51 of the August issue of BE the article titled "Weather Alert Detector" by James Lunacek has an error relative to the Weather Service alerting frequency. The National Weather Service uses an alerting frequency of 1050Hz (1.05kHz) plus or minus .03%. The 567 decoder band width can be anywhere from 14–0% of f_0 depending on the circuit components and input level (≤200 MV, RMS). I believe this information should be furnished to potential users of Lunacek's circuit, which otherwise looks like a winner.

Keith C. Morton, P.E.
Communications Systems Engineer
National Weather Service

New products

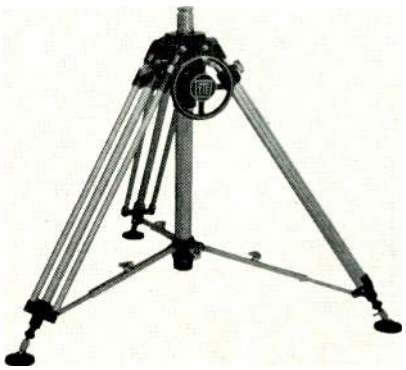
level control permits flexibility in interfacing with other signal processing equipment. The front panel output mix control allows blending of the direct and reverberated signals. The equalization section of the XL–121 is provided to allow the user to tailor the sound of the reverb to exact requirements. Included in this section is a low, mid and high control, all with 12dB of boost and cut.

A dual-colored indicator is provided, which illuminates green when power is applied to the unit. This LED serves as an overhead indicator by illuminating red when near overload condition occurs. The XL–121 incorporates ¼-inch signal connections located on both the front and rear panels. Included on the rear panel is a patch point designed to allow an external equalizer or other high-level effects device to interface directly with the XL–121. Also located on the rear panel is a ¼-inch footswitch connection that permits the reverb section to be footswitched in and out without affecting the direct signal.

Circle (203) on Reply Card

EFP camera tripod system

A tripod system especially designed for EFP cameras equipped with the studio viewfinder package has been introduced by *Innovative Television Equipment*. The ITE-T13 tripod's

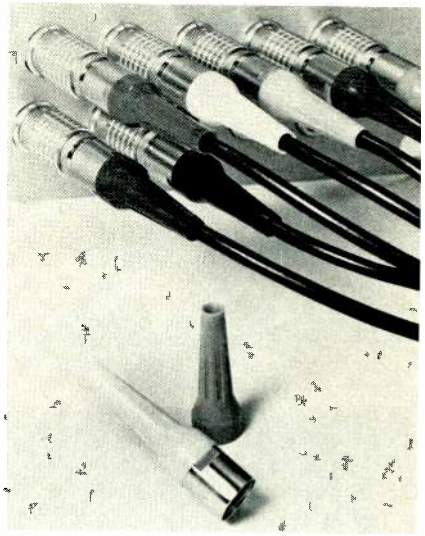


design eliminates radial twisting to the top assembly and legs. The ITE-T13, which weighs 15 pounds, will support cameras weighing up to 60 pounds. The tripod's elevator column allows smooth, rapid elevation with an additional 18 inches of travel. The T13's built-in spyder (tyrod) is adjustable in length for wide angle shots.

Circle (204) on Reply Card

Cable protectors

Lemo U.S.A. Inc. has introduced molded plastic cable protectors that mount directly on Lemo connectors to reduce damage to the cable from sharp bends at the connector-cable interface. When combined with the Lemo collet-type strain relief, the new cable protectors provide a connector-cable transition that grips and protects the cable and ensures the reliability of the connection. Lemo cable protectors are available in 10



colors. This feature may be used to promote color coordination with other components including the cable, or to alert the user to mate certain cable assemblies with similarly color-coded equipment. The cable protector is secured to the connector with a friction fit to a special backnut. It is installed by snapping it in place. Protectors with three different cable entry diameters are offered for each connector shell size.

Circle (205) on Reply Card

1000W inverter

Vanner Inc. has introduced a 1000W Inverter 12 or 24Vdc to 120Vac, which is ideal for mobile production and ENG vehicles. Pulse width modulation with less than 14% harmonic distortion, combined with RMS regulation to less than 2% make the Vanner-Verter Model 20-100X useful for most sensitive applications. Typical in-field systems powered from the unit can include: ¾-inch cassette recorder, sync and color bar generator, transmitter and receiver, audio mixer, color monitor and scope.

Two models are currently available, the ENG Vanner-Verter No. 20-100X for 12Vdc operation provides 1000W continuously with 1500W surge capabilities. Model No. 24-15QX, for 24Vdc helicopter use develops 1500W and surges to 2200. Both are lightweight (26 pounds), compact (6" x 8" x 13"), and efficient (87% and 92% respectively). A built-in, automatic shore power transfer switch is available on both models.

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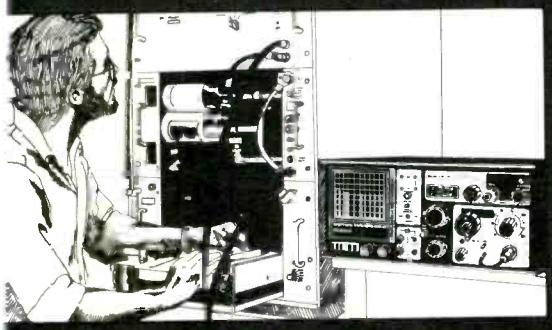

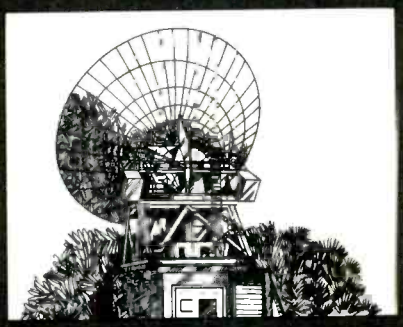

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PROD. & REMOTE EQUIP. SALE: Complete AMPEX RA-4000 Editing System, numerous AMPEX 1200-A's, 1200-B's and 2000-B's, GATES PE-245 Film Camera and PF-12 Multiplexer, HITACHI SK-70, SONY ¾" Recorders, GRASS VALLEY Switchers, CONRAC Color & B&W Monitors, Audio and Distribution Equipment. 35 foot 4-Camera Mobile Unit with PC-70's, GRASS VALLEY 1400-8, RTS PL & IFB, full monitoring and terminal equipment. Thousands of feet of camera cable. For complete listing call: 214-637-2400. 11-81-1t

TIME CODE: SMPTE Specialists. High Speed Reader/Displays, Field Generators, many more problem solvers. Less than dealer cost on many items. DYMA (505) 758-8686. 11-81-2t

AUDIO — 2-Track, Capstan Servo, AMPEX 449-CR Reel to Reel Recorder. The perfect workhorse master. Less than dealer cost. DYMA (505) 758-8186. 11-81-2t

Z-6 EDITOR. By Videomedia. Less than dealer cost. Any configuration. Stores 100 edit decisions. Can produce multiple first generation edited masters. DYMA (505) 758-8686. 11-81-2t

EQUIPMENT FOR SALE (CONT.)

IKEGAMI-350: Best buy in the country. Full warranty. DYMA (505) 758-8686. 11-81-2t

ONE VIDEO MEDIA Z6B SET UP for ¾" Sony system (note: Z6B edition may be updated if required for 1 inch "C" interface or either play or record side). One Sony VP-2260 player ¾" U-matic. One Sony VO-2860A recorder ¾" U-Matic purchase price was $23,500.00 new system price now $13,315.00 firm. One R.C.A. Quad TR-70B color with auto chroma, velco comp, splicers $21,000.00. One R.C.A. Quad TR-70B less auto chroma, and velco comp $18,000.00. Four G.E. PE400 cameras with C.B.S. image enhancers and 3M encoders (three with 15 to 1 lens/one 10 to 1 zoom lens) four under carriage, one lot of spare parts and cable $20,000 total or best offer. Two IVC 500A cameras with C.B.S. image enhancers, 3M encoders R.T.H. 10 to 1 lens and under carriage lens - three years old -good condition $15,000.00 total or best offer. One Computer Image switcher model 381, three bus, one mix effect, eight input, chroma key, boarder line generator — very good condition $7,000.00 or best offer. One Ikegami HL-77 camera with gen lock $18,000.00 firm. One Ikegami HL-35 camera with gen lock $12,500.00 firm. Both Ikegamis used in pro production only — excellent condition. One R.C.A. TH-100 (Sony) 1 inch "C". Excellent Condition $29,000.00. One R.C.A. TBC 100 $12,000.00. One Quant-A-Font Q-VII character generator with dual disk drives and monitor bridge — excellent condition $21,500.00. One Microtime 2020 T.B.C. with velcor and D.O.C. (lease transferred at no charge to qualified leasee) like new-used 60 days $602.17 month. All equipment F.O.B. Atlanta-ask for Jim or Fred Orton or David Byars. Phone: 404-427-9496. 11-81-1t

MISCELLANEOUS FOR SALE

VIDEO T-SHIRTS. TV DESIGNED, preshrunk T-Shirts. Our four designs are; "ENG" and Reg. Chart, "GLITCH", "RESOLUTION" and chart, and "VIDEO PEOPLE DO IT IN SYNC". $8.50 each and $2 handling. Send check and size to: AaRLO ENTERPRISES, 109 MINNA ST., SUITE 254, SAN FRANCISCO, CA 94105. 8-81-tfn

HELP WANTED

ELECTRONIC MAINTENANCE ENGINEERS

The NBC owned and operated television station, KNBC in Burbank, California, has several excellent opportunities for experienced Electronic Maintenance Engineers.

Successful candidates should possess 1-3 years hands-on service experience, preferably from a broadcast station or related activity. Consideration will also be given to individuals with good working knowledge of any of the following: 3/4 inch and 1 inch videotape recorders, audio and video equipment, time base correctors and peripheral equipment. AAS or BS degree in Electronics desirable.

We offer an excellent benefit package, including tuition assistance, salary commensurate with experience. Please send detailed resume and salary history in confidence to:

Employment Office — EME
National Broadcasting Co.
3000 West Alameda Avenue
Burbank, CA 91523

Equal Opportunity Employer M/F

HELP WANTED (CONT.)

TELEVISION HELP WANTED—TECHNICAL: $40,000 + FIRST YEAR GUARANTEED. Our company has grown so quickly in the past 5 years, we are in desperate need of a very special person who knows broadcast equipment intimately and has aggressive sales ability. We are diversifying into other areas and need someone to take over the equipment sales division. Responsibilities include sales of new and used broadcast equipment and further development of equipment sales division as business demands. We are a first rate company and believe in paying top dollar for the right person. Call Bill Kitchen, Quality Media Corp., (800) 241-7878. 9-80-TFN

ENGINEERS, TV Systems Engineers, Electronic Technicians, Technical Supervisors, Maintenance. Immediate openings. Experienced. Full time. Full benefits, plus Pension. Excellent salary plus commissions. Send resume to Technical Operations, Inc., P.O. Box 840, New Hyde Park, N.Y. 11040, or call Personnel Mgr. (516) 352-2238. 9-80-tfn

LORAIN COUNTY COMMUNITY COLLEGE
CHIEF TELEVISION ENGINEER

An administrative position responsible for the area of television operation to include: installation, modification, inspection and maintenance of ¾" video, ENG and editing equipment; CCTV, CATV, microwave, and color studio. Two years college or technical school and demonstrated experience in the set-up, operation and maintenance of the above systems. At least 2 years electronic television experience in an educational TV system and the possession of an FCC license.

Starting salary range is $20,000 to $26,000 contingent upon relevant experience and training. The salary is enhanced by a competitive fringe benefits package.

Send letter of interest, transcripts, resume and letters from three current professional references to:

Gordon L. Fox, Coordinator
Audiovisual/Television Services
Lorain County Community College
1005 N. Abbe Road
Elyria, Ohio 44035

Incomplete files will **not** be considered!

Deadline for receipt of application materials is **December 31, 1981** (postmarked).

An Affirmative Action/Equal Opportunity Employer

SYSTEM DESIGN ENGINEER—CCTV. Must be able to specify, design, supervise installation and de-bug top quality industrial CCTV systems. Experience required. SYSTEM ENGINEER—AUDIO VISUAL and PROFESSIONAL AUDIO. Hands on experience with audio/visual equipment a must. Digital knowledge helpful but not required. Responsibilities include complete job oversee and client interface. Both positions provide paid health, life insurance, vacation, etc. Please call collect 201-288-6130, Stylist Systems, Teterboro, N.J. 9-81-tfn

SALES ENGINEER

For International Market

Broad line of radio broadcast equipment.
Some travel.
Send resume in confidence to: Dept. 551
Broadcast Engineering
P.O. Box 12901
Overland Park, KS 66212

HELP WANTED (CONT.)

BROADCAST MAINTENANCE TECHNICIAN. Maintains, sets up, operates, and repairs audio and video color equipment for public TV broadcast and production facility at West Virginia University. Need experienced applicants with solid electronic background including digital circuits. Prefer applicant with at least 2 years full-time experience in TV. Full benefits available—retirement—medical insurance—credit union—sick leave—vacation—full-time staff use of university facilities—plus other university benefits. Send letter or resume to: Keith Massie, Associate Director of Operations, Station WWVU-TV, P.O. Box TV-24, Morgantown, WV 26507-0897, or Telephone (304) 293-6522. West Virginia is an Equal Opportunity/Affirmative Action Employer M/F. 10-81-2t

ASSISTANT CHIEF ENGINEER, for group owned, net affiliated UHF station in sunbelt top 100 market. First Class FCC license and several years of maintenance experience on all studio and transmitter equipment. Must have desire and ability to move up to chief eng. within a few years. Include salary requirements in reply. Send resume to Steve Weber, Chief Engineer, KFSN-TV, 1777 G. Street, Fresno, Calif. 93706. We are an equal opportunity employer. 11-81-1t

TRANSMITTER TECHNICIANS—Voice of America has career opportunities available for qualified transmitter technicians at VOA stations near Delano, California; Greenville, North Carolina; and Bethany, Ohio. Duties include operations/maintenance of high power VOA transmitters and related facilities on shift basis. Applicants must have 3-5 years recent "hands-on" experience in technical operation of broadcast, TV, or military fixed-station transmitters. U.S. citizenship required. Starting salary $20,467. Full federal fringe benefits apply. Qualified candidates should send standard Federal application form SF-171 (available at U.S. Post Offices) to International Communication Agency, MGT/PDE, Washington, D.C. 20547. AN EQUAL OPPORTUNITY EMPLOYER. 10-81-3t

EXPANDING CHRISTIAN BROADCASTER requires 4 experienced maintenance Engineers. Digital experience a definite plus. Work with State-Of-The-Art equipment and participate in construction of a modern television facility. Also have a need for two experienced videotape editors. Send resume or contact: Don Faso, Director of Engineering, Jimmy Swaggart Ministries, P.O. Box 2550, Baton Rouge, LA 70821 (504) 926-6239. We are an Equal Opportunity Employer. 11-81-2t

TECHNICAL MAINTENANCE ENGINEER POSITION: major Los Angeles FM radio station looking for qualified technical maintenance engineer. Responsible for all areas of operation: transmitter, studio, microwave equipment. First Class FCC license required. 5 years minimum experience. Union position. EOE. Dept. 550, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-1t

TECHNICAL DIRECTOR for educational media operation. Responsible for engineering and production, quality control, compliance with FCC standards, liasion with station, purchasing and maintenance of equipment. Requires first class license, three years experience, including some administrative experience. Reply to: Sharon Edmunds, Chicago City-Wide College, 185 N. Wabash, Chicago, IL 60601. 11-81-1t

BROADCAST MAINTENANCE ENGINEER wanted for growing ABC affiliate in South Florida. Must be capable of maintaining engineering equipment, studio cameras, QUAD, and video cart machine. Two years maintenance experience required. Send resume and salary requirements—Personnel, WPEC-TV, Fairfield Drive, West Palm Beach, FL 33407. EOE m/f. 11-81-1t

ENGINEERING SUPERVISOR for growing ABC affiliate in South Florida to supervise studio engineers and maintenance of engineering equipment, studio cameras, QUAD and video cart machine. Experience required. Send resume and salary requirements—Personnel, WPEC-TV, Fairfield Drive, West Palm Beach, FL 33407. EOE m/f. 11-81-1t

HELP WANTED (CONT.)

ENGINEERING
AND TECHNICAL SALES
POSITIONS

We specialize in the placement of Technical Engineers with Television Stations, Cable TV, Satellite Programmers & Networks, Pay TV, Manufacturers, Industrial TV, CCTV, Production Houses & Dealers. Also, technical sales with Manufacturers & Dealers. All levels, positions & locations nationwide. Employers pay all fees - confidential, professional. Over $3,000,000.00 in Salaried Positions Placed. Employee & Employer inquiries invited.

PHONE/RESUME - Alan Kornish (717)287-9635

KEY SYSTEMS

106 new bridge center, kingston, pa. 18704

TV STUDIO MAINTENANCE TECHNICIANS familiar with latest broadcast equipment, TBC, ¾ tape, E.N.G., etc and a minimum of 2 years experience. Send resume to: KCRL-TV/Engineering, P.O. Box 7160, Reno, NV 89510, EOE. 11-81-2t

BROADCASTING ENGINEER: Excellent career growth opportunities currently exist at a PBS affiliated educational television facility serving Los Angeles, KLCS-channel 58. Requirements: three years experience within the past seven years in a TV broadcasting facility, including responsibility for the operation and maintenance of all technical equipment used in color video production, recording and transmission, and the maintenance of FCC required logs and reports and a First Class Radio Telephone operators license or a general class radio telephone operators license issued by FCC. Salary range is $2,093-2,607 per month. Call for an application: (213) 742-7761. Applications will be accepted until November 20, 1981. LOS ANGELES UNIFIED SCHOOL DISTRICT, P.O. Box 2298, Los Angeles, CA 90051. An Equal Opportunity Employer. 11-81-1t

Se Necesita Director Técnico: La revista RADIO Y TELEVISION necesita un Director Técnico que tenga la habilidad de escribir y leer fluentemente el inglés y español para traducir terminología técnica. También debe tener amplios conocimientos sobre equipo de radiodifusión y teledifusión. Enviar las solicitudes conjuntamente con antecedentes profesionales y requisitos de salario a: Publisher, Radio y Televisión, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-3t

TELEVISION BROADCAST maintenance engineer—Experienced only; familiar with cameras, ¾", 1", 2" video tape recorders, ENG/EFP Equipment. Send detailed resume to Chief Engineer, WKRC-TV, 1906 Highland Ave., Cincinnati, Ohio 45219. 10-81-2t

TV MAINTENANCE ENGINEER... Minimum of 3 years experience. General class FCC license required. An Equal Opportunity Employer. Send resume to: Gene Rader, Director of Engineering, KBIM-TV, P.O. Box 910, Roswell, N.M. 88202-0910. 10-81-2t

HELP WANTED (CONT.)

KIMN-KYGO, Denver, has an opening for a full-time engineer. Minimum five years experience in studio, transmitter and operational requirements. Contact Chuck Waltman, Chief Engineer KIMN/KYGO, 5350 W. 20th Ave., Denver, CO 80214, (303) 234-9500. 11-81-1t

DIRECTOR OF ENGINEERING: For large AM/FM Group Operator with headquarters in the West. Heavy broadcast experience necessary. Responsibilities include directing engineering staffs, planning of facilities installation, purchasing, and maintaining technical standards consistent with sound engineering practices and FCC rules and regulations. Qualified applicants should have strong maintenance background, familiarity with state-of-the-art equipment and operations, proven leadership ability, and administrative skills. Salary open, benefits include company car, expenses plus bonus. Would prefer E.E. degree, but not mandatory. Must relocate to corporate headquarters. Send resume to Dept. 552, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. An Equal Opportunity Employer. M/F/H.
11-81-1t

MAINTENANCE ENGINEER: Looking for technician interested in moving into Assistant Chief Engineer position. Immediate opening at Upstate N.Y. Independent UHF. Must be a self starter with strong maintenance background. Advancement opportunities within growing broadcast group; company paid benefits. Send resume to: Chief Engineer, WUHF-TV, 360 East Ave., Rochester, N.Y. 14604. EOE.
11-81-3t

TRANSMITTER ENGINEERS: Broadcast group needs chief engineer and several assistant engineers. Must be able to run the transmitter and troubleshoot technical problems. Chief must have 1st class license. Willing to consider applicants working towards a 1st. as assistants. Send resume and salary requirements to Dept. 548, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-1t

ENGINEERING TROUBLESHOOTER. Broadcast group seeks versatile radio engineer who is willing to perform international travel as a troubleshooter on short term to one year assignments. Must be able to set-up new stations and rebuild existing stations in order to meet government regulations. Send resume and salary requirements to Dept. 549, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-1t

MEDIUM MARKET CHIEF with first phone and 3½ years experience in AM directionals, FM stereo, automation, proofs & studio construction. Presently working, need bigger challenge. Send replys to: Dept. 547, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-1t

OPERATIONS CREW CHIEF, Studio Engineering: Associate degree in electronics or equivalent, 5 years of technical experience preferably with TV broadcasting studio equipment, with at least one year of a supervisory nature. First Class FCC license preferred. Salary range: $13,790-$21,340, D.O.E. Send resume by October 16, 1981, to Director of Engineering, New Hampshire Public Television, Box Z, Durham, NH 03824, AA/EEO. 11-81-1t

TV/RADIO MAINTENANCE ENGINEER. State-of-the-art television production facility and FM radio station. Minimum 3 years current broadcast maintenance experience. Salary – low to mid 20's. Excellent benefits. Contact: Personnel Services, San Diego Community College District, (714) 230-2110. EO/AA Employer.
11-81-1t

SE NECESITA DIRECTOR TECNICO: La revista RADIO Y TELEVISION necesita un Director Técnico que tenga la habilidad de escribir y leer fluentemente el inglés y español para traducir terminología técnica. También debe tener amplios conocimientos sobre equipo de radiodifusión y teledifusión. Enviar las solicitudes conjuntamente con antecedentes profesionales y requisitos de salario a: Publisher, Radio y Televisión, P.O. Box 12901, Overland Park, Kansas 66212. 11-81-3t

TELEVISION ENGINEER: Excellent career growth opportunities currently exist at a PBS affiliated educational television facility serving Los Angeles, KLCS-channel 58. Requirements: two years of experience operating color video and audio equipment or a certificate of completion of a specialized curriculum in telecommunications from an industry-recognized video production company, the armed forces or a television broadcasting company. Graduation from an accredited college or university with a major in telecommunications may be substituted for the required experience. Salary rangeis $2,093-$2,335 per month. Call for application: (213) 742-7761. Applications will be accepted until November 20, 1981. LOS ANGELES UNIFIED SCHOOL DISTRICT, P.O. Box 2298, Los Angeles, CA 90051. An Equal Opportunity Employer. 11-81-1t

WANTED

WANTED; Pre-1928 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, CA 92054, (714) 722-6162. 3-76-tf

HIGHEST PRICES PAID for 112 Phase Monitors and for clean, 12 year old or less, 1 KW and 10 KW AM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Thorncliffe Park Dr., Unit 28, Toronto, Ontario, Canada. M4H 1H2, 416-421-5631
2-79-tfn

INSTANT CASH FOR TV EQUIPMENT: Urgently need transmitters, antennas, towers, cameras, vtrs, color studio equipment. Call toll free 800-241-7878. Bill Kitchen, Quality Media Corporation (in Georgia call 404-324-1271). 6-79-tfn

WANTED: Radio Transcriptions 16" E.T.'s, any Eddy Arnold, or other Country 15" or 12" Transcriptions. Will consider others. Interested in Radio Station Libraries to purchase, all speeds of records. Boyd Robeson, 2425 W. Maple, Wichita, Kansas 67213, (316) 942-3673, 722-7765 Ev. 9-80-tfn

RENT IT! We offer one of the largest broadcast equipment rental fleets in America. Call or write for your copy of our rental equipment catalog. David Green, Broadcast Consultants Corporation, Box 590, Leesburg, VA 22075. Phone: 703-777-8660. 9-81-3t

WANTED: USED RECORDING EQUIPMENT of all ages and varieties. Mics, outboard, etc. Dan Alexander. (415) 441-8936. 6-81-12t

INSTANT CASH FOR BROADCAST EQUIPMENT: Urgently need UHF Transmitters, Microwaves, Towers, Weather Radar, Color Studio Equipment, AM & FM Transmitters. Call Bill Kitchen, Quality Media. (800) 241-7878. In GA call (404) 324-1271. 11-81-1t

REWARD FOR UHF TRANSMITTERS. Quality Media will pay a $500 reward for information which leads to our purchase of any UHF television transmitter. One reward per transmitter. Call Bill Kitchen, Quality Media, (800) 241-7878. In GA call (404) 324-1271.
11-81-1t

EQUIPMENT WANTED by non-profit Religious organization. Everything needed for a radio and tv station. Tax receipt given for any donation. IGS Broadcasting, 105 W. Jefferson, Fairfield, Iowa 52556. 515-472-9774. 11-81-2t


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