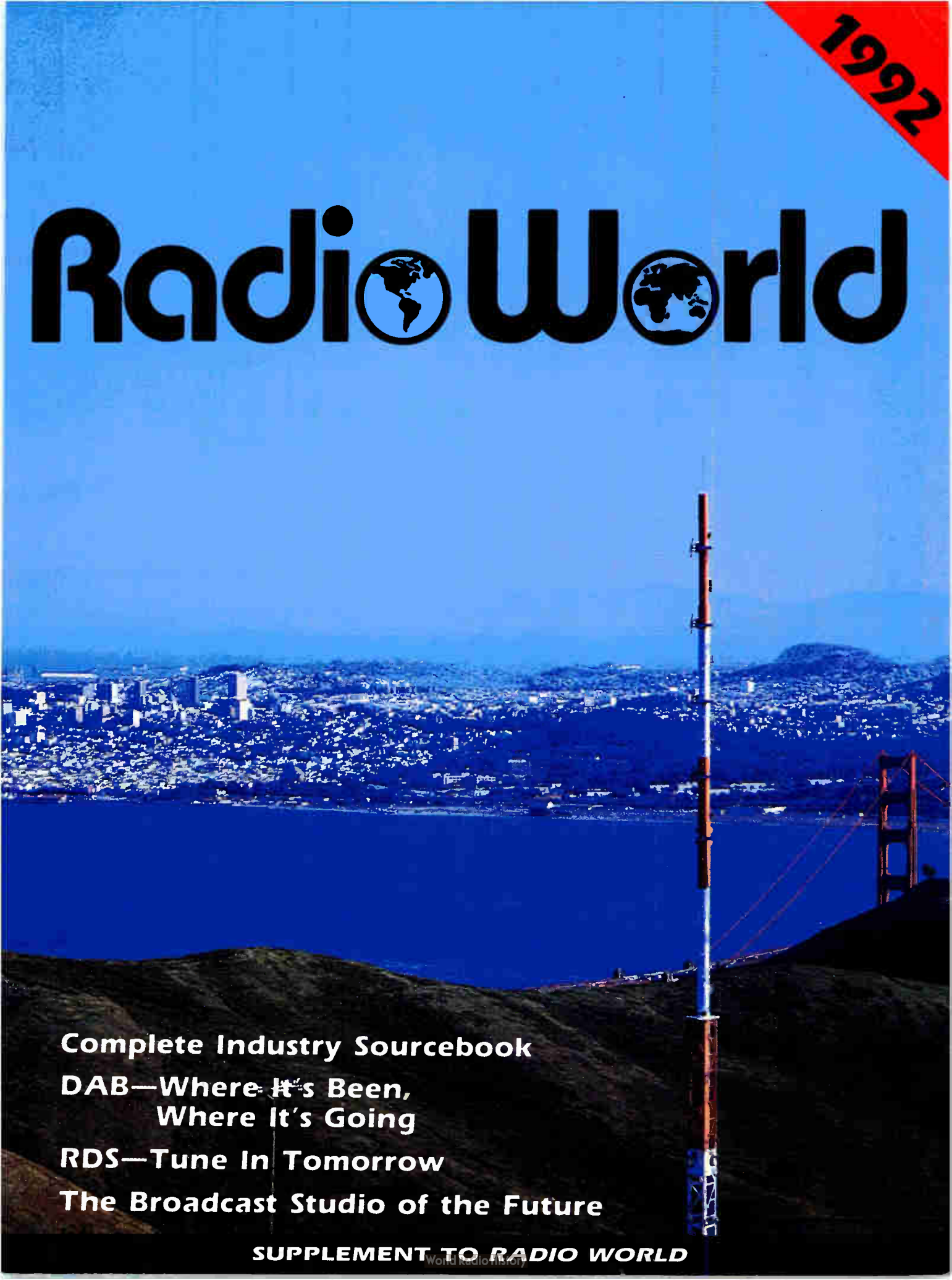
1992

Radio World



Complete Industry Sourcebook

DAB—Where It's Been, Where It's Going

RDS—Tune In Tomorrow

The Broadcast Studio of the Future

SUPPLEMENT TO *RADIO WORLD*

Wheatstone Corporation

The Closer You Get...

We Mean It—we really DO provide the quality, performance, technical support, and innovation we promise!

Our model A-500 is a thoroughly engineered on-air console: it delivers the level of performance your clients now expect, and DAB demands. All components are selected for long life—gold bus connectors, gold I/O connectors, all gold contact switches, gas-filled relays, triple burned-in integrated circuits, solid state ON/OFF lamps, and precision laminated Lexan control surfaces for a lasting, wearproof finish. And we back that up with a 3-year parts and labor warranty, complete with factory support from a technically competent and responsive staff.

We've also handled your special requirements as well with a super family of accessories, including a choice of three different telephone modules, an intercom module, an off-line mixer module for your remote feeds, talent control stations, accessory panels, failsafe power supplies, and auto cart and CD sequencing options.

So take a close look: we've got the quality, we've got the innovations, and you've got our commitment to top-notch support.

The Better We Look!

Circle (112) On Reader Service Card

A-500

6720 V.I.P. Parkway, Syracuse, NY 13211 (tel 315-455-7740 fax 315-454-8104)

More Power and More Performance

The New Dyaxis. Now providing automated real-time EQ and Level Control for our 2 and 4 output virtual multitrack systems. Other advanced features include support of a 1 gigabyte hard drive for up to 10 hours of stereo recording, new full magneto optical capability and full sample frequency conversion.

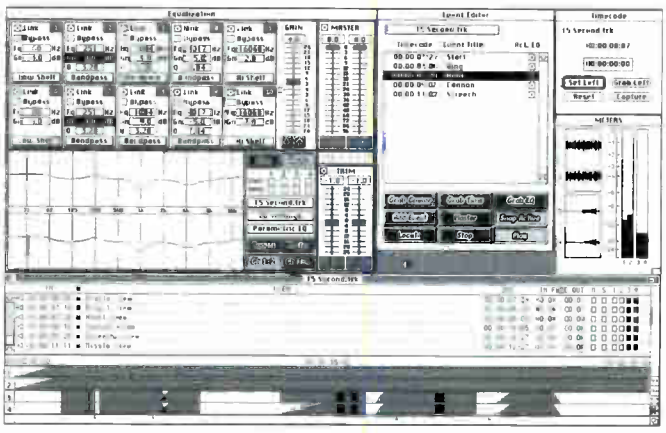
Synchronization Is Easy. With the System Synchronizer and time code option, Dyaxis is a master of sample accurate time code based slave applications. Just a click of the mouse enables Dyaxis to lock to SMPTE, EBU, VITC, video, and film tach.

Superb Audio Quality. Through Studer Editech Corporation's own proprietary A-D/D-A converter implementation, anti-aliasing filter and analog circuit designs, Dyaxis has achieved a worldwide reputation for outstanding sound quality.

RDAT. Dyaxis' integrated RDAT subsystem allows you to reliably back up 1.2 gigabytes of information on a DAT data cassette. Using our custom Studer-Backer II software, you can retrieve an entire job or a single sound effect quickly and easily.

Digital Compatibility. Dyaxis communicates with and transcodes between all major digital formats such as DASH, AES-EBU, SPDIF, PD, SDIF, 601 and more.

Studer Dyaxis — Designed For You. With Dyaxis, you not only get the most up to date digital technology available you also get free on-line service and support from professionals who care. To find out more about the right Dyaxis system to fit your specific needs, call your Studer representative for complete details.



Studer Revox America, Inc. • 1425 Elm Hill Pike • Nashville, TN 37210 • Tel: 615/254-5651 • Fax: 615/256-7619
New York 212/255-4462 • Los Angeles 818/780-4234 Studer Revox Canada Ltd., Toronto 416/510-1347

STUDER

Circle (19) On Reader Service Card

Some of our best ideas are up in the air.

From antennas to shelters, Cablewave Systems designs, manufactures and installs a comprehensive line of innovative broadcast, RF and microwave products. All of which reflect over 35 years of experience. So make Cablewave Systems your single source. Because getting your broadcast facility up and running is our top priority.

"Signals of Excellence"

RFS Radio Frequency Systems, Inc.
Cablewave Systems Division

Cablewave Systems

60 Dodge Avenue
North Haven, CT 06473

Circle (54) On Reader Service Card

RADIO WORLD 1992

On the Cover...

From Mt. Beacon in Sausalito, Calif., half a mile north of the Golden Gate Bridge, KABL San Francisco broadcasts 100 kW ERP by running 70 kW of transmitter power through a ceiling-mounted Shively bandpass filter into a Model 6814 four-bay, three-quarter wave spaced Shively FM antenna.

The photograph was shot on a rare clear fall day in 1991 by Pat Johnson, courtesy of Shively Antennas.

Special Thanks to Jon Clark.

EDITORIAL
Editorial Director: Marlene Lane
Editor: Charles Taylor
Listings Editor: Caroline Behan

PRODUCTION
Director: Kim Lowe
Regan Deatherage
Lisa Roach
Julianne Stone
Lisa Stafford

CONTRIBUTORS
Alex Zavistovich
John Gatski
Judith Gross
Steve Crowley
Nancy Reist
John Bisset
Harold Hallikainen
Thomas L. Vernon
John Moretti

ADVERTISING
Art Constantine
Simone Mullins
Jack Ducart

Radio World

PUBLISHER
Stevan B. Dana

ASSOCIATE PUBLISHER
Carmel King

EDITOR
Alex Zavistovich

CIRCULATION DIRECTOR
Tiana Hickman

COMPTROLLER
Anne Clark

Radio World (ISSN: 0274-8541) is published semimonthly by Industrial Marketing Advisory Services, inc., 5827 Columbia Pike, Falls Church, VA 22041. Phone: 703-998-7600, FAX: 703-998-2966. Second class postage rates are paid at Falls Church VA 22041 and additional mailing offices.

Postmaster: Send 3579 forms and address changes to Radio World, P.O. Box 1214, Falls Church, Va. 22041.

Was It Hot Or Was It Not?

by Alex Zavistovich

Part of the fun of being the editor is that not only do people listen to your opinions, you're actually expected to *have* opinions, and even to give forth with them every now and then.

Amid the deals and the dealmakers, the news and the newsmakers of the past year, there are some events, characters and stories that stand out in one's mind. These are the people and things that just kept cropping up over the year, whose names were never too far from the news, if they weren't actually *making* the news.

What's interesting about such a phenomenon is that it runs in a cycle—those names and stories that now blanket the industry so completely are replaced next year by another group with the same kind of reach. It's all a question of what's hot and what's not.

With that in mind, I and some of the other RW editors got to thinking about 1991, and the characters and events that gave the year its own style. We then thought about 1992, and the stories that seem to be percolating for the year ahead.

That list, which we're calling "What's Hot and What's Not," is published here for your amusement and amazement. Some of the more meaty ones I've included in this story, along with the opinions that led me to putting them on the list.

★★★

With the FCC's decision last November to recommend only S-band spectrum for digital audio broadcasting (DAB) at the World Administrative Radio Conference (WARC), L-band can't be considered a hot topic any more.

What *is* hot is in-band development. Companies like USA Digital Radio, American Digital Radio and LinCom—U.S.-based firms—are at the leading edge of in-band technology. They're hot, but the Eureka project and NAB's eagerness to pursue licensing for it are not.

And while I'm somewhat reluctant to go out on this limb all by myself, I have to say that the entire DAB issue has been defused at least for a while. Let's face it, a lot more work has to go into digital audio broadcasting before it ever makes anyone a dime—the upcoming spring NAB convention may offer some revelations, but the technology still is out of reach to most of us.

Sure, the VOA and NASA demonstrated that satellite-based digital broadcasting can be accomplished now, but all they demonstrated was AM-quality. DAB is just not as hot a topic as it was last year. Let's wait until WARC is over, *then* see what happens.

If DAB isn't hot, what's taken its place? Radio Data System (RDS). Already a hit in Europe, the applications of RDS—in

Pilot Tone
. . . Radio A to Z

which data is fed along with a broadcast signal—have enormous potential. For travelers, the RDS system may become indispensable.

★★★

When I worked at my college radio station, I was exposed to a lot of performers labeled as "alternative" or "progressive"—you know, way-out bands like U2, Duran Duran, The Talking Heads, The Thompson Twins and R.E.M. Well, since my college days, each of these bands has had its share of international hits, and at least a couple have the right to be called superstars.

The point is, except for colleges and the occasional underground commercial station, there's never been a format to allow bands like these to gain acceptance. Many programmers are too often willing to follow the safe route and label any band that dares to think for itself as "alternative."

That's why the New Rock format is a hot idea—it acknowledges that music that doesn't follow the hit lockstep doesn't have to carry any label other than "new."

What's not hot is New Age Contemporary—a blending of new age music and airy, sometimes jazz-tinged pop that aims for a mature yuppie audience. Unfortunately, the new age selections always fall somewhere between an ESPN soundtrack and Zamfir, Master of the Pan Flute. The light hits are often so light, they dissolve as you listen to them, like musical cotton candy. The NAC concept was hot last year, the execution in general was not.

While I'm on the subject of formats and performers, I think there's no denying that Cher's tattooed backside was a hot topic, at least as far as ads in

(continued on page 36)

Hot	Not
RDS	DAB
In-band	L-band
U.S. DAB	Eureka systems
Howard Stern	Mark and Brian
RAB's Gary Fries	RAB's Warren Potash
New Rock	New Age Contemporary
CBS's Nancy Widman	Emmis' Jeff Smulyan
Debt restructuring	Leveraged buyouts
Arbitron's Jay Guyther	Arbitron's Rhody Bosley
Mercury Awards	Clio Awards
Larry King	Rush Limbaugh
Garth Brooks	Ricky Skaggs
DCC	Consumer DAT
Expanded AM band	NRSC standard
One-to-a-market	Move-ins, a la Tom Gammon's Anniston, Ala. rule relaxation deal
Safe sex, condom ads	Just Say No ads
Cher's tattooed tush	Sinead O'Connor's coiffure
Ervin Duggan	Sherrie Marshall
Radio drama	Morning zoos
Pirate radio stations	Pirate Radio (and all its imitators)
Live news remotes	"Rip'n'read" newscasts
NPR's Nina Totenberg	Deborah Norville
Shortwave radio	Cable radio
Self-inspection	Hard look FM processing

1992 CALENDAR

January

9-12—International Winter Consumer Electronics (CES) Show, Las Vegas

25-29—National Religious Broadcasters (NRB) 49th Annual Convention & Exposition, Washington

30-Feb. 2—Radio Advertising Bureau (RAB) Convention, Nashville

February

3-March 3—World Administrative Radio Conference (WARC) of the International Telecommunication Union (ITU), Torremolinos, Spain

March

24-27—92nd European Audio Engineering Society (AES) Convention and Exhibition, Vienna, Austria

April

12-16—National Association of Broadcasters (NAB) Convention and Engineering Conference, Las Vegas

May

28-31—International Summer Consumer Electronics (CES) Show, Chicago. For the first time in its 25-year history, the CES will be open to the public.

June

3-5—Association of Professional Recording Services Ltd., London

10-13—First NAB/Montreux International Radio Symposium and Exhibition, Montreux, Switzerland

July

3-7—14th International Broadcasting Convention (IBC), Amsterdam

1977—The "Broadcast Equipment Exchange" makes its debut. Three years later, the publication is retitled, "Radio World." Circulation at year-end 1991: 18,000.

September

9-12—National Association of Broadcasters (NAB) Radio 1992, New Orleans, La.

23-26—Radio and Television News Directors Association (RTNDA) 47th International Conference and Exhibition, San Antonio, Calif.

October

1-4—Audio Engineering Society (AES) 93rd convention, San Francisco

14-17—Society of Broadcast Engineers (SBE) convention, San Jose, Calif.

SPECIAL DAB SECTION

DAB 1991—A Year of Surprises

Who needs daytime soaps? The digital audio broadcasting (DAB) saga in 1991 stretched the imagination. L-band, S-band, in-band .... Where DAB would settle in the spectrum was anybody's guess. By year end, a final decision had yet to be reached, but exhaustive discussions had at least ensued. Meanwhile, proponents popped up everywhere, headed by the NAB's influential endorsement of Eureka 147. Joined by American Digital Radio, Kintel, USA Digital and others, it was a trying year for the fledgling but imminent technology.

NAB's bus demo of Eureka's DAB system gave listeners at the Las Vegas show a chance to compare the new technology with FM—and, as notable, finally somewhere to sit.

by Judith Gross

Digital Audio Broadcasting first sprang upon an unsuspecting radio industry early in 1990, but if anything, 1991 can be considered the year that brought DAB from a big question mark to a discussion-worn controversy.

No convention or conference was complete without a DAB session, and seminar podiums swelled as the ranks of systems proponents grew. By the time the fall convention season had ended, attendees were weary of sitting through the same presentations and theoretical block diagrams and were eager for substance.

While the raging battles were far from settled by year's end, they did manage to polarize enough factions to give some clear directions and define the battleground for 1992.

NAB jumped into the DAB arena early and stunned broadcasters when the Radio Board endorsed the European-developed Eureka 147 system at its winter meeting in January. A general information session for non-Board managers just prior to the vote was characterized by opposition to any premature alliance with a particular system.

Eureka opposition

Randy Odeneal of Sconnix Broadcasting raised issues that were to characterize the debate throughout the year and land him the chief opposition voice on the DAB Task Force, also set up by the Radio Board in January.

...The possibility of an in-band or narrow-band fight between Eureka and U.S. system developers looms.

But even though early word of a U.S. DAB system in development by Gannett leaked out to the Board, it did not stop them from putting their support firmly behind Eureka and giving the nod to the beginnings of negotiations between NAB and Eureka on a royalty/licensing deal.

NAB turned aside accusations of "conflict of interest" and vowed to "manage and control" the development of DAB, specifically to stop the potential for satellite DAB, which had introduced the battles with early petitions in 1990.

Despite the bold moves on the Radio Board's part, a long hard struggle was just beginning for NAB.

Spectrum gluttony

Along with the pat on the back to Eureka, the Radio Board was briefed on a DAB spectrum study that NAB had commissioned to see how much spectrum it would take to accommodate every existing AM and FM station with the Eureka 147 DAB system.

The results were staggering: A conservative and much-criticized preliminary look said at least 57 MHz of new spectrum would be needed to do the job and that was a best case scenario. The question was—where was such a vast amount of new spectrum to be found?

The NAB settled early on L-band (1500 MHz), the same part of the spectrum being targeted by satellite DAB interests, and detractors immediately accused the organization of being more interested in stopping satellites than helping broadcasters.

►

Why Auditronics' 210 console remains radio's virtual standard

The contemporary 210 console contains exactly those features and qualities your on-air people tell us they need to do their best work. Nothing more, nothing less.

The Auditronics 210 has the best record for up-time of any radio console. It just plain works, elegantly, all day, every day, all year, every year.

And, most important in this age of cost concern, we've made our production more efficient, so we can deliver today's 210 console at a price less than that of over a decade ago.

It's no wonder the 210 console continues to be the on-air mixer of choice among quality-conscious broadcasters. Choose the Auditronics 210 for your next console replacement or upgrade. Call 901-362-1350 today for complete information.

This Auditronics 210-18 in KPFA-Berkeley's on-air studio is one of four 210s in use at the Pacifica Foundation station.

auditronics inc. 3750 Old Getwell Road, Memphis, Tennessee 38118 • 901-362-1350 FAX 901-365-8629

Circle (10) On Reader Service Card

Engineers looked at past studies of L-band and saw power costs rising as building and foliage attenuation increased. NAB countered by saying that Eureka's 147 design might actually increase the performance at L-band, but the debate raged and the industry called for tests.

The DAB Task Force decided to schedule L-band tests later in the year and Canada, which also supported L-band, said it would perform its own tests during the summer.

Two other developments grabbed the headlines in the meantime. The Radio Operators Caucus, a body of larger group owners, began meeting on DAB, and U.S. proponents began to surface with DAB systems of their own.

U.S. in-band development

Kintel was the first to announce an in-band DAB system, with a theoretical plan to piggy-back a digital signal on an FM's analog signal and separate the two in a specially designed receiver. Kintel had no plans to address AM DAB, however.

Gannett, joined by CBS and Group W, announced an in-band DAB system developed with Stanford Research Institute that could put a digital signal "under" both AM and FM signals and extract it for reception using U.S. military technology.

The Gannett system was dubbed Project Acorn, and later officially named USA Digital. It had its debut in an NAB-supplied booth during the annual spring convention, where the demonstration/on a first adjacent channel/drew accolades and crowds.

Ted Schober of Radiotechniques announced a system called American Digital Radio that would require DAB to be phased-in in a tiered system of allocations, where analog stations would convert over to digital, giving up their analog licenses as critical mass penetration of receivers was reached.

Mercury Digital announced an in-band system on first adjacent FM channels that also could accommodate AM stations on the FM dial. And also at the NAB convention, systems from Synetcom and a company called LinCom were announced.

In the meantime, two other players continued their own crusades. Strother Communications, which had at first wanted to test the Eureka 147 system at UHF-TV frequencies, got the UHF test channels from the FCC but had no system to test, thanks to NAB's endorsement of Eureka.

Strother filed for test authority in several other frequencies and announced plans for an independent test center to test DAB systems in Washington, D.C. It also filed for a pioneer's preference under a proposal before the FCC.

The pioneers' preference was later approved by the Commission, but only a single license was granted per pioneer and Strother filed for reconsideration in the latter half of 1991.

The Eureka 147 system, meanwhile, continued to lead the development of DAB. It was demonstrated in a mobile environment successfully by the NAB at its spring convention.

In addition, Eureka researchers began to suggest that their system could be adapted to narrower bandwidths. This sprang from work already done in Europe on UHF-TV taboo channels but stopped short of the characterization "in-band."

The NAB began licensing talks with Eureka researchers around mid-year as a letter of intent was extended several times and finally stretched to the end of 1991.

Another NAB surprise

The DAB debate in the last half of 1991 focused squarely on the L-band controversy. By the time of the NAB spring convention, the U.S. Air Force had released a position firmly opposing giving up any L-band to broadcasters.

The Department of Defense and then NTIA supported the military opposition to relinquishing the spectrum, which is used for flight test operations. But in June, the FCC asked for "some L-band and some S-band (2300 MHz)" for DAB and the behind-the-scenes talks began.

Sconnix's Odeneal, now an official member of the NAB's DAB Task Force, continued to lead the opposition to L-band and generated a successful letter writing campaign among ROC members.

Letters opposing both the NAB's push for L-band and its endorsement of Eureka poured into the FCC's offices. The L-band opposition was based on the reality that an allocation at that frequency would pave the way for satellites. It also was fueled by the hopes raised by U.S. in-band DAB proponents.

NAB, not swayed by the arguments, continued urging an L-band allocation policy for the U.S. delegation to this year's World Administrative Radio Conference (WARC) and continued licensing talks with Eureka.

But NAB took pains to cover other bases as well. The DAB Task Force, opening its meetings to various in-band and non-Eureka proponents, softened the original stand taken by the Radio Board in January. By mid-summer the Task Force announced it would consider in-band systems "on a parallel track" with Eureka.

Then, just before September's NAB Radio '91 show, the association stunned the industry again by asking Eureka to develop an in-band or narrow-band DAB system for U.S. broadcasters, putting Eureka in firm competition with U.S. in-band developers.

►

*"The **paragon—transmission** is an audio engineer's dream come true! Its sonic flexibility and peak control without clipping provide a whole new range of processing possibilities." ..... "It's the fidelity and flexibility that counts, and the **paragon—transmission** is a fine musical instrument."*

Dennis R. Ciapura, Senior Vice President
Noble Broadcast Group

paragon—transmission
Features:

- *Digital* 4-Band Compressor
- *Digital* 4-Band Limiter
- *Digital* Wideband AGC
- *Digital* 10-Band Graphic EQ
- Touch Screen Controlled
- "On-Air" A/B Comparison
- Storage & Recall of User Created Processor Setups
- On-Line Help Screens
- Digital I/O Card (sold separately)

The paragon—transmission is now being shipped with Version 2.0 software.
Featuring:

- **Compressor & Limiter** *Zoom*-Detail Screens, which provide additional in-depth processing parameters
- **AGC Detail Screen**, which offers many new AGC parameters
- **Peak Controller Detail Screen**, offering full control over all parameters
- **5-New Setup Files**. Created by radio's top Program Directors and Engineers

paragon
digital audio transmission processor

6632 Central Avenue Pike ▮ Knoxville, Tennessee 37912 ▮ (615) 689-2500

Euro-Distributor Info: JWM (M) Ltd., P.O. Box 115, Swindon, Wiltshire, SN2 1DA, England
Phone: (Int. 44) 637 877170 ▮ Fax: (Int. 44) 637 850495

AUDIO ANIMATION INCORPORATED

Circle (151) On Reader Service Card

Since Eureka maintained that an in-band on-channel system was not feasible, and that AM was an impractical place for a digital signal, the only conclusion left from NAB's move was that it was asking Eureka to develop a narrow-band DAB system for AM and FM stations on FM first adjacents.

The idea of an in-band system on FM first adjacents also began gathering opposition from the ROC, which met but stopped short of an in-band, on-channel DAB system endorsement.

Eureka developers, meanwhile, called in-band DAB development "difficult at best" and urged a consortium of all in-band developers to accomplish the task. But U.S. in-band system developers have shown no enthusiasm for such a partnership.

Other developments

Several other DAB developments paralleled the L-band and in-band debate. Satellite CD Radio, which had begun the entire process with its petition to begin satellite DAB service in May of 1990, modified its plan a number of times.

At first interested in some 60 MHz of L-band for a hybrid national/local DAB service using Stanford Telecom's (not to be confused with Stanford Research, working with Gannett) it reduced its request to 32 MHz, reflecting the pessimism on L-band allocation.

It ultimately modified its plans further, decided to abandon Stanford Telecom's system and become instead a "passive carrier" of whatever DAB scheme becomes the standard.

Strother Communications, meanwhile, went from neutral back to being a DAB system proponent. Strother formed a research alliance with several industry firms and began underwriting tests for LinCom and Synetcom's DAB systems.

In October, Strother and LinCom demonstrated LinCom's system to government agencies and the DAB Task Force. The LinCom system would put a digital signal on each FM's first adjacent channel, with enough capacity for every existing AM and FM licensee and the addition of more stations/a major fear of current station owners.

L-band question settled

Early in the fall, Canada completed the first L-band tests and showed that the pessimism over signal propagation at L-band might be unwarranted. NAB decided to postpone its own L-band tests, a move that proved prophetic late in the fall when the U.S. WARC position was determined.

After high level discussions between the Executive Branch and the FCC, L-band for DAB became a moot point. It was decided that the U.S. delegation would go to WARC asking for an S-band allocation for DAB satellite service.

Having killed L-band and any new spectrum DAB allocation plans in the U.S., DAB U.S. development is now focused firmly on in-band. But NAB talks with Eureka continue, and the possibility of an in-band or narrow-band fight between Eureka and U.S. system developers looms.

Toward the end of the year, two more groups joined the DAB debate. The Electronic Industries Association (EIA) set up a standards setting committee to examine systems, issues and ultimately suggest a DAB standard. The EIA had its first meetings and encouraged comprehensive participation from all interests involved.

And the House subcommittee on Telecommunications and Finance held the first of what is said would be a series of hearings on DAB, where NAB came under heavy questioning for its Eureka alliance and the satellite/terrestrial controversy was still very much alive.

DAB 1992—When the Dust Settles

If 1991 was chaos for DAB (digital audio broadcasting), perhaps 1992 will see some of the dust settle. Who will win—the NAB, broadcasters, the listening public? Stay tuned.

by Judith Gross

With the unforeseen convolutions that have marked the course of DAB over the past two years, a crystal ball would be needed to determine what the future holds for the burgeoning technology.

Most of 1991 saw new systems springing up seemingly every week. As the players changed, the debate has become focused on arguments barely hinted at in the beginning.

For 1992, the World Administrative Radio Conference (WARC) no longer is really an issue. The conference, which takes place in Spain in February, will see the U.S. favor the S-band (2300 MHz) for satellite DAB and complementary terrestrial.

Terrestrial DAB allocations in the U.S. will be an internal affair and will not require action at WARC. And unless the U.S. delegation has managed some heavy-duty diplomacy by WARC, the S- band stand will pit the U.S. in opposition to other Region II countries such as Canada and Brazil, which support L-band (1500 MHz) for both satellite and terrestrial DAB.

As to domestic DAB considerations, the FCC is planning to initiate more action on DAB sometime in the spring, most likely just after WARC in March. Insiders say this could take the form of another Notice of Inquiry or even a Notice of Proposed Rulemaking.

Eureka still the focus

The NAB seems determined to continue to push for some sort of alliance with Eureka 147, despite the development of DAB ongoing in the U.S. It will be interesting to see if Eureka extends its letter of intent to NAB into 1992, and if the NAB Radio Board remains as committed to the Eureka alliance after its winter meeting.

The Eureka 147 consortium was re-funded for 1992, with an additional $50 million forthcoming from the government and commercial European interests that make up the consortium. Despite this funding, the future of an in-band or narrow-band Eureka system specifically for U.S. broadcasters at the request of the NAB remains in doubt.

One Eureka researcher estimated $10 million and three years of research would be needed for such a system, and the idea of a non-on-channel DAB system still faces heavy opposition from U.S. station owners.

Even though opposition to Eureka will no doubt fuel debate within the DAB Task Force, U.S. broadcasters probably have not heard the last of Eureka; unless some startling turnaround occurs early in 1992, the system probably will be present at the NAB's spring convention.

Other U.S. systems

It is generally a foregone conclusion that 1992 will be a "make or break " year for U.S. in-band developers. It will be time to show-and-tell or risk losing credibility among a broadcast industry already weary of several years of debate.

USA Digital developers Gannett, CBS and Group W know they have to demonstrate their system on-channel and in a mobile environment. They also must begin to make it a reality on the AM dial.

Another booth demonstration on first adjacent FMs will lower the system's credibility, at least in the verbal debate. The project has severed ties with Stanford Research and is working with an unnamed military contractor, which Gannett and CBS spokesmen say has a way to achieve an on-channel solution.

Strother Communications (SCI) plans to show a hardware demonstration of the LinCom system at the spring NAB convention, complete with a practical receiver implementation. SCI also hopes to have a mobile demo by the fall radio show and will no doubt begin tests of the system on Cook Inlet Partner stations in at least three cities.

SCI also has asked the FCC to reconsider its pioneer preference and award more than just a single license to would-be innovators.

Hardware developments from the other system proponents are very much up in the air as DAB moves into its third year of development. Most systems were looking for additional funding by the close of 1991 and had yet to announce plans for any realistic hardware demonstrations.

As for satellite DAB, pushed into the S-band region by U.S. policy-makers, it is unlikely that any systems will move very quickly to the forefront for at least most of 1992.

(continued on page 51)

A Summary of DAB Proponents

SPECIAL DAB SECTION

by Steve Crowley

This summary provides an overview of companies proposing digital audio broadcasting (DAB) transmission technology for the U.S.

The intent is to distinguish among systems, as many have common features, including reliance on audio source coding, such as MUSICAM or Dolby, to reduce the audio bit rate; time interleaving of data to minimize the effects of short bursts of errors; forward error correction; multipath mitigation through techniques such as frequency diversity and adaptive equalization; accommodation of on-channel boosters; low transmitter power; and acceptable audio degradation characteristics at signal threshold.

A brief summary such as this necessarily contains omissions. Readers interested in learning more about a particular system should contact that proponent for the latest information.

Steve Crowley is a consulting engineer with the Washington firm of du Treil, Lundin & Rackley, and a **RW** columnist.

American Digital Radio
P.O. Box 367
Haddon Heights, N.J. 08035
609-546-8008
Edward A. Schober

ADR's ADR 2000 is an in-FM-band DAB system for AM and FM stations that would combine three to five programs at each transmitter and multiplex the data over several channels to obtain frequency diversity.

Under ADR's conversion plan, several pioneer stations would be constructed in each major market with more stations making the digital conversion as digital receiver penetration increased. In smaller markets, all AM and FM stations could make the digital conversion immediately.

Eureka 147 Project Office
German Aerospace Research Establishment
Department MD-TK
Linder Hohe
D-5000 Cologne, Germany
+49 2203 601 3331
Egon Meier-Engelen

Eureka 147 employs a modulation process called Coded Orthogonal Frequency Division Multiplexing, or COFDM, which separates the audio and overhead data and transmits it on many closely spaced frequencies. The data rate per carrier is so low, the data symbol duration is longer than the spread of multipath delays. This helps the receiver decide what data value the received signal represents.

Eureka 147 is the only DAB system that has been publicly demonstrated in a mobile environment. An out-of-band system, it is designed to operate in an exclusive allocation of spectrum. In-FM-band investigations also are being conducted.

Kintel Technologies Inc.
P.O. Box 32550
San Jose, Calif. 95152
408-729-3838
John E. Leonard

Kintel uses a technique it calls Power Multiplexing, occupying no more than 200 kHz of bandwidth on the same frequency as the associated FM station.

Power Multiplexing makes use of the capture effect of FM receivers. A strong FM signal suppresses the effect of a weaker signal if the power levels are sufficiently different.

The digital signal is at lower power to minimize impact to FM. To extract the lower-power digital signal, a demodulator circuit creates a replica of the FM signal, shifts it in phase 180 degrees and adds it back to the original. It attenuates it to the point where the digital signal can be recovered without interference.

Mercury Digital Communications
243 El Dorado, Suite 201
Monterey, Calif. 93940
408-649-0679
Thomas R. Duffy

MDC's system is in-FM-band and designed to operate in channels adjacent to those of existing stations. The design is expected to allow transmission of 256 kilobit-per-second data for audio plus six 16 kilobit-per-second subcarriers—all in a single 200 kHz-wide channel. The potential exists for AM stations to operate on the FM station's other adjacent channel.

The modulation technique is multi-frequency modulation (MFM). MFM multiplexes the data over many radio frequencies close to each other without interference. The low data rate per carrier allows the receiver more time to make a decision as to the digital value represented by the received signal.

SCI/LinCom
1900 L Street, N.W., Suite 500
Washington, D.C. 20036
202-331-7007
Ron Strother

A joint effort of Strother Communications Inc. and LinCom Corp., a communications engineering company in Los Angeles.

This in-FM-band system is designed to operate in a first adjacent channel from an FM station. AM stations could potentially operate in other adjacent channels.

Several waveforms are under investigation. The architecture is being implemented on a breadboard to provide a real-time hardware model. After over-the-air testing, the receiver design is to be committed to a single VLSI chip selling for $5 to $10.

Stanford Telecom
2421 Mission College Blvd.
Santa Clara, Calif. 95054
408-980-5614
Lloyd R. Engelbrecht

Stanford Telecom calls its modulation process dynamic single channel per carrier, or D-SCPC.

An out-of-band system, D-SCPC uses frequency-hopping techniques to multiplex the data for a single program over many frequencies. By interleaving multiple programs in the same bandwidth, no increase in spectrum is required over that required by transmitting the programs continuously on the same frequencies. The modulation technique is four-phase phase shift keying.

Synetcom Digital
1426 Aviation Blvd., Suite 101
Redondo Beach, Calif. 90278
213-379-2000
Etienne Resweber

Synetcom's Digital FM-S operates in an FM station's subcarrier region. It places multiple digital subcarriers carrying the digital audio data in the FM baseband next to the existing analog transmission. The system is expected to fit within the FCC's FM emission mask, but may require slightly more room than the FCC currently provides for subcarriers in the FM baseband.

Existing SCAs would be moved to digital subcarriers. An open protocol is envisioned, by which multiple SCA programs can be transmitted using time division multiplexing. Synetcom also is investigating solutions for AM stations.

USA Digital Radio
6255 Sunset Blvd., Suite 1117
Los Angeles, Calif. 90028
213-466-8381
Paul Donahue

USA Digital's Acorn DAB places a DAB signal on the same channel as an FM signal. It does this by combining the DAB signal with the FM exciter signal and sending both to the transmitter power amplifier.

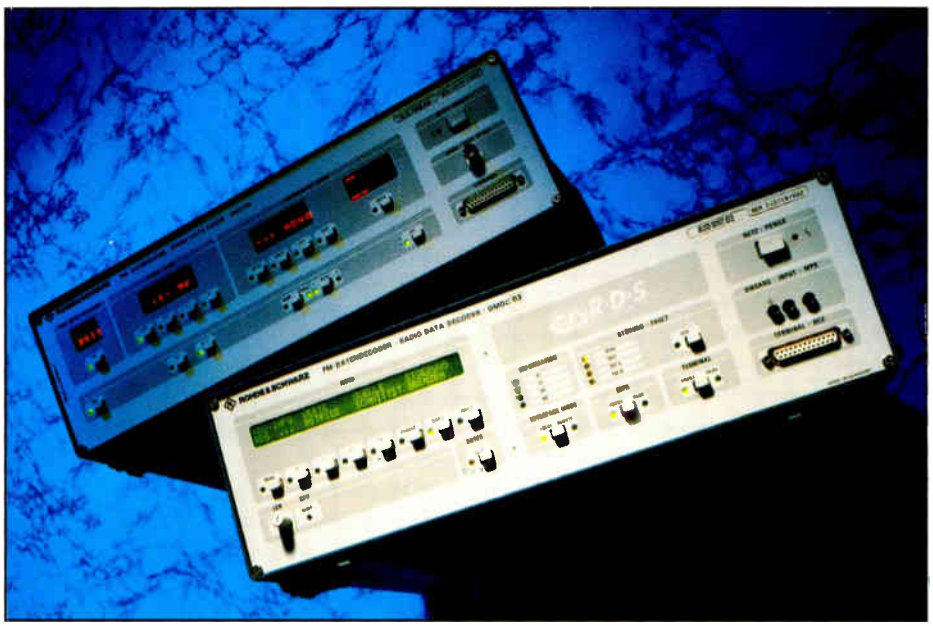
The DAB signal is at a much lower power than the FM signal, so FM users experience no interference. At the receiver, the main FM signal is canceled out and the lower-power digital signal is demodulated. The modulation scheme is called Coded Poly-Vector Digital Modulation (CPVDM) and uses 21 closely spaced carriers.

USA Digital is developing a system for the AM band as well.

RDS Success Spelled Out for U.S.

Radio Data System (RDS) already is an up-and-coming standard throughout much of Europe. Its possibilities still are under scrutiny in the U.S., but after three years, the technology appears closer than ever to becoming a practical tool domestically.

by John Gatski



Rohde & Schwarz has played a major role in the worldwide introduction of RDS. Here, its DMC05 coder and DMDC03 decoder.

Since its debut demonstration in the U.S. nearly three years ago, RDS (Radio Data System) has been riding a fast track toward becoming a domestic standard.

Although there have been snags along the way, it is likely that a U.S. standard will be adopted by the NRSC (National Radio Systems Committee) by April 1992.

The U.S. RDS standard (which has been renamed RBDS—Radio Broadcast Data System—domestically), was worked out through the NRSC's RDS subgroup, which sent the standard to the full NRSC in January 1991.

Part of the reason for RDS's rapid standard adoption process is the technology itself, which already was well developed in Europe. RDS is transmitted on a 57 kHz subcarrier and broadcast on a station's main FM carrier.

It provides a variety of functions, including text display, text scrolling, automatically locking onto a music format when traveling from area to area, and switching between a station's translators. RDS also has been proposed as a replacement for the EBS system.

Prevalent in Europe

European countries have used the technology for several years to automatically switch between government broadcasts on various frequencies as one drives from area to area. RDS also can be used for emergencies and traffic alerts that automatically override a music broadcast or tape player.

U.S. broadcasters have expressed particular interest in the text function of RDS. The capability to transmit call letters and frequency to car listeners especially appeals to marketing powers. More advanced RDS units will even be able to display the name of a song and the artist playing from CDs or digital tape that has such information contained in the digital subcodes.

Because many receiver manufacturers already produce RDS products for the European market, they are poised to start producing slightly different versions for the U.S. Delco already has a 16-character display RDS model and companies such as Sony and Pioneer have RDS home receivers.

During the 1991 Berlin consumer electronics show, there were about 122 RDS receivers available for market. U.S. versions will have at least an eight-character display and there will be optional scrolling on some radios.

Currently, most RDS encoder generator equipment is manufactured by European companies. The major players are Rohde and Schwarz, Germany; RE Technology, Denmark; VGE Electronics, United Kingdom; and Teli AB, Sweden. As of late 1991, the only U.S. company to manufacture an RDS encoder was Modulation Sciences, Somerset, N.J.,

(continued on page 56)

Surprise Yourself.

Why settle for less?

Radiomixer is the most affordable high-performance console in radio with configurations starting at under $10,000. Stations with the most stringent budgets can now have major market PR&E quality. Isn't that a nice surprise? Call today for more information.

Add multitrack production power to the on-air features of a Radiomixer and you have Productionmixer, the most affordable production console in broadcasting.

Pacific Recorders & Engineering Corporation
2070 Las Palmas Drive
Carlsbad, CA 92009
Tel: 619-438-3911 Fax: 619-438-9277

DESIGNS THAT MAKE THE DIFFERENCE

Renovating Right from Ground Zero

Studio renovation or relocation involves a lot more than just finding the right contractor. The responsible station plans each step along the way, realizing that little changes dealt with early will likely save big money later.

by Nancy Reist

WCDX-FM in Richmond, Va., sketched new studio layouts around existing cabinetry for its on-air, news/production and eight-track studios.

Beginning a major studio renovation or station move without careful planning and a detailed budget can be like leaving thousands of dollars in unmarked bills on a park bench.

That's the warning from Al D'Alessio of Northeastern Communication Concepts Inc. and Jack Williams of Pacific Recorders & Engineering Corp. They led a session at Radio 1991 to help managers avoid these unnecessary losses.

The two outlined six stages of the construction process and emphasized that success in the latter stages depends on the care planners take in the early stages. Since your radio station is not a commodity like a car or a computer, attention to the details that make your station unique is critical, they said.

From the beginning, a project should be looked at in three phases—conceptualization, where a list of ideas and variables desired are put down on paper; design, where architects and engineers start spending real money to make the ideas interlock; and actual construction.

"The cheapest time to make up your mind is in the first stage," they said, "because everything after that goes up dramatically in price. Think things through and make sure everything is there from the beginning. Don't assume that you can always change it later, because it will be more expensive down the line."

Stage I: Budgeting/programming

Two of the most common mistakes in getting projects going are poor planning and cost "guesstimates." Williams and D'Alessio advised a minimum time line of 18 months for major projects and advised managers to design detailed budgets based on well-researched and documented figures. Estimates for equipment installation should be made by installation specialists, not the supplier.

"It was an all-around move up," says Contract Engineer Jeff Loughridge of WCDX's carefully articulated relocation.

Stage II: Schematic development

An experienced "prime consultant" is a good idea to help design floor plans and determine what technical equipment you'll need and where it should go. Even simple changes—an additional mic position in the studio, for example—can cost thousands of dollars if they're introduced later in the project.

Your consultant should understand both the technical and business side of radio *and* should be experienced in the design and construction of radio stations. D'Alessio also emphasized that this should be a position of trust, because the consultant needs to know details of the station's finances.

You also need a project manager from your staff who is always available for consultation. The project manager should understand both the business and technical side of radio and should have the authority to make decisions. While you're at it, make sure you have a simple chain of command so that responsibilities and supervision are clear.

►

THE OPTIONS GET EVEN BETTER

Series 2

New

The New Series 2 Offers Enhanced Features Broadcasters Have Been Asking For: For Demanding Production — Dolby HX Pro™ Headroom Extension*, Tape Timer, Cool Operation. For Demanding Installations — Heavy-Duty XLR's, Active Balanced Inputs & Outputs, An Autoranging Power Supply. And Much More.

Series 1

Since its introduction in 1990, the popular Series 1 has earned a reputation for Performance, Reliability, and Value.

Whichever Option You Choose, The Quality and Features Needed To Remain Competitive Are Assured.

And, Of Course, Both Series 1 & Series 2 Include The Added Confidence Of ITC's 4 Year Limited Warranty. **An Industry Exclusive!**

For More Information On ITC Products, Contact These Authorized Distributors:

Audio Broadcast Group:	**800-999-9281**
Broadcast Services Company:	**800-525-1037**
Broadcast Supply West:	**800-426-8434**
Harris/Allied Broadcast Equipment:	**800-622-0022**
Northeast Broadcast Lab:	**800-227-1093**
***In Canada:* Maruno Electronics Ltd.:**	**416-255-9108**

*Dolby HX Pro™ Headroom Extension originated by Bang & Olufsen and manufactured under license from Dolby Laboratories Licensing Corporation.

Since 1969, ITC has set the standards for cartridge machine quality and performance, providing over 70,000 machines to broadcasters worldwide.

International Tapetronics Corporation
P.O. Box 241, Bloomington, IL 61702-0241
TEL: 800-447-0414; 309-828-1381
FAX: 309-828-1386

Circle (16) On Reader Service Card

Stage III: Design development

During this phase, the prime consultant coordinates with the other project consultants. Although progress may not be obvious, Williams and D'Alessio explained that this stage is critical for the successful completion of the project and should not be rushed.

Stage IV: Contract documents

Since major construction projects are likely to be the largest transactions a station makes, contracts are critical. They should include project specifications and the terms between the station and the general contractor. Williams emphasized that details not included in the contract *will* incur cost overruns.

Stage V: Negotiation and contracting

Three tips were offered for managers who put projects up for bid. First, if there is more than a 25 percent spread between the low and high bids, make sure the bidders have the same understanding of the project's parameters. They may be bidding on apples and oranges.

Second, if the lowest bid seems too good to be true, it probably is. Reject it.

And finally, if the bids are all too high, don't try to strong arm the price down. Instead, examine the differences between the original budget estimates and the bids and reduce the scope of the project where appropriate.

> ***If the lowest bid seems too good to be true, it probably is. Reject it.***

They recommended not selecting a contractor on the basis of price alone. You should be familiar with the contractor's reliability, timeliness and qualifications for working on complex technical projects, they said.

Stage VI: Construction

Be sure to allow sufficient time for construction. If you try to rush things, you'll pay in cash or poorer quality. Also carefully monitor construction progress, for the contractor may not faithfully follow the design if you're not watching. This advice is particularly important when it comes to designing acoustic spaces, which may be exorbitantly expensive to correct if they get on the wrong track.

Williams and D'Alessio contended that although horror stories all seem to come into play at this stage, they usually can be traced to earlier carelessness.

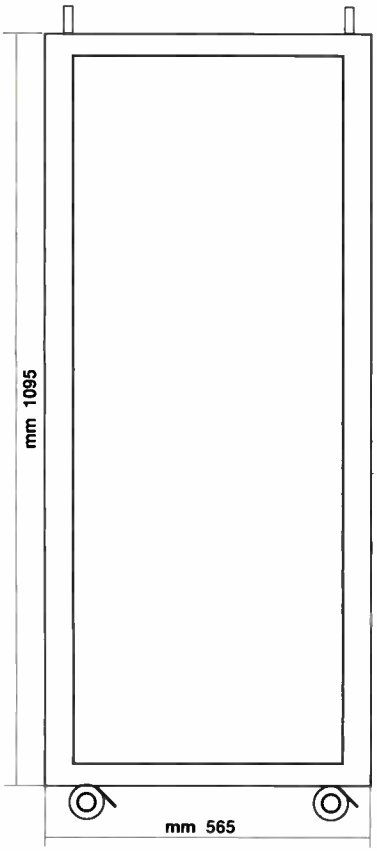
"The most common consequence of poor planning is a poor relationship with the contractors and vendors. It's important that you appreciate that contractors are not in the business for their health. You must accept the fact that they're out to do business (for the same reasons you do) and that's to make a profit," they said.

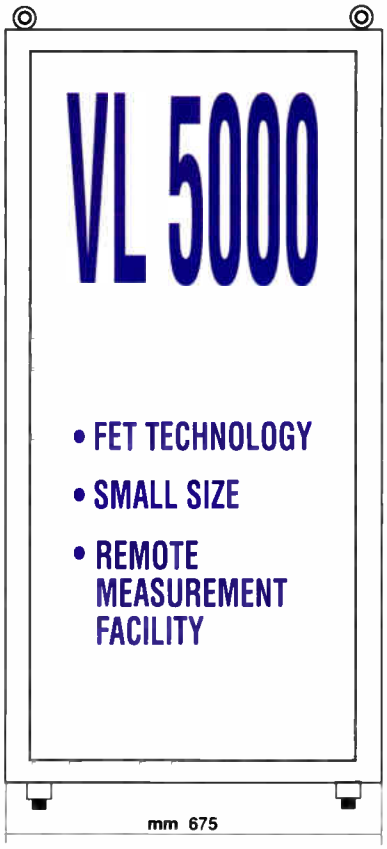
Don't try to negotiate the contractor's profits out of the deal. You're likely to pay for it in poor workmanship or a lack of timeliness.

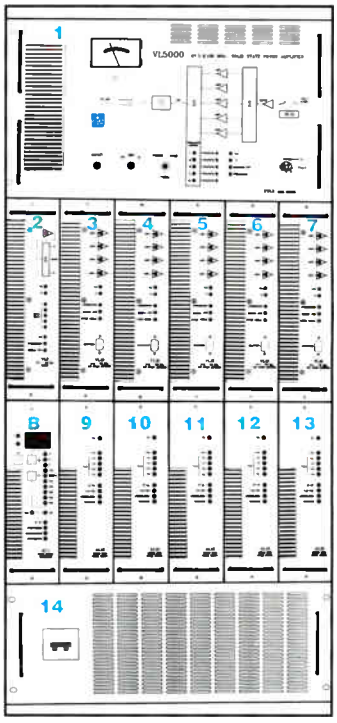
If you are thinking about major station renovations, remember that detailed plans and budgets, adequate consultation and a generous timeline can keep your money off the park bench and in your station's operations and profits where it belongs.

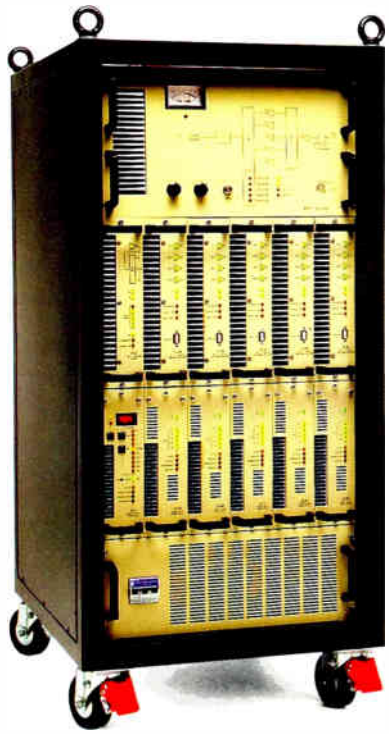
Nancy Reist is an assistant professor of broadcast communication arts at San Francisco State University.

CTE'S COMMITMENT TO ENGINEERING EXCELLENCE; A 5 KW SOLID STATE TRANSMITTER SETTING NEW LIMITS FOR SIZE AND COST EFFICIENCY.









1 Output Coupler Unit
This unit includes the output coupler of the 1 kW-5 modules, the resistive terminals, the power meter, the output power as well as the over-heating, unbalance condition and excessive SWR indications. A BNC connector provides an output voltage sample attenuated by 60 dB. The output connector is EIA 1 5/8" flange.

2 Driver Module
Good driving is the basic step for good amplification. This operation is assured, in any input condition, by a 300% oversized feedback, controlled by a detector circuit with output depedent on working frequency. Also this module is protected against over-heating and excessive SWR values at the output.

3 1 kW Module
4
5 The CTE 1 kW Module is composed of 4 basic amplifiers, combined both in input and output by a coupler circuit
6 conceived and developed in our labs.
7 The use of the coupler permits good SWR over the whole frequency band, even without one or more basic units. A sophisticated control device, assures a balanced condition, also in case of damage of one of the modules. This circuit acts on the circuits power supply within a short time, reducing the values to safety levels. A special connector placed on the front panel of the amplifiers modules allows the reading of the different values that, addressed by a 4 bit code and analyzed by an optional tester, permits verification of the proper operation of the unit.

8 Power Supply Controller
This module provides all the necessary values concerning the operation of the unit's power supply. These operations are: input and output voltage, auxiliary voltages total and partial current of each single amplifier.

9 Switch Mode Power Supply.
10
11 A switching power supply assures a tolerance on the power supply voltage of +/- 20%. Each module can supply
12 up to 40 A and is complete with luminous LEDS, indicating input and output voltage, auxiliary voltages, overload,
13 overheating and stand-by position of every single power supply.

14 This unit has a three-phase insulating transformer, gas discharger and a thermal-magnetic main switch, besides of course a complete set of fast protections for the main voltage.

ITALIAN TECHNOLOGY, FOR WORLDWIDE MARKETS

In U.S.A. please call: **International Broadcast Supply, Inc. I.B.S.**
2450 N. Powerline Road, Suite 12, Pompano Beach, FL 33069
Tel 305-977-9111 - Fax 305-977-0488
CTE INTERNATIONAL s.r.l. Via R. Sevardi, 7 - 42010 Mancasale Reggio Emilia - Italy
Tel. 0039-522-516660-47441 - Telex 530156 CTE I - Fax 0039-522-47448

cte INTERNATIONAL

Circle (89) on Reader Service Card

IBS INTERNATIONAL BROADCAST SUPPLY, Inc.

2450 N. Powerline Rd. U-12 Pompano Beach, FL. 33069 U.S.A. Tel: 305-977-9111
Fax: 305-977-0488

CTE INTERNATIONAL BROADCASTING DIVISION
CTE INTERNATIONAL s.r.l.

KT·3000

250 WATTS TRANSMITTER

HUNDREDS OF THESE UNIT ARE WORKING ALL OVER WORLD UNDER THE TOUGHEST ENVIRONMENT CONDITIONS, REPAYING GENEROUSLY THE LOW COST. THE UNIT CAN BE EASILY CONVERTER FROM MONO TO STEREO AND VICEVERSA. OUTPUT POWER IS FRONT PANEL ADJUSTABLE FROM SO UP TO 2SOW. THE BALANCED INPUTS AVOID MAINS AND RF INTERFERENCE ON THE AUDIO INPUTS AND ALLOW DIRECT CONNECTION OF THE UNIT TO PROFESSIONAL AUDIO EQUIPMENT.

KT·24

30 WATTS PLL EXCITER

THIS EXCITER FEATURES A FULL 30 WATTS OUTPUT, STOUT CONSTRUCTION AND HIGH RELIABILITY. THE COST AND THE GOOD PERFORMANCE MAKE IT A PRODUCT OF CERTAIN INTEREST FOR INTERNATIONAL MARKETS. IT IS AVAILABLE BOTH IN STEREO AND MONO VERSION.

VL·1000

1 KW VHF LINEAR
AMPLIFIER "MOS-FET"

THIS NEW AND MODERN LINEAR AMPLIFIER HAS BEEN CONCEIVED WITH THE MOST ADVANCED TECHNOLOGIES:
* "SOLID STATE" CONSTRUCTION WITH MOS-FET TECHNOLOGY
* "SWITCH MODE" POWER SUPPLY * CONTROL AND COMMAND LOGIC
* MULTIPLE OPTION FOR VARIOUS UNITS * ULTRA COMPACT DESIGN BY USING "STRIP-LINE" CONSTRUCTION TECHNIQUES IT IS POSSIBLE TO CONTAIN THE WHOLE AMPLIFIER IN A SINGLE STANDARD 19"/SU CABINET WITH A DEPTH OF 640 mm. A STANDARD 19" CABINET CAN BE SUPPLIED AS AN OPTIONAL EXTRA. THIS PERMITS THE USE OF THE AMPLIFIER IN CONJUNCTION WITH OTHER EQUIPMENT, FOR INSTANCE EXCITERS, STUDIO LINKS, ETC...
DUE TO THE A.L.C. CIRCUIT,THE HIGH OUTPUT POWER STABILITY OF 3% IS ALWAYS ASSURED.THE UNIVERSAL SINGLE PHASE POWER SUPPLY IS 110 VAC/60 Hz. OR 220VAC/SO Hz. 15%, WHICH IS DIRECTLY SELECTABLE BY THE USER, DURING THE INSTALLATION.

"CTE" EQUIPMENT	MODEL
FM EXCITER 2-20 WATTS SYNTHESIZED, MONO/STEREO.	S-22
FM EXCITER 2-30 WATTS SYNTHESIZED, MONO/STEREO.	VL-30
SOO WATTS SOLID STATE AMPLIFIER.	S-500
1 KW, SOLID STATE AMPLIFIER.	S-1000
2 KW, SOLID STATE AMPLIFIER.	S-2000
5 KW, FET DEVICES - AMPLIFIER.	VL-5000
1 KW, TUBE AMPLIFIER.	AV-1000
2 KW, TUBE AMPLIFIER.	AV-2000
5 KW, TUBE AMPLIFIER.	AV-5000
10 KW, TUBE AMPLIFIER.	AV-10000
STL TRANSMITTER 300-1000 Mhz.	TX-02
STL RECEIVER 300-1000 Mhz.	RX-10
20 WATTS STL AMPLIFIER.	S-02
LOW POWER TV TRANSMITTER.	
ANTENNAS UP TO 5 KW.	

OTHER PRODUCTS

* "PACETTER"	SCA RECEIVERS
* "CELWAVE"	ANTENNAS & COAXIAL CABLE
* "AUDIOTRONICS"	AUDIO CONSOLES
* "EIMAC"	TUBES
* "COAXIAL DYNAMICS"	WATTMETERS
* "TAPECASTER"	CART MACHINES

IBS ESTA AL SERVICIO DE LA INDUSTRIA DE RADIODIFUSION DESDE 1981, PROVEYENDO SERVICIO TECNICO Y CONSULTORIA. LOS EQUIPOS QUE OFRECEMOS SON DE DISEMO MODERNO Y DE TECNOLOGIA AVANZADA A UN PRECIO ECONOMICO AL ALCANSE DE SUS POSIBILIDADES.

Circle (89) on Reader Service Card

How FCC Rules Are Made

I. Initiation of Action

Suggestions for changes to the FCC Rules and Regulations can come from sources outside of the Commission either by formal petition, legislation, court decision or informal suggestion. In addition, a Bureau/Office within the FCC can initiate a Rulemaking proceeding on its own.

II. Bureau/Office Evaluation

When a petition for Rulemaking is received, it is sent to the appropriate Bureau(s)/Office(s) for evaluation. If a Bureau/Office decides a particular petition is meritorious, it can request that the Dockets department assign a Rulemaking number to the petition.

A similar request is made when a Bureau/Office decides to initiate a Rulemaking procedure on its own. A weekly notice is issued listing all accepted petitions for Rulemaking. The public has 30 days to submit comments. The Bureau/Office then has the option of generating an agenda item requesting one of four actions by the Commission. If a Notice of Inquiry (NOI) or Notice of Proposed Rulemaking (NPRM) is issued, a docket is instituted and a docket number is assigned.

III. Possible Commission Actions

Major changes to the Rules are presented to the public as either an NOI or NPRM. The Commission will issue an NOI when it is simply asking for information on a broad subject or trying to generate ideas on a given topic. An NPRM is issued when there is a specific change to the Rules being proposed.

If an NOI is issued, it must be followed by either an NPRM or a Memorandum Opinion and Order (MO&O) concluding the inquiry.

IV. Comments and Replies Evaluated

When an NOI or NPRM has been issued, the public is given the opportunity to comment initially, and then respond to the comments that are made. When the Commission does not receive sufficient comments to make a decision, a further NOI or NPRM may be issued.

It may be determined that an oral argument before the Commission is needed to provide an opportunity for the public to testify before the Commission, as well as for the Bureau(s)/Office(s) to present diverse opinions concerning the proposed Rule change.

V. Report and Order Issued

A Report and Order is issued by the Commission stating the new or amended Rule, or stating that the Rules will not be changed. The proceeding may be terminated in whole or in part.

The Commission may issue additional Report and Orders in the docket.

VI. Reconsideration Given

Petitions for reconsideration may be filed by the public within 30 days. They are reviewed by the appropriate Bureau(s)/Office(s) and/or by the Commission.

VII. Modification Possible

As a result of its review of a petition for reconsideration, the Commission may issue an MO&O modifying its initial decision or denying the petition for reconsideration.

Provided by FCC

Learning: The Never-ending Story

Today's successful broadcast engineer must do a lot more than repair and install equipment. He or she must hone strong interpersonal skills, the ability to write well and management savvy. His or her education also is a never-ending pursuit.

by Thomas L. Vernon

The broadcast engineering industry has undergone tremendous changes over the last decade. It's easy to look around and notice the differences in hardware and newer technologies.

What is less obvious are the various career paths and educational opportunities available to today's broadcast engineer.

In the future, new technologies will require new standards of knowledge and understanding for technical personnel to keep up with a quickly evolving industry. An understanding of the resources available today is a step in the right direction for the broadcast engineer of tomorrow.

In the old days

About 20 years ago, an informal mentoring and apprenticeship system was one of the best paths into broadcast engineering. Youngsters could hang out at the local station and work with the chief engineer. Customarily, he was an older man with many years in the broadcast business and possibly military training as well.

Being a gofer meant you received low or nonexistent pay, emptied lots of wastebaskets and cleaned countless tape heads and pinch rollers.

In exchange you got to look over the engineer's shoulder and see how equipment was maintained and repaired. You studied instruction manuals and eventually got into some of the equipment.

FCC exam guides were studied until the day came when you were ready to take the test. With the First Class ticket in hand, you were ready to start out on your own.

Some former gofers became chiefs at small market stations. Others went on to college and got involved with campus radio, where there were opportunities to build equipment from scratch and learn a little more about RF by maintaining carrier current transmitters.

Into the 1990s

Now we're into the 1990s and all that has changed. Most stations have contract engineers who come in on an as-needed basis. Older, more experienced men either have retired or gone on to more lucrative careers. The FCC First Class license no longer is available as a benchmark of technical competence. And knowledge of a dozen or so basic circuits isn't sufficient to repair and maintain today's microprocessor-based equipment.

Young people entering broadcast engineering today must be more innovative in seeking out the knowledge they need to succeed in this profession. Technical books, home study courses, college engineering programs and manufacturer's training seminars all are components of a well-rounded technical education.

Getting on the mailing list for catalogs from technical book publishers will keep you alerted to new technology publications. Many of these books are too specialized to be stocked in retail book stores. Some publishers have pre-publishing sales and discounts for mail order customers.

Reading the broadcast trade magazines is almost mandatory. Subscribing to one of the general interest electronics magazines is useful as well. News of the latest technical developments will be found in these publications first, owing to the fast lead time of monthly periodicals.

Home study courses are an excellent way to continue your education or brush up on weak areas. Some, such as the Heath programs, come with text in three-ring binders along with the parts needed to complete the experiments. At the conclusion of the course, you may ►

elect to take the optional exam and mail it back to Heath.

Successful completion earns you a certificate and a prescribed number of CEUs. Most useful to broadcasters are Heath's Electronic Communications and Data Communications and Networks courses.

Cleveland Institute of Electronics offers a Broadcast Engineering course comprising 76 lessons, including resonant circuits, broadcast transmitters and remote control. Students are allowed 18 months to complete the program and earn 20 credit hours toward CIE's AAS degree program. This course is recommended to students who already have some hands-on experience in electronics.

Getting the degree

Many colleges offer two- and four-year degrees in electronics engineering. Most of these will give their graduates a solid background in basic electronics, digital techniques and computer technology. Few programs offer more than a brief mention of analog electronics, audio or RF topics, as most of their graduates are prepared to enter the computer industry.

Manufacturers' training seminars are a good way to learn a great deal in a short time. The only equipment manufacturer with a full-time training staff is Harris Corp. It offers two types of programs: broadcast technology and product-specific training.

The four-day AM and FM transmitter workshops take participants from the operator level through RF systems. At a more advanced level, Harris offers three week-long courses: RF Circuits I, II and Solid State RF Devices and Control Logic. Among the topics presented are power measurements, neutralization, RF pulse testing techniques and RF power amplifiers.

Product-specific training is offered in week-long seminars. Equipment covered includes SX series, DX-10, 25, 50 Series, SS FM PT series and more. All courses are offered at the Harris plant in Quincy, Ill.

The most comprehensive education offered to broadcast engineers comes from the Voice of America. Here, the engineering operation is evolving into a true learning organization.

From its Network Training Center at the Greenville, N.C., transmitting site, VOA's instructors develop both general electronics and product-specific education packages that are delivered at relay stations around the world. Each relay station has its own training officer to administer the assessment, education and qualification programs at that site.

Many colleges offer two- and four-year degrees in electronics engineering, giving graduates background in electronics, digital techniques and computer technology.

Several activities run simultaneously in Greenville. Members of the training staff work with equipment manufacturer's instructors to develop systems integration materials to VOA standards. Trainers develop product-specific programs that they deliver overseas to foreign service nationals.

Programs are taught at Greenville for Americans who will become foreign service officers. One of these is a year- ►

Look These Up:

Professional Organizations

Society of Broadcast Engineers (SBE)
7002 Graham Street
Indianapolis, Ind. 46220
317-842-0836

Institute of Electrical and Electronic Engineers (IEEE)
345 East 47th Street
New York, N.Y. 10017
212-705-7900

National Association of Broadcasters
1771 N Street, N.W.
Washington, D.C. 20036
202-429-5300

Home Study

Cleveland Institute of Electronics
1776 East 17th Street
Cleveland, Ohio 44114
216-781-9400

Heath Corp.
Education Corp.
Benton Harbor, Mich. 49022
616-982-3980

Manufacturer's Training

Harris Corp.
Broadcast Technology Training Center
P.O. Box 4290
3200 Wiseman Lane
Quincy, Ill. 62305
217-222-8200

U.S. Government
Voice of America
330 Independence Ave., S.W.
Washington, D.C. 20547
202-619-4700

Technical Book Publishers

Addison-Wesley Publishing Co.
Jacob Way
Reading, Mass. 01867
617-944-3700

McGraw-Hill Book Co.
1221 Avenue of the Americas
New York, N.Y. 10020
212-512-2000

MacMillan Publishing
Front and Brown Streets
Riverside, N.J. 08075
800-257-5775

Prentice-Hall Inc.
Route 9W
Englewood Cliffs, N.J. 07632
201-592-2455

Tab Books
P.O. Box 40
Blue Ridge Summit, Pa. 17214
717-794-2191

U.S. Government Bookstore
720 North Main Street
Pueblo, Colo. 81003
719-544-3142

Van Nostrand Reinhold Co.
135 West 50th Street
New York, N.Y. 10020
212-254-3232

long program that interweaves six months of classroom instruction with six months of hands-on experience. Within the program are courses on digital techniques, transmitter operations, propagation and monitoring and antennas.

At its conclusion, most are sent overseas to one of the VOA's relay stations. Openings in the VOA are posted at the Office of Personnel Management, located in many federal government buildings.

The successful broadcast technologist of the future must be able to do more than repair and install equipment. He or she must possess strong interpersonal skills, good writing skills and an understanding of budget and administrative duties. The ability to function as part of a team also is essential. This emphasis on engineering management, rather than just technical skills, is evolving in all areas of electronics servicing.

The old mentoring system is no longer in place.

Broadcast management must be involved in the process as well. For facilities to be reliable and well maintained, sufficient time and money must be set aside for the engineer to purchase instructional materials, travel to manufacturer's seminars and attend classes at community colleges.

More of an effort needs to be made in recruiting recent electronics graduates into broadcasting. In the past, radio seemed to attract technical personnel with no effort, much as computer technology does these days. This effort may involve local broadcasters or Society of Broadcast Engineers (SBE) chapters setting up booths at job fairs, or broadcast engineers guest lecturing at local colleges and universities.

The successful broadcast technologist of the future must be a self-directed learner. The old mentoring system is no longer in place. Completion of a two- or four-year EE program is a good start, but additional self study will be needed to round out your education.

The rate of change for technology is rapidly increasing and a dedication to perpetual learning will be necessary. It may help the self-directed learners to have an awareness of their own learning style and to become proficient in study skills.

Tom Vernon, a regular **RW** *columnist, divides his time between consulting and completion of a Ph.D.*

WORKBENCH

Top Tech Tips of 1991

by John Bisset

Our first year of Workbench included a multitude of practical tips for broadcasters.

The following is a recap of some of the more novel, practical and general purpose tips that appeared throughout 1991.

At the tower

We'll start at the tower. Repairing AM tower radials or ground straps is facilitated using MAPP gas. This gas produces a hotter flame, which makes for quicker silver soldering. Note, however, that MAPP gas cylinders must be used with MAPP gas torch heads.

Another time-saving maintenance tip involves wiring two J-plug jacks in parallel to both the input and output of the ATU. When operating at low power, inserting a portable ammeter or bridge into the circuit is facilitated.

In addition to protecting your tower gate locks with a spray lubricant or deicer, you may want to consider making ice shields for each lock. Using an old inner tube—traded for a station T-shirt at the local gas station—rubber squares can be cut out that can be either nailed above the lock or cut so the hasp of the lock sticks through and the rubber hangs down and around the lock body, providing a "tent" against snow and ice.

Inside the shack

Solid state exciters are protected from any garbage kicked back through the transmitter by placing a BNC "T" on the exciter RF output, and connecting a shorted quarter wave stub to the other end of the "T."

The stub can be constructed out of RG-58 and coiled into a loop on the back of the exciter.

Speaking of exciters, for those engineers without a backup FM, you may want to consider investing in a motorized coaxial transfer switch, or at the very least, a manual patch panel. Such an arrangement will permit the exciter to be wired through the switch.

Should the main transmitter fail, the exciter can be switched out of the transmitter input and into the antenna. If your antenna is mounted on top of a mountain, you'll be surprised at how far 20 to 30 W will cover.

A long wooden cotton-tipped swab is all that's needed to fashion a retriever, for getting to nuts, washers and debris that have fallen into tiny nooks of electronic equipment. Useful to remove broken pieces of finger stock inside a tube socket, a 1/8-inch wide strip of tape is looped around the end of the wooden stick. Hold the cotton-tipped end, stick the wooden end into the hard-to-reach ►

area, and the lost part will stick to the tape, permitting easy retrieval.

If you have a spare transmitter blower motor, try pre-wiring the ends with male-female crimp connectors. Then, break the line to the existing blower and insert the same type connectors. Remember, the female end connects to the transmitter side (AC side) and the blower is wired with male connectors.

If you've dodged the PCB capacitor/transformer issue, dodge no longer. The EPA is handing out some pretty stiff fines for those who have ignored the law. PCB-free replacement capacitor kits can be obtained from a single source. Contact Dan Churchill at Commercial Radio Supply (802-226-7582) for pricing information, and to see if your transmitter is affected.

Need to drive two 50-ohm terminated devices from one RF source? Grab three 16.6 ohm resistors (sized according to power level) and tie the three legs together. The "Y" you've now formed makes up the splitter, with 50 ohm input RF coming in from the bottom, and 50 ohm "split" RF coming out the two ports at the top of the "Y." Construction is not critical.

If your satellite gets iced regularly, consider tying a nonconductive plastic bag around the feed horn. For one meter "microsats," consider putting the whole dish in a large non-conductive trash bag. Ice or snow that forms on the bag can be easily shaken off. For larger dishes, get out the auto paste wax and give the dish a good waxing—snow will slide right out.

A trash bag for your dish, MAPP Gas for quicker silver solder connections, WD-40 for removing duct tape residue, and Static Guard for your studios. Just a few of the items to speed your job.

Changing tubes

Changing transmitter tubes? Don your gloves. Grease and oil can contaminate the glass or ceramic globes of tubes. When subjected to heat, the stain darkens and can be misinterpreted for arc marks. Using a cheap pair of cotton gloves will ensure that any marks on the tube didn't come from your hands.

Weather emergencies and EBS messages can be missed or copied incorrectly as today's operators talk to groupies on the phone, keep transmitter readings up to date and do their shows. A foolproof solution is to connect a consumer-grade voice-activated cassette recorder to these alarms. The alarm alert tone triggers the recorder, the message is recorded, and can be easily disseminated at the operator's leisure.

Spare fuses in the studio are never a problem if you stick the box to the back of the console or pedestal using male and female pieces of Velcro™. By affixing the Velcro to the metal side of the box, the clear see-through box also will help you keep tabs on fuse inventory.

While you're behind your studio pedestals, make some sense out of the jumble of wires routing audio and remote signals to each cart machine by labeling the connectors with either a fine-point indelible marker, or using an old soldering iron tip on the plastic connector shells and engrave CT-1, CD-1, etc.

If your budget console doesn't have input selector switches, which allow either Left, Right, Mono or Stereo to be selected on each console fader, you can easily solve the dilemma of single-track agency dubs by paralleling the tape recorder outputs so one fader has both Left and Right and a second pair of faders carry Left only and Right only.

When single channel dubs come in—say, recorded only in the Left channel—simply pot up the fader that has the Left-only tape output wired to it.

Remote broadcasts

If you have a remote van with a collapsible mast, at some point in time the nycoil tubing that spirals around the mast and protects the cables will crack and need replacing. To feed cables through a new piece of nycoil without kinking it is next to impossible, unless you wire tie the nycoil in a horizontal line along a fence. This will straighten the nycoil, permit insertion of a fishtape and let you keep your sanity.

As *Workbench* celebrates its first year, **RW** pays tribute to all the engineers who took time to send in the contributions that have made this column such a useful tool. Not only will submissions earn SBE Certification credit, but a modest honorarium also is provided by **RW** in appreciation for your efforts. Fax your tips and suggestions to 703-998-2966.

John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.

BUYERS GUIDE CALENDAR

Each month, *Radio World* examines a different category of radio equipment. Articles are solicited from users and manufacturers. The calendar of categories is fixed as follows:

January	February	March	April	May	June
Test & Monitoring Equipment	Digital Workstations & Automation Equipment	Tape Recorders, Microphones & Monitors	AM Transmitters & Exciters	Antennas Towers & Cables	Program Audio Processing
July	**August**	**September**	**October**	**November**	**December**
Studio Audio Equipment & Furniture	Consoles	Production & Broadcast Services	STL, Remote & Telco Equipment	FM Transmitters, Exciters & SCAs	Digital and Analog Cart Machines & CDs

For more information on editorial opportunities in the Buyers Guide, contact Charles Taylor at 703-998-7600.

Where does Kansas City's KCMO-FM turn when it's time for "Kansas City?"

Halland's Rock n' Roll Graffiti!

"Rock 'n Roll Graffiti *and* The Seventies *are a great way to get an extensive collection of the songs you need at an affordable price. Lots of listeners say these versions of the songs they haven't heard in a while really sound good. The index printouts and floppy disc database give us fast access to anything we need during our all-request noon hour.*"

Phil West, *PD*,
KCMO-FM, Kansas City, MO

How does LA's KRLA check into the "Hotel California?"

With The Seventies from Halland!

"*You can't program an oldies station like KRLA with re-mixes and 'sound-alikes.' The convenience of having an entire authentic oldies library on CD made* Rock 'n Roll Graffiti *and* The Seventies *attractive. The price made them necessities.*"

Mike Wagner, *PD*,
KRLA, Los Angeles, CA

How does WPOK/WJEZ in Pontiac, IL fire up "GTO?"

With Rock n' Roll Graffiti!

"Rock 'n Roll Graffiti *is as complete a collection as you'll find anywhere, and with the alphabetical-by-artist sequencing, it couldn't be easier to find a request.* The Seventies *is a great core library with excellent quality. Listener response has been overwhelming—I'd recommend both Halland libraries to any station that plays Oldies or Gold. In fact, we own two sets of each.*"

Lane Lindstrom, *PD*,
WPOK/WJEZ, Pontiac, IL

300+ Stations Worldwide Rely On Our CD Libraries—So Can You.

Call today and your CDs will be on their way tomorrow.

Rock n' Roll Graffiti [1229 songs on 50 CDs] and *The Seventies* [545 songs on 30 CDs] are *in stock!*. Call (818) 963-6300 and place your order today for immediate delivery. Or ask for a complementary Song Index and Demo CD.

All Halland CD Libraries are sold on a "one time buyout" basis. There are NO additional monthly or yearly fees.

HALLAND BROADCAST SERVICES, INC.

HALLAND BROADCAST SERVICES, INC.
1289 E. Alosta Avenue • Glendora, CA 91740
Tel (818) 963-6300 • Fax (818) 963-2070

Circle (23) On Reader Service Card

Trade Terms You Thought You Knew

"Familiarity breeds contempt" (Aesop, "the Fox and the Lion").

According to "Webster's New World Dictionary," a definition is a statement of what a thing is. According to industry experience, definitions of trade terms might be more useful if they provided a clear indication of what can and will go wrong.

Tossing about humorous definitions has, on more than one occasion, helped the author "resist the urge to toss about malfunctioning gear and uncooperative colleagues."

Here then, a collection of glossary terms - steeped in reality - culled from many years of blood, sweat and tears.

by John Moretti

Acronyms: A complex form of language perfected by engineers who don't want others to understand what they're talking about (i.e., "Looks like your R-DAT is SOL. Think we need to tweak your SPDIF I/O to keep that RF from leaking into the IC.")

Advance tone: An inaudible tone of a specified frequency that triggers another piece of equipment to malfunction.

Air time: 15 minutes before whatever needs to be on the air is finished.

Alignment: A common problem with the front wheels of rapidly aging and abused station vans.

Analog: Descriptive of a system that uses electrical voltages to generate and store unwanted noise.

Audio feed: Important audio transmitted when the receiving equipment is not working properly.

Band: A group of untalented musicians with marketing support.

Bidirectional mic: A microphone that picks up unwanted sounds in two directions at once.

Board: An electronic device that routes and combines separate channels of unwanted noise.

Board fade: Decreasing mental capability brought on by too much time spent in front of a board.

Bulk eraser: A powerful, hand-held electromagnetic device used to obliterate audio from tapes that are not to be erased.

Card: A modular assembly of integrated circuits that fails soon after being installed in an unaccessible location.

Cardioid mic: A directional mic that picks up unwanted sounds within a heart-shaped pattern.

Carrier: Radio frequency signal upon which unwanted noise is transmitted.

Cart: An abbreviation of "tape cartridge"—a plastic shell, containing a length of endless tape, which is immune to failure unless used.

Cart machine: An electromechanical device that jams carts.

CD: A good way to ensure future financial stability while employed in the volatile business of broadcasting.

Channel: A circuit through which erroneous information or unwanted noise flows.

Combo: Small band in which a broadcasting employee might play to supplement his or her income.

Compact disc: A flat, round digital storage medium, which is virtually indestructible until removed from its container.

Condenser mic: A type of microphone that picks up unwanted sounds by means of one or two vibrating plates. ►

Console: 1) A mixer through which different channels of unwanted noise are routed to recording equipment, other consoles or the transmission chain. 2) A natural habitat in which "Post It Notes" thrive and reproduce. 3) A natural collecting area for cigarette ashes and spilled coffee. 4) To attempt to lessen the grief of one who's on the receiving end of a lousy book.

Crosstalk: A style of interpersonal communication often used by management when addressing employees.

Cue tone: An inaudible tone of a specified frequency used to trigger an outside event, such as a cart machine jamming a cart.

Current: A measurement of the electricity flowing through one's body by mistake.

Cutoff frequency: The number of times in a given period during which a fatigued engineer accidentally removes flesh with a pair of wire strippers.

Decode: To transform from code into another form or language (i.e., "Would you decode what the Chief Engineer just said?").

Directional mic: A microphone that picks up unwanted sounds mainly from one direction.

Disc: An integral element of the spine which, when forced out of alignment from continuous grovelling to management, causes intense lower back pain.

Distortion: The difference between that which is sent and that which is received (i.e., the difference between what you *meant* as a professional suggestion that management consider upgrading the station's aging equipment and what management *perceived* as a sarcastic inference that your children's toys contain superior electronics).

Drop out: The educational status of many announcers.

Dry: The state of one's mouth following a budget review.

Dub: The blank tape that is supposed to have a copy of the master tape on it.

Dynamic mic: A type of mic that picks up unwanted sounds by means of a vibrating coil of wire.

►

A Guide To Interpreting Specs

Manufacturers have developed a special language to proclaim the many virtues of their products. Ordinary language does not seem to do justice to the many wondrous things they make for us. Sometimes these virtues cannot be completely understood by the average person unless they have the anointed translation. Here is your guide to knowledge:

New—Different color from previous design.

All New—Parts not interchangeable with previous design. Exclusive Imported product.

Unmatched—Almost as good as the competition.

Design simplicity—Costs cut to the bone (manufacturer's costs).

Foolproof operation—No provision for any adjustments.

Advanced design—The advertising agency doesn't understand it.

It's here at last!—Rush job; nobody knew it was coming.

Field-tested—Manufacturer lacks test equipment.

High accuracy—Unit on which all parts fit.

Direct sales only—Factory had a big argument with distributor.

Years of development—We finally got one that works.

Unprecedented performance—Nothing we had before ever worked this way.

Revolutionary—It's different from our competitors.

Breakthrough—We finally figured out a way to sell it.

Futuristic—No other reason why it looks the way it does.

Distinctive—A different shape and color from the others.

Maintenance-free—Impossible to fix.

Redesigned—Previous faults are corrected, we hope.

Hand-crafted—Assembly machines operated without gloves on.

Performance proven—Will operate through the warranty period.

Meets all standards—Ours, not yours!

Satisfaction guaranteed—Manufacturer's, upon cashing your check.

Microprocessor controlled—Does things we can't explain.

All solid-state—Heavy as hell!

Broadcast-quality—Produces noise.

Latest aerospace technology—One of our techs recently laid off by Boeing.

High reliability—We made it work long enough to ship it.

High accuracy surface tolerances—Feels smooth.

Built to precision tolerances—Finally got it all to fit together.

New generation—Our old design didn't work; this one should.

Mil-spec components—Got a deal at the government surplus auction.

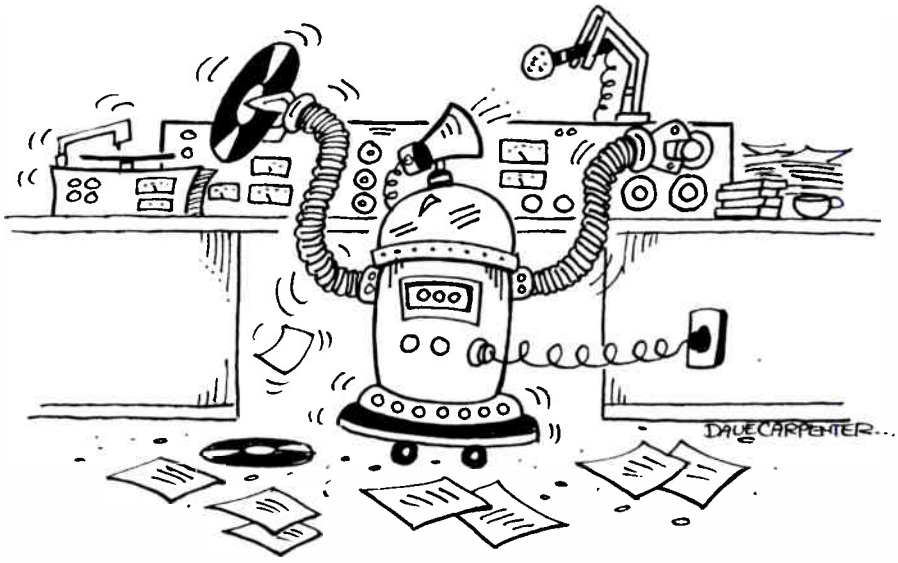
24-hour service—Given 14 hours, we can usually find a second person to ignore your problem.

Customer service across the country—You can return it to us from most airports.

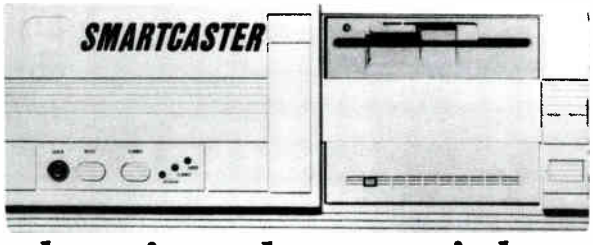
The origin of the previous guide apparently rests with Sequoia Electronics in Los Gatos, Calif., though no individual can be pin-pointed with the blame. For information, you may call the company at 408-356-3232.

SMARTCASTER

DIGITAL AUDIO



" There have been many attempts at broadcast automation!"



"but there's only one right way."

SMARTCASTER Digital Automation simplifies the process to a single computer, and cuts your operating expenses by taking over many tasks at your radio station.

SMARTCASTER interfaces to satellite, CD or Automation systems, and offers features found only in the most expensive systems, but at an affordable price, Simultaneous record-playback, automatic spot fill, automatic recording and logging. Of course it interfaces to the popular SMARTS Billing and Traffic System.

SMARTS BROADCAST SYSTEMS
BOX 293
EMMETSBURG, IA 50536
800 747-6278
712 852- 4047
FAX 712 852-3061

Circle (6) On Reader Service Card

Fade: To gradually become unconscious because of constant pressure and insufficient sleep.

Fader: A broadcasting employee who has run out of coffee.

Feedback: An unpleasant, high-pitched squealing sound made by management during a budget review.

Final mix: The final product of a production session that does not meet the requirements of a client.

Flat: The state of carbonation in a soft drink purchased from a break room's vending machine.

Food groups: There are only three food groups that broadcasting employees consume on a regular basis: carbohydrates (sugar), alkaloids (caffeine) and sludge (partially hydrogenated tropical oils found in non-dairy creamers and junk food).

Fringe area: The area of a broadcasting employee's head where hair is beginning to thin due to excessive pulling before (and after) the ratings arrive.

Gain: To add body weight by consuming the staples of an announcer's diet. See Food groups.

Gate: An electrical device that allows only unwanted noise of a certain strength to pass.

High impedance: A characteristic of the consumer-grade audio equipment used to outfit many stations. See Trade out.

Holiday: See Workday.

Inaudible tone: An audio tone beneath the range of human hearing that generally is used to cause another piece of equipment to malfunction.

Induction: A formal inauguration into the glamorous world of broadcasting - usually the first tiny paycheck.

Initial sound: The scratching sound made by a GM who's perfected a rapid, indecipherable signature.

Input: Any suggestions or thoughts communicated to management, which are subsequently ignored.

IPS: British colloquial pronunciation of "hips."

Jack: A tool for lifting heavy loads, such as an aging and abused station van with serious mechanical problems. See Alignment.

Kill date: Any length of time, up to several weeks, before a timely announcement, promo or commercial is actually terminated.

Lavalier mic: A small microphone, usually hung around the neck or attached to the wearer's lapel, which has the unique ability to pick up embarrassing internal body sounds.

Lead: Industry gossip or hearsay about a job opening that doesn't exist.

Line-in: A circuit or cable through which amplified unwanted noise is fed into a system or piece of equipment.

Line-out: A circuit or cable through which amplified unwanted noise emanates from a system of piece of equipment.

►

Low impedance: Low resistance to electrical loads. The human body is considered a low impedance device.

Megahertz: Severe injuries inflicted by molten drops of solder, various engineering tools or electrical current.

NAB: A yearly convention at which broadcasters brag about their jobs and simultaneously look for better opportunities within their fields.

NABET: A yearly convention where the language of acronyms is perfected.

Nondirectional mic: A microphone that picks up unwanted sounds from all directions.

Ohm: British colloquial pronunciation of "home."

Out cue: The sound that precedes dead air.

Output: The electrical point in a piece of equipment from which unwanted noise emanates.

Pan: To direct unwanted noise to either the left or right channel of a stereo mix.

Patch: A temporary fix for the worn tires of a rapidly aging and abused station van.

Patch cord: A cord that is not quite long enough to connect different pieces of electronic equipment.

Peak indicator: A title given in lieu of a raise, signaling the employee that he or she has reached the "compensation ceiling."

Phone patch: Electrical circuit or cable that feeds the noise generated by a telephone line directly into broadcast equipment.

Potentiometer: A device used to overmodulate an audio signal. Often called a "pot."

Power: That which turns a mild-mannered human who finds himself in his first management position, into an insufferable tyrant.

Primer: A document issued by the FCC to complicate the definition of a rule or concept of the Commission.

Promo: An announcement about any contest, program or event sponsored by the station, which will be much less successful than anticipated.

Proof of performance: Electrical measurements that prove that the station has not been operating within designated parameters.

Propagation: Transmission or dissemination of unwanted noise.

Public file: A file that does not contain the important documents it's supposed to.

Rack mount: A rack or cabinet of standard dimensions into which equipment does not fit.

Reference monitor: (1) A monitor speaker that faithfully reproduces unwanted noises. (2) A monitor speaker that allows the listener to hear the poor quality of the recording equipment and medium.

Resistance: What one encounters when making a case for desperately needed new equipment during a budget review.

Resistor: The person whose bonus is based on keeping the bottom line as low as possible.

►

Rough mix: A preliminary mix of an audio production which, when played for a station client, will provide insight into how difficult working with that client will be.

Shotgun mic: A highly directional mic that can zero in on unwanted sounds coming from a considerable distance.

Trade out: A clever method of outfitting a station with inexpensive and inferior consumer-grade electronic gear.

TRT: Total running time; the elapsed time between the beginning of a programming element and the beginning of a period of dead air.

Union scale: An artificially overpriced pay scale for union members that allows the member to make the same amount of money he'd make as a non-union member, with just enough left over to pay ridiculously high union dues.

Variable speed: A function of most broadcasting employees directly proportional to the amount of caffeine ingested.

Windscreen: A haven for second-hand microbacteria.

When he's not producing network radio programming, John Moretti usually can be found playing percussion instruments with his infant son Jacob.

Was It Hot or Not?

(continued from page 6)

the music trades were concerned. Notice I did not say her *record* was hot (it really was more of a low simmer), just her tattoo. In fact, maybe it was just tattoos that were hot.

What was not hot was the Sinead O'Connor mystique, shaved head, military boots and all. When she sprang fully formed as naive waif art-rocker a couple years ago, the shorn Sinead look took off among more extreme fashion-conscious young women.

Unfortunately, for her longevity, Sinead's outspoken views about the national anthem came at a time when middle America would settle for nothing less than unrestrained patriotic zeal. Suddenly, a vast number of fashion pacesetters who had taken their cue from Ms. O'Connor found themselves merely bald. Talk about the emperor's new clothes . . .

Now I know that the last thing the industry needs is yet another awards show. Still, the Mercury Award is one that really makes sense. The award, established in part by the RAB, Group W and the Interep Radio Store, honors excellence in radio campaigns. The premiere of the "Merks" (if I may be the first to coin that term) is later this spring, and it will be hot, particularly considering that the Clio Awards—the mother of all advertising-oriented award shows—seems to be floundering right now.

★★★

Returning to the technological side of the industry, a hot topic last year—and one that may stay hot in 1992—was the expanded AM band. The 100 kHz tacked onto the top of the AM dial was incorporated into the FCC's AM improvement docket 87-267, with stations producing the most interference getting first dibs.

AM stereo broadcasters were also given special preference for the expanded band—the first time the FCC has even looked twice at that technology in years. (Maybe AM stereo will get hot again? Maybe not.)

At any rate, the expanded AM band as part of a program to reduce interference is hot. In my mind, it supplanted the NRSC AM standard on the heat index. It's not that NRSC is no longer a good idea for stations, but it's a maturing technology.

The FCC's AM self-inspection guide also was hot; the FM hard look policy was not. Abandoned by the Commission, which maintained that it successfully reduced application errors, the hard look policy is now just a bad taste in the mouth of consulting engineers everywhere. If the FCC now would only adapt its self-inspection plan for FM as well as AM stations, things would be moving in the right direction. Think of it: bureaucracy with the nobler purpose of education, rather than aggravation.

Now I know that the last thing the industry needs is yet another awards show. Still, the Mercury Award is one that really makes sense.

Another hot topic was the new consumer digital equipment under development last year. Both Philips' digital compact cassette (DCC) and Sony's Mini Disc (MD) got quite a push at the summer Consumer Electronics Show, but it was Philips backward-compatible DCC that really got the attention of some industry observers. True, it offers only near-CD quality audio, but DCC is riding the crest of a promotional wave that has swept under Sony's unusually cautious efforts to hype MD.

What was not hot in that arena was consumer DAT, of which the recording industry seems to have made an example. Powerful lobbying efforts and the Serial Copy Management System (SCMS) that recorders are to be encumbered with are keeping the technology from advancing. On the professional side, DAT is seeing some new applications, particularly in the area of data logging, but the bloom is off the rose for consumer DAT.

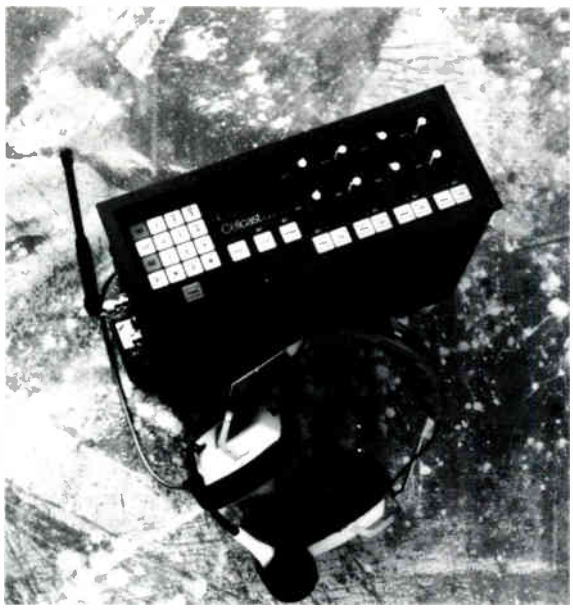
That's about all I have room to go into here, but as I said, the full list accompanies this story. It was quite a year, and 1992 looks even more interesting. I can hardly wait to see what ends up hot next year—and what cools off.

Tune in next time,

Alex

NOW AVAILABLE

Let Cellcast Expand Your Remote Broadcast Possibilities.



NO HASSLE REMOTES

Cellcast's cellular or land-line technology makes it an instant studio for on-the-spot response. No crowded RF frequencies, just quality broadcast in a compact, easy-to-use unit. And inexpensive. Only $2,950 for the four-channel unit which includes a one-year warranty and loaner program.!

Cellcast is everything you need to broadcast - including a frequency extender and mixer all in one.

Sound good? You bet!! - And now you can Try before you Buy - with no hassle - just call Cellcast direct 1-800-852-1333 to have a Cellcast RBS-400 unit available to you for 2 weeks for only $130.00. We will ship a ready to use unit the day you call.

So, experience hassle free remotes on us, Cellcast * Cost effective * Compact * Convenient.

*Covers shipping, activation of cellular service, technical support and 2 hours of airtime. Try Before you Buy charge will be deducted from purchase price if unit purchased during the TBB program.

Cellcast®
REMOTE BROADCAST STUDIO

RETAIL PROMOTIONS, NEWS, SPORTS. CALL 1-800-852-1333.

Tri-Tech, Inc., 6015 North Xanthus, Tulsa, OK 74130, 918-425-5588 FAX 918-428-1423

Circle (138) On Reader Service Card

Taking a Hard Look at Soft Times

1991 was a soft economic year for radio. Though 1992 may not bring total relief, bright new product innovations and short-term solutions such as LMAs are preparing the industry for a more solid future.

by Alex Zavistovich

There's no doubt about it, 1991 was a lean year for the U.S. economy. Belt-tightening measures were implemented in almost every American industry to stave off the effects of the recession. Radio was no exception.

On an engineering level, the economic downturn in 1991 meant a closer examination of expenses, along with finding ways to do more with less. Group owners learned to accept that spending money on one station often meant others ended up feeling the pinch.

In some cases, operators tried to save money in the short term by brokering time on their stations to other groups. On that level, the catch phrase for the year became ''local marketing agreements'' (LMAs), in which stations tried to shore up sagging bottom lines by sharing staffing and programming expenses.

The prognosis for the economy in 1992 is for more of the same, according to some industry observers. Even so, numerous product introductions that marked the radio trade shows at the end of 1991 indicated a number of manufacturers are hoping the worst is over.

From go-go to no-go

What happened to the economy? The answer isn't easy to come by. In radio, however, economic problems can be traced to the so-called "go-go" trading years of the late 1980s.

Station trading was a fast-paced business then. Leveraged purchases of stations led to quick turnovers in ownership, which in turn led to healthy returns for investors willing to take the short-term investment risks. For a while, everyone was getting rich—especially media brokers. As long as the rest of the economy was in good shape, the sky was the limit.

Of course, when the rest of the economy went soft, radio felt the effects—hard. In an economic "reality check" presented at the Society of Broadcast Engineers (SBE) convention in October 1991, SBE VP Jerry Whitaker provided some sobering statistics on station trading.

In 1988, the average sale price for a radio station was approximately $2 million, Whitaker said. By 1990 that average had fallen to $830,000. By 1990, the dollar volume for stations sold was approximately $1.7 billion, he said, and 1,045 stations changed hands.

According to Whitaker, the depressed economy threw off investors' projections for station profitability. Many who looked to radio as a speculative investment became trapped by their own deferred principle loans, he said, owing creditors millions.

More recently, Paul Leonard, a partner in the media brokerage firm Star Media Group, echoed Whitaker's view.

►

"Every group operator was off budget for 1991," Leonard said. "While stations had budgeted for five to eight percent increases in the year, most markets actually suffered a four percent shrinkage."

In many cases, according to Leonard, the owners are attacking this economic downturn by "cutting expenses, reducing staffing and promotions, and asking for concessions from their suppliers without guilt."

Technology victim

In this attack on expenses, among the first areas to be cut back was new equipment purchases. For many manufacturers of radio gear, sales were down throughout 1991.

The sales slump was compounded by the industry's own technological advances, at least according to Neil Glassman, creative director of Cate Cowan Communications. Formerly sales manager for Bradley Broadcast Sales, Glassman interpreted softness in equipment sales as a result of affordable technology undercutting more traditional broadcast products.

"Even stations that have solid equipment budgets are finding that advanced digital and analog technologies present a wide range of less expensive alternatives," Glassman said.

Technological advances, he said, make it possible for stations to get quality performance from lower-priced professional or even consumer gear. For example, Glassman noted, "compact discs are predominant in radio, but a large percentage of stations are using consumer CD players because they are unable to justify the added expense of professional units.

"Why should a station purchase a professional reel-to-reel when a pro DAT machine can do the job at half the price and twice the quality?" This attitude on the part of stations affected the sales of big-ticket items, which form the backbone of distributors' profit margins.

Glassman interpreted softness in equipment sales as a result of affordable technology undercutting more traditional broadcast products.

From the trenches

Of course, not all stations are shying away from the larger purchases. Don Culp, CE for WMAL-AM/WRQX-FM in Washington, said his station is planning to replace its phasor and RF tuning units next year.

According to Culp, there really is nothing significantly different in the way his station is operating. "We're watching the budget more closely," he said.

"From a corporate perspective," he acknowledged, "it's taking much longer to look at allocating funds for projects." The recession for Culp has been chiefly manifested in the reduction of overtime and looking at more creative ways to get the job done.

Frank Kramer, VP of engineering for Viacom's radio division, said the recession has "definitely impacted us—we're

(continued on page 53)

Calling AP12-8C3, Chief Engineer

by Judith Gross

Photography Courtesy of Smithsonian Institute

You take a quick glance at the digital clock on the dashboard as traffic begins to ease up near your exit. It's 6:15 a.m.—late—but the snarl up of diesel-burning cars is the perfect excuse.

Your own Japanese electric, radio-controlled vehicle never has to worry about MPG, and it's so small it usually can slip around the big diesel-powered ones. No matter. With the crackdown in rules from the newly formed FD&SCC (Federal Digital & Satellite Communications Commission), no radio station can afford to be without a chief. But then, let's not get smug, AP12-8C3, you think to yourself.

The car's surround-sound system is blasting the morning team's idiotic banter back at you from six speakers. The four-letter words fly, and you can't figure out why a federal agency that has begun to get so picky about technical rules could let programmers go so far, but it's either racy talk or give your ratings to the satellite services, you guess.

They finally play a cluster of spots, and the last one is for ordering the latest pressing of Rachmaninoff on mini-disc, with a bonus Boston Pops Christmas singalong for your home Karaoke system. You tilt your head in the direction of the dashboard mic and say, "Order."

The synthesized voice tells you "Thanks, we have your card number and your order will be shipped in two weeks. Your station employee discount has been calculated." Maybe later, when the spot for that new little French bistro airs, you'll make dinner reservations.

You pull into the parking chute and race into the building, brushing aside the PD's annoyed look. "You know those diesels," you shrug, and he eases up.

Chief to control

First stop: the control booth to check for the problem. You enter through the double doors and let your eyes adjust to the dim lighting. On the front wall the red LED ►

Comtech's 3.8 Meter has the Extra Performance Margin Needed for Crystal-Clear Audio Reception.

Why Settle for Less?

Major network affiliates all over the country are specifying Comtech's 3.8 Meter Antenna. The reason is simple: No other antenna in its size category can deliver a gain of 42.9 db at 4 GHz.

This increased performance margin means outstanding audio reception on SCPC sub-carrier signals, and digital even in low EIRP areas.

Comtech's leadership in satellite antenna design is no accident. They pioneered the exclusive 3-piece "splice-strap" parabolic reflector with a superior surface tolerance unequalled by mesh or other home-type antennas. The result is higher efficiency, optimum side-lobe performance and increased gain. This is the extra margin of performance that only a Comtech Antenna can provide. That's why literally hundreds of Comtech 3.8 Meter Antennas are operating today at radio stations throughout the U.S.

So why settle for marginal performance when you can have a performance margin today and in tomorrow's 2° spacing environment.

Allied Broadcast Equipment distributes Comtech Antenna systems to the radio industry nationwide. Call today for more information.

317-962-8596

HARRIS ALLIED
BROADCAST EQUIPMENT

3712 National Road West
P.O. Box 1487
Richmond, IN 47375

Comtech Antenna Corp.—Taking the lead in Satellite Antenna Systems

Radio Station KAIR/JOY, Inc.
Tucson, Arizona
3.8 Meter Antenna Installation

Circle (60) On Reader Service Card

says the time: 06:45 and date: 09-10-15.

September 10, 2015 and only a day to go until you head to Hawaii for the fall radio show, a joint venture of the NATB (National Association of Terrestrial Broadcasters) and NASB (National Association of Satellite Broadcasters).

You can't wait to see the latest gizmos, but right now you'd better concentrate. Your watch alarm has told you there's a problem in the audio chain.

Had it been the RF chain, your car phone would have dialed up the transmitter automatically and the problem would be obvious on your screen. But these watch alarms only go so far.

You decide to go over everything with a fine tooth comb, but first you'd better alert the morning team. The traffic report is airing, so a touch of the red button on the console should reach them.

"Joe's massage parlor," you hear a familiar voice come out of the cue monitor.

"Listen guys, this is AP12-8C3. I have to switch over to auxiliary control. Just want you to know."

"OK, Appie, we read you. Let her rip, babe," the jock says. You push another button and it's done. Babe? Here it is the 21st century and sexism still runs rampant. Small matter. One half of the morning team is in Cincinnati and the other's in Boca Raton. You rigged up the satellite links from each of their homes yourself. Now, onto finding that problem.

Right to the source

First, source materials. The show's producer finally comes back from getting the latest spot, a last minute replacement. "Hi, Appie. Got a problem?" she asks.

"Unless there's something wrong with my watch. We're on auxiliary now."

"No problem. Just snooping around, don't mind me. I'll keep track of Garbage Man and Foul Mouth while you hunt." You think she's being cute with the epithets, but then you remember that those are the team's on-air monikers. Progress.

The first look goes to the mini-disc players, stacked up eight on top of each other. You fire each one up and even remote them. No problem there. The spots should play fine, even the record units don't skip. Check the DAT players next, an ancient set from the mid 1990s. A quick head cleaning, which you realize has become a dying art, and they seem fine too.

September 10, 2015 and only a day to go until you head to Hawaii for the fall radio show.

Two CD players, a record and play, set where a turntable once was about 25 years ago. "We'll keep these around just in case," you decided about three years ago. But they've been used only on the rare occasion for that vintage recording that some producer didn't have time to put onto mini-disc or in hard storage. You check them anyway, just to be sure. Nope, no problem there.

On to the hard storage. A quick look at the touchscreen and the log shows that things are humming along fine. No crashes, but you give the command for diagnostics with a touch of one of the two-inch square "buttons" on the 25-inch screen.

The OK sign flashes, so the trouble isn't there. Let's do a mic check, even though they're not in use now. Twin digital stereo pairs stare back at you from the desk but a quick adjustment of levels shows that they're fine also.

A virtual problem?

How about the console itself? It's tricky, because console functions are all virtual and nobody really needs the "desk." But you've rigged up the faders and meters for a few old timers who can't get used to the touchscreen and its built-in switcher, so they can have manual control over things the virtual console can handle automatically.

Two kinds of digital: hand and board, you smile to yourself. Oh well. Even Rick Dees, doing his senior citizen "Best of the Last Century" morning show from KIIS, still insists on using rotary pots on his virtual console.

To check the digital circuit boards on the switcher, you take out your hand-held DMU—digital maintenance unit. When the test and measurement folks came up with this one, every chief cheered. It looks like a "jewel case" to slip the board into, and the LED readout can spot a faulty board in seconds.

There are eight in the switcher, which you test one by one. Nope, they all read fine. How about the digital mic processors, Harmonizer and digital reverb? You go back to the mics and test out each, recording your voice onto a blank mini-disc. They sound fine, too.

This is getting to be more of a problem than you thought. Maybe a quick coffee break will help you figure it out. You head out to the new machine outside your office.

"Coffee, light, no sugar or sweetener," you tell the voice activation unit. "Protein bar, too, please."

An instant later you have your coffee and chocolate-flavored protein bar: not your customary breakfast, but now that the ►

National Science Foundation has determined that caffeine makes you live longer and chocolate improves your sex life, it's worth a try. Back to your problem.

Maybe a look at the transmitter shack, just to be sure. Even though it was the watch and not the car phone that sounded, you didn't build your reputation as one of the Society of Telecommunications Technicians' senior members by being careless.

Stealth shack

The "shack" is a small container, 10 by 10 by 10, where all the new digital devices fit together nicely. The outside is RF- shielded with a special paint developed by the makers of the Stealth bomber, and its camouflage brown and green blend in with the surrounding countryside, after the famous "Eyesore" court case, *People vs. CBS*.

Now all transmitter shacks are required to blend in with the environment, use only recycled building materials and be painted with Stealth camouflage.

Your station is one of the first DAB licensees, simulcasting its analog FM. Since starting DAB six years ago, and largely because of Garbage Man and Foul Mouth, both analog and digital ratings and revenues have soared. It didn't hurt that those DAB receivers got out there so quickly, either.

The FM exciter and solid state transmitter sit side-by-side with the much smaller DAB exciter-transmitter. It's nice that the same manufacturer sells and services both. The LED readouts tell you that there's no problem with either. You also give the RDS unit a quick once-over, but both the *EBS* and *Reg* lights are fine.

Ten-inch high LEDs clue you in on your levels. They're attached to the latest in modulation monitors, and that's not all. They're also connected by V-sat to the FD&SCC's Field Bureau office, as is every station's monitor.

If a station overmodulates, an alarm sounds immediately in the FBO and the chief gets a nasty call at the station, at home, in the car, wherever, reminding him or her what the mod rules are. A second alarm is an automatic fine. A third, revocation of license. Those LEDs have no doubt saved many a chief's neck, since the reregulation mania of the first decade of the 21st century.

Over in the corner are twin sets of processors, stacked high. On the analog side there's at least one of each and two of several of the brands. There are three fewer boxes on the digital side, since you finally convinced the PD that the digital sound would only be hurt by that extra digital clipper. No wonder the processor manufacturers' booths were the most crowded at the trade shows.

Concentrate

Thinking of trade shows, you realize you'd better find this problem soon. Your plane to Hawaii leaves tomorrow morning and if things aren't humming along perfectly, you'll have to end up catching the show on video conference instead of leaving town. Concentrate.

The digital STL looks good and the large LED screen on the north wall of the shack tells you the tower you share with five other stations is fine, too, along with the antenna bays and the DAB antenna. Maybe you'll end up leaving late for Hawaii and have to miss the AES-EBU meeting.

That's it. Of course! Thinking of the meeting gives you an idea. You race back to the studio and look at the LED on the control room's south wall. Screen 1 shows you that each component is operating fine. But the touchscreen command to Screen 10 will look at the interfaces between units.

Now all transmitter shacks are required to blend in with the environment, use only recycled building materials and be painted with Stealth camouflage.

Connections 1A to 4B are fine. But there it is. Connector 5B and 6B, the Harmonizer to mic processor connectors, are flashing a horrendous blue. You only checked each one by itself, not the two together. Time for some hands on. You trace it by the color-coded cables and have a look.

Just as you thought. The pins don't match. Somebody kluged some ancient homejob that was still laying around from two chiefs ago and swiped the required AES-EBU standard interface. Now what's the use of setting standards if the staff is going to ignore them? Good thing your watch alerted you before an effect or special spot was needed.

You retrieve the standard interface from your workbench, replace it and switch the morning team back during a spot break. The mid-day jock, Kyle, the only talent to do the show on-premises, enters the control room.

"Hey, man," you ask, "who's been fooling around with my connectors? We could have been in bad shape if my alarm hadn't sounded."

"Hey Appie, don't look at me. I saw Dave in here yesterday, though. He said he needed to 'borrow' something for his office teleconferencer," Kyle replies. Your indignation sinks. Dave is the PD. No telling him off. Oh well. Maybe an electronic flasher: "Hands Off" or some such thing.

"You got it fixed, though?" Kyle asks.

"Oh sure. It was nothing." You smile and shrug. Time for more caffeine, and you'll get to Hawaii on time after all. Not bad for an android.

Society of Broadcast Engineers

Chapter 0—Canada/Kitchner
Paul Firminger
c/o General Delivery
Glen Morris Ontario, N0B
1W0
519-740-0413

Chapter 1—Binghamton
Charlie Hallinan
Route 11
Binghamton, N.Y. 13903
607-724-5608

Chapter 2—Northeastern Pennsylvania
Charles Sakoski
P.O. Box 2209
Wilkes Barre, Pa. 18703
717-735-0730

Chapter 3—Kansas
Ric Jung
KHCC-FM
815 N. Walnut
Hutchinson, Kan. 67501
316-665-3555

Chapter 5—Atlanta
Vic Jester
69 McNeal Drive
Marietta, Ga. 30060
404-364-5841

Chapter 7—Jacksonville
Jim Biggers
WJXT-TV
1851 Southampton Road
Jacksonville, Fla. 33207
305-295-0740

Chapter 9—Phoenix
Al Hillstrom
KTSP-TV
511 W. Adams
Phoenix, Ariz. 85003
602-257-1234

Chapter 11—Boston
George St. Andre
120 School Street
Braintree, Mass. 02184
617-843-1281

Chapter 14—Connecticut Valley
Charle Allen
WTXX-TV20
414 Meadow Street
Waterbury, Conn. 06702

Chapter 15—New York City
Chris Tobin
WBAB
522 Sunrise Way
W. Babylon, N.Y. 11704
516-587-1023

Chapter 16—Seattle
John Schneider
R.F. Specialities
1718 NE 98th Street
Seattle, Wash. 98115
206-633-5590

Chapter 17—Minneapolis
Ken Benner
1251 Kent Street
St. Paul, Minn. 55117
612-489-2835

Chapter 18—Philadelphia
Ronald W. Simpson
1970 New Rodgers Road,
No. 20
Levittown, Pa. 19056
215-943-4374

Chapter 20—Pittsburgh
John A. Luff
Synergistic Technologies Inc.
3 Parkway Center,
Suite 102
Pittsburgh, Pa. 15220
412-928-0448

Chapter 21—Spokane
John Barnett
4510 S. Miami
Spokane, Wash. 99223
509-448-5152

Chapter 22—Central New York
Jim Peck
WCNY TV& FM
506 Old Liverpool Road
Syracuse, N.Y. 13220
315-453-2424

Chapter 24—Madison
Jim Hermanson
5727 Tokay Blvd.
Madison, Wis. 53719
608-274-1234

Chapter 25—Indianapolis
Tom Weber
WTTV-TV4
3490 Bluff Road
Indianapolis, Ind. 46217
317-787-2211

Chapter 26—Chicago
Warren Shulz
c/o Lou Sabatini
11159 S. Oak Park Avenue
Worth, Ill. 60482
312-984-5328

Chapter 28—Milwaukee
James Radmann
1569 Fielding Road
Cedarburg, Wis. 53021
414-357-3908

Chapter 29—Corpus Christi
Don Dunlap
729 Crestview
Corpus Christi, Texas 78412
512-855-2213

Chapter 30—South Bend
Steve Richard
WSBT Inc.
300 W. Jefferson Blvd.
South Bend, Ind. 46601
219-233-3141

Chapter 32—Tucson
Roy Mitchell
17762 W. Cocoraque Lane
Marana, Ariz. 85653
602-795-0311

Chapter 33—Southwestern Ohio
H. Fred Stone
WPTD-TV
110 S. Jefferson Street
Dayton, Ohio 45402
513-220-1686

Chapter 34—Albuquerque
John Ramp
KNME-TV
1130 University Blvd. N.E.
Albuquerque, N.M. 87102
505-277-2121

Chapter 35—Kentucky
Tom Landers
Route 2,
Hunters Lane
Shelbyville, Ky. 40065
502-722-5556

Chapter 36—San Diego
John Barcroft
4286 Farley Ct.
San Diego, Calif. 92112
619-292-1360

Chapter 37—D.C.
Chip Fetrow
WXTR
5210 Auth Road
Marlow Heights, Md. 20746
301-899-3014

Chapter 38—El Paso
David Stewart
KBNA/AM-FM
2211 E. Missouri,
Suite 300
El Paso, Texas 79903
915-544-9797

Chapter 39—Tampa Bay Area
Lloyd Berg
WUSA Radio
504 Reo Street
Tampa, Fla. 33609
813-879-1420

Chapter 40—San Francisco
Paul Black
FM Station KMEL
55 Francisco Street
San Francisco, Calif. 94133
415-391-1061

Chapter 41—Central Pennsylvania
Robert B. Good, Jr.
600 Wilson Drive
Lancaster, Pa. 17603
717-393-5851

Chapter 42—Central Florida
Jim Doyas
211 Springview Drive
Sanford, Fla. 32773
407-644-3535

Chapter 43—Sacramento
Jack Davis
KRBK-TV
31 500 Media Place
Sacramento, Calif. 95815
916-929-0300

Chapter 44—Shreveport
James A. Bostic
P.O. Box 502
Shreveport, La. 71162
318-631-3085

Chapter 45—Charlotte
David Wooten
11618 Moonridge Drive
Charlotte, N.C. 28226
704-335-4807

Chapter 46—Baltimore
Dwight Weller
53 Gerard Avenue
Timonium, Md. 21093
301-252-8351

Chapter 47—Los Angeles
Sandra Woodruff
KFWB
6230 Uucca Street
Hollywood, Calif. 90028
213-871-4660

Chapter 48—Denver
Andre Smith
10151 Milwaukee Street
Thornton, Colo. 80229
303-871-2166

Chapter 49—Central Illinois
Eddie Lane
1501 Honeysuckle
Champaign, Ill. 61821
217-333-1070

Chapter 50—Fort Collins
Milton J. Messersmith
712 Kimberly Drive
Ft. Collins, Colo. 80524

Chapter 51—Tri-Cities
Felipe E. Olvera
KVEW-TV
601 N. Edison
Kennewick, Wash. 99336
509-735-8369

Chapter 52—Central Ohio
Mark Bohach
445 Bayshire Rd.
Groveport, Ohio 43125
614-341-9595

Chapter 53—South Florida
Marvin Reis
10110 N.W. 21st Ct.
Pembroke Pines, Fla. 33026
305-576-1010

Chapter 54—Tidewater
Charles Stutsman
WAVY-TV
300 Wavy Street
Portsmouth, Va. 23704
804-393-1010

Chapter 55—St. Louis
Joseph Geerling
1575 Harkee Drive
Florissant, Mo. 63031
314-553-5965

Chapter 56—Tulsa
Troy Langham
1508 S. Owasso Avenue
Tulsa, Okla. 74120
918-587-0941

Chapter 57—Rochester
Edward Wright
WXXI
P.O. Box 21
Rochester, N.Y. 14601
716-325-7500

Chapter 58—Northeast New York
David Palmer
WXXA-TV
815 Central Ave.
Albany, N.Y. 12206
518-438-8700

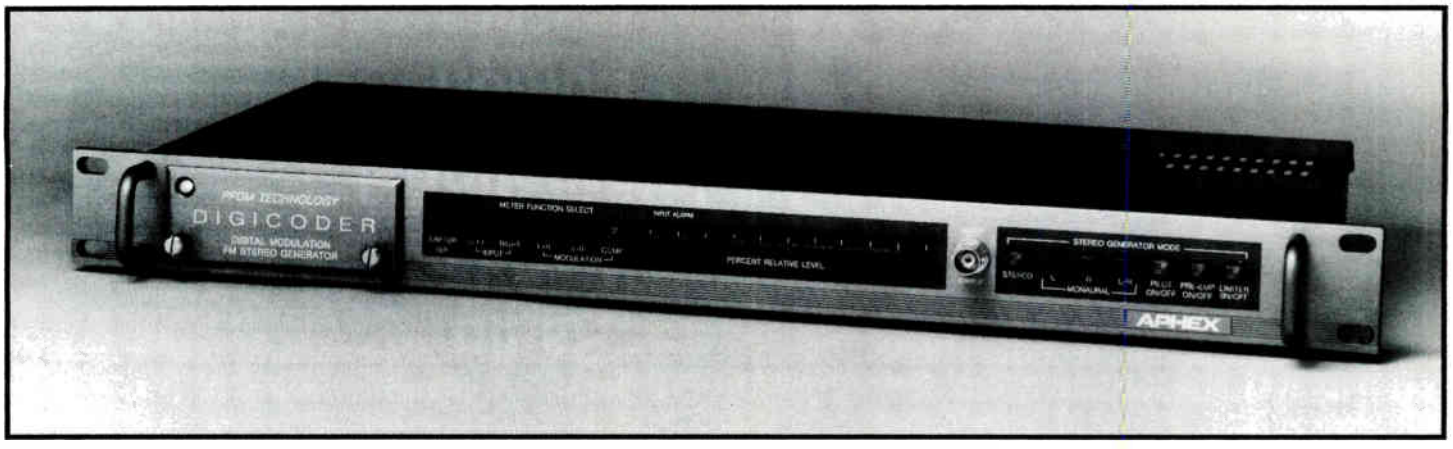
Chapter 59—Kansas City
Chris Ostrander
12025 Goodman
Overland Park, Kan. 66213
913-722-2866

Chapter 60—Richmond
Ken Sell
WXEX
SBE Chapter 60
P.O. Box 35089
Richmond, Va. 23235
804-320-4347

Chapter 61—Memphis
Kirk Harnack
Harnack Engineering
1385 Lamar Ave.,
Suite 5
Memphis, Tenn. 38104
901-278-1306

On Air Around the World!

The Aphex Stereo Generator ... A Leap Beyond Digital



Under development for over six years, it's finally here. The Aphex Digicoder™ Stereo Generator ... the next link in the Aphex Audiophile Air Chain. The Digicoder provides unequaled sonic transparency of Class A analog with the separation and stability of digital ... and sustains maximum loudness. Plus it interfaces to your existing equipment with no A to D convertor.

This lab standard generator uses a proprietary PPDM™ (Parallel Path Digital Modulation*) circuit to provide a dynamic range beyond measureable limits ... better than *any* DSP system currently available!

Because of its sophisticated design, the Digicoder is easy to use and requires no maintenance. It is fully remote controllable and provides remote status output.

Broadcasters around the world have relied on the Aphex Audiophile Air Chain, a combination of the Aphex Compellor®, Aural Exciter® and Dominator™ to achieve *consistent high quality sound*. The Digicoder continues the tradition, providing the highest audiophile quality available at any price.

ARGENTINA— A G Electronica S.A.; **AUSTRALIA**—East Coast Audio; **AUSTRIA**—AKG Acoustics; **BENELUX**—Trans-European Music NV; **CANADA**—Gould Marketing; **DENMARK**—SC Sound; **FINLAND**—Nores-Oy; **FRANCE**—Cineco; **GERMANY**—AKG Acoustics; **GREECE**—Omikron S.A.; HONG KONG—Ace Co. Ltd.; **HUNGARY**— ATEC; **INDONESIA**—David Sutedja & Assoc.; **ISRAEL**—Sontronics; **ITALY**—Audio Equipment sri; **JAPAN**—Otaritec; **KOREA**—Young Nak So Ri Sa; **NEW ZEALAND**—Maser Broadcast Systems,Ltd.; **NORWAY**—Audiotron S/A; **SINGAPORE**—Auvi Private Ltd.; **SPAIN**—Neotechnica S.A.E.; **SOUTH AFRICA**—Tru-Fi Electronics; **SWEDEN**—Leab AB; **SWITZERLAND**—Audio Tech; **TAIWAN**—Acesonics International Co. Ltd.; **U.K.**—Stirling Audio

APHEX
SYSTEMS
11068 Randall St.
Sun Valley, CA 91352
(818) 767-2929

All Aphex products are designed and manufactured in the U.S.A.

* Patent Pending

Circle (56) On Reader Service Card

Chapter 62—Utah
Chuck Condron
Broadcast Eng.
5906 S. Riverpoint Circle
Murray, Utah 84123
801-580-3025

Chapter 63—Hawaii
Rodney Shimabukuro
46-212 Auna Place
Kaneohe, Hawaii 96814
808-944-5200

Chapter 65—Quad Cities
John Hegeman
1460 Grapler Court
Bettendorf, Iowa 52722
319-383-7000

Chapter 66—Fresno
Pat Fennacy
1310 E. Swift Avenue
Fresno, Calif. 93704
209-226-1868

Chapter 67—North Texas
Jerry Ernest
KRLD Radio
2521 Anderson
Irving, Texas 75062
214-634-1080

Chapter 68—Birmingham
Troy Pennington
WZZK Radio
530 Beacon Parkway
W. Birmingham, Ala. 35209
205-942-7800

Chapter 69—South Texas
Dale Taylor
5401 Timber Canyon
San Antonio, Texas 78250

Chapter 70—Northeast Ohio
Lawrence J. Van Camp
2465 Glen Valley Drive
Westlake, Ohio 44145

Chapter 71—Eureka
Tom Williams
2573 Broadway Street
Samoa, Calif. 95564

Chapter 72—New Orleans
Oscar L. Tablot, Jr.
3604 Campagna Drive
Chalmette, La. 70043
504-581-7002

Chapter 74—Midland
James Leedham
2008 North 104th Circle
Omaha, Neb. 68134
402-397-9524

Chapter 78—Blue Ridge
Milton S. Ridgeway
Route 3, Box 267AB
Lynchburg, Va. 24504

Chapter 79—Austin
Dick S. Pickens
Microcom Systems, Inc.
8201 Little Deer Crossing
Austin, Texas 78736
512-288-3005

Chapter 80—Fox Valley
William J. Hubbard
2420 Nicolet Drive
Green Bay, Wis. 54311
414-465-2500

Chapter 81—Grand Junction
Dwight Morgan
629 Ouray Avenue
Grand Junction, Colo. 81501
303-243-6093

Chapter 82—Southeast Michigan
Mark Phelps
WLTI
28411 Northwestern Hwy.
Southfield, Mich. 48034
313-354-9300

Chapter 84—Winston-Salem
Ed Kasovic
3439 Hunting Creek Drive
Pfafftown, N.C. 27040
919-722-4545

Chapter 85—Central Western
Britt Lockhart
1615 N. Council Road
Oklahoma City, Okla. 73127
405-528-5543

Chapter 86—Greenville Area
Craig Turner
P.O. Box 1717
Spartanburg, S.C. 29304
803-232-9900

Chapter 87—Holdrege
Val A. Lane
1907 Central Avenue
Kearney, Neb. 68847
308-236-7201

Chapter 88—Palm Beach
Jimmy Gamble
WPBF-TV
3970 RCA Blvd.
Suite 7007
Palm Beach Gardens, Fla.
33410
407-694-2525

Chapter 89—Alaska
Clyde Plukett
KYMG-FM
500 L Street
Anchorage, Alaska 99501

Chapter 91—Central Michigan
Michael Winsky
7131 Morrice Road
Morrice, Mich. 48857
517-484-7747

Chapter 93—Raleigh-Durham
Sam Garfield
7416 Fiesta Way
Raleigh, N.C. 27615
919-870-1289

Chapter 94—High Plains
Paul Hinderliter
KUPK-TV
P.O. Box 126
Copeland, Kan. 67837
316-668-5513

Chapter 95—North Central Florida
Kelly Rosenlund
Weimer Hall
University of Florida
Gainesville, Fla. 32611
904-392-5748

Chapter 96—Rockford
Gregory A. Dahl
1901 Reidfarm Road
Rockford, Ill. 61111
815-877-3075

Chapter 98—Platte Valley
Chris Davies
KNOP-TV
Box 749
North Platte, Neb. 69101
308-532-2222

Chapter 99—Bryan
Steve Sandlin
KBTX
4141 E. 29th Street
Bryan, Texas 77802
409-846-7777

Chapter 101—Columbia
Andy Moore
Sec./Treas.
602 S. Prospect Street
Columbia, S.C. 29205

Chapter 102—Grand Rapids
Dale Wolters
4594 36th St., S.W.
Grandville, Mich. 49418
616-784-4200

Chapter 103—Nashville
Randy Cain
Nashville Network
2806 Opryland Drive
Nashville, Tenn. 37214
615-871-6968

Chapter 104—Toledo/Ohio
Barry Gries
2681 CR 24
Gibsonburg, Ohio 43431
419-849-3078

Chapter 105—Houston
Daryl McQuinn
KMJQ
24 Greenway Place, #1508
Houston, Texas 77046
713-623-0102

Chapter 108—Central Coast
Wayne Woollard
KDON
P.O. Box 81460
Salinas, Calif. 93912
408-422-5363

Chapter 109—Des Moines
Ken Drewes
2000 S.E. Coulder
Des Moines, Iowa 50320
515-282-6213

Chapter 110—Northern N.H.
David B. Raynes
54 Old Stage Road
Madbury, N.H. 03820
603-742-7187

Chapter 111—Huntsville, Alabama
Rod Hughes
209 Jones Valley Drive
Huntsville, Ala. 35802
205-533-4848

Chapter 112—Corpus Christi
Don Dunlap
729 Crestview
Corpus Christi, Texas 78412
512-855-2213

Chapter 113—Knoxville
Edwin R. Martin
Kennedy Maxwell Productions
P.O. Box 4607
Maryville, Tenn. 37802
615-970-2192

Chapter 114—Philippines
Arcadio M. Carandang, Jr.
Molave Brdcst, #202,
Centrum II Building
150 Valero,
Salcedo Village,
Makati Manila, Philippines,
1200

Chapter 115—Southern Idaho
Peter Hoekzema
7670 Iron Ct.
Boise, Idaho 83704
208-375-7277

Chapter 116—El Paso
David Stewart
KBNA/AM-FM
2211 E. Missouri,
Suite 300
El Paso, Texas 79903
915-544-9797

Chapter 117—Moscow, Idaho
Mitch Wasson
KUID-TV Radio-TV Center
Moscow, Idaho 83843
208-885-6723

National Association of Broadcasters

1771 N Street, N.W.
Washington, D.C. 20036

Unless otherwise indicated all numbers should be preceded by 202-429

(202) 429-5300

Advanced Television Systems Committee (ATSC) 5345

Broadcast Capital Fund (BROADCAP) 5393

Broadcast Ind. Council. to Improve American Productivity (BICIAP) 5330

Broadcast Education Association (BEA) 5355

Broadcast Pioneers Library Catherine Heinz 223-0088

NAB Department Listings

Accounting 5432
Administration 5440
Billing ..... (800) 626-5542
Building Maintenance 5331
Data Processing 5349
Conventions and Meetings .. 5356
Employment Clearinghouse . 5497
Exhibit Office 5335
Government Relations 5301
GR Hot Line ..... (800) 424-8806
Insurance 5492
International Consultant 5451
Legal 5430
Library & Information Ctr. ... 5490
Lobby 5333
Minority & Special Services . 5498
Personnel 5438
Public Affairs & Comm. 5350
Publications 5376
Toll-free
(Pubs & Ins) .... (800)368-5644
President 5444
Production 5394
Radio 5420
Radio Membership 5400
Research & Planning 5380
Science & Technology 5346
Station Services 5373
Television 5362
Television Membership 5363
Tarpac 5318

U.S. Frequency Band Allocations

Band	GHz	Band Center Frequency
Government	1.710- 1.850	1.750
Operational Fixed	1.850- 1.990	1.920
STL	1.990- 2.110	2.000
Common Carrier	2.110- 2.130	2.120
Operational Fixed	2.130- 2.150	2.140
Common Carrier	2.160- 2.180	2.170
Operational Fixed (TV Only)	2.500- 2.690	2.595
Common Carrier—Space	3.700- 4.200	3.950
Government	4.400- 5.000	4.700
Common Carrier—Space	5.925- 6.425	6.175
Operational Fixed	6.575- 6.875	6.725
STL	6.875- 7.125	7.000
Government	7.125- 7.750	7.435
Government	7.750- 8.400	8.075
Common Carrier	10.700-11.700	11.200
Operational Fixed	12.200-12.700	12.450
CATV-STL (CARS)	12.700-12.950	12.825
STL	12.950-13.200	13.075
Government	14.400-15.250	14.825
Common Carrier, CATV, Operational Fixed	17.700-19.700	18.700

Relationship Between System Reliability and Outage Time

RELIABILITY %	OUTAGE TIME %	OUTAGE TIME PER		
		YEAR	MONTH (Avg.)	DAY (Avg.)
0	*100*	*8760 hours*	*720 hours*	*24 hours*
50	*50*	*4380 hours*	*360 hours*	*12 hours*
80	*20*	*1752 hours*	*144 hours*	*4.8 hours*
90	*10*	*876 hours*	*72 hours*	*2.4 hours*
95	*5*	*438 hours*	*36 hours*	*1.2 hours*
98	*2*	*175 hours*	*14 hours*	*29 minutes*
99	*1*	*88 hours*	*7 hours*	*14.4 minutes*
99.9	*0.1*	*8.8 hours*	*43 minutes*	*1.44 minutes*
99.99	*0.01*	*53 minutes*	*4.3 minutes*	*8.6 seconds*
99.999	*0.001*	*5.3 minutes*	*26 seconds*	*0.86 seconds*
99.9999	*0.0001*	*32 seconds*	*2.6 seconds*	*0.086 seconds*

Federal Communications Commission

Broadcast-Related Phone Listings

*Unless noted, all numbers are in area code 202, Washington, D.C. Area code 717 refers to the Gettysburg, Pa., office, area code 301 refers to the laboratory in Laurel, Md.

Chairman Alfred Sikes 632-6600
Confidential Asst. Elaine Lorentz 632-6600
Chief of Staff Terry Haines 632-6600
Senior Advisor Kenneth Robinson 632-6600
Legal Advisor Cheryl Tritt 632-6600
Legal Advisor Lauren Belvin 632-6600

Commissioner James Quello 632-7557
Confidential Asst. Ginger Clark 632-7557
Senior Advisor William Harris 632-7557
Legal Advisor Robert Corn-Revere 632-7557
Special Advisor Brian Fontes 632-7557

Commissioner Sherrie Marshall 632-6446
Confidential Asst. Patricia Hunter 632-6446
Senior Advisor Stevenson Kaminer 632-6446
Legal Advisor Diane Cornell 632-6446
Legal Advisor Peter Ross 632-6446
Commissioner Andrew Barrett 632-7116

Confidential Asst. Delores Browder 632-7116
Senior Advisor Robert Branson 632-7116
Legal Advisor Byron Marchant 632-7116
Legal Advisor Madelon Kuchera 632-7116

Commissioner Ervin Duggan 632-6996
Confidential Asst. Linda Botbyl 632-6996
Senior Legal Advisor Leonard Kennedy 632-6996
Legal Advisor Michele Farquhar 632-6996
Legal Advisor Linda Oliver 632-6996

Inspector General James Warwick 632-0471

Access Charge (CCB)
- Rules and Policies 632-9342
- Tariff 632-6387

Accounting systems (CC) 634-1861
Advisory Committees
- Radio Broadcasting 632-6485
- Emergency Broadcast System 632-3906
- National Public Safety 632-7060

Alien Restricted Permits (FOB) 632-7240
Allocation
- Broadcast 634-6530
- Call Signs 634-1923
- Call Sign Block 653-8126
- Call Sign Policy 653-8126

Charts and Tables (OET) 653-8108
- Government (OET) 653-8141
- Non-Government (OET) 653-8108
- International (OET) 632-8126

Amateur Licenses (PRB) ..... (717) 337-1212
Annual Report Form (CC) 632-7084
Annual Employment Report (CCB) 632-0745
Antennas & Towers (FOB) 632-7521

Application Status
- Amateur (PRB) ..... (717) 337-1212
- Aviation (PRB)
- Aircraft ..... (717) 337-1212
- Aviation Ground ..... (717) 337-1511
- Business (PRB) ..... (717) 337-1511
- Cellular 632-6400
- Commercial Operator (FOB) 632-7240
- Common Carrier 634-1800
- Domestic Satellite 634-1624
- Mobile Services (CCB) 254-6810
- Microwave (CCB) 634-1706
- Multichannel Service (CCB) 634-1706
- International (CCB) 632-7265
- Experiment (OET) 653-8146
- General Mobile (PRB) ..... (717) 337-1511
- Industrial (PRB) ..... (717) 337-1511
- Land Transportation (PRB) ..... (717) 337-1511
- Equipment Authorization RF Devices only:
- 24 Hour computer access ..... (301) 725-1072
- Non-computer access ..... (301) 725-1585
- Offshore Radio Service (CCB) 653-5560
- Rural Radio Service (CCB) 653-5560
- Microwave (Industrial) (PRB) ..... (717) 337-1421
- Public Safety (PRB) ..... (717) 337-1511
- Radio, TV, & Aux. Serv. (MM) 634-6307

Assignment of Microwave Common Carrier Licenses (CCB) 634-1706
Auctions (OPP) 653-5940
Automobile Emergency (PRB) ..... (717) 337-1212
Bills (Legislative) (OLA) 632-6405
Broadcast, Inspection of Stations (FOB) 632-7014

Broadcast Services—(MMB)
- *AM Service*
- Engineering Rules:
- Existing Stations 632-7010
- Minor Changes Applications 254-9570
- New stations and major changes Applications 254-9570
- STLs; RPUs, Intercity Relays 634-6307
- Non-Engineering Rules:
- Advertising Questions/Comments 632-7551
- Application Forms 632-7272
- Assignment/Transfer Applications 254-9470
- Construction Permit Applications 254-9570
- Emergency Broadcast System 632-3906
- Political Broadcasting 632-7586
- Programming Questions 632-7048
- Renewal Applications 254-9572
- Equal Employment Opportunity 632-7069
- Reports
- Employment (Form 395B) 632-7069
- Ownership (Form 323) 632-7258
- *FM Services*
- Engineering Rules
- Existing Stations 632-6908
- Minor Changes Applications 632-6908
- New Stations/Major Changes 632-6908
- SCA 632-7166
- STLs; RPUs; Intercity Relays 634-6307
- Translators/Boosters 634-6307
- Advertising Questions 632-7551
- Application Forms 632-7272
- Construction Permits 632-6908
- Educational FM 632-6908
- Emergency Broadcast System 632-3906
- Political Broadcasting 632-7586
- Programming Questions 632-7551/632-7048
- Renewal Applications 632-3954
- Equal Employment Opportunity 632-7069
- Employment (Form 395B) 632-7069
- Ownership (Form 323) 632-7258
- SCA's Stereo-Multiplex 632-7166

Bulletins, Request for (OPA) 632-7000
Business Radio (PRB) ..... (717) 337-1212
Registration (MMB) 632-7076
- Complaints (Subscribers) 632-7048
- Franchising 632-7076
- General Radio and TV 632-7048

- Microwave
- Legal 632-7480
- Engineering 254-3420
- Pole Attachments (CCB) 632-4890
- Policy
- Access 632-7480
- Public Reference Room 632-7076
- Special Relief 632-7480
- Technical Standards & Rules 254-3420

Cablegrams (CCB) 632-7265
Call Letters (Signs—)
- Private Radio Services ..... (717) 337-1212
- Broadcast 634-1923

Campus Radio Stations (OET) 653-6288
Carrier Equipment (CCB) 634-1800
Cases in Court (OGC) 632-7112
Cellular Mobile Radio 632-6400
Cellular (Recorded Message) 653-5858
Certification of RF Gear (OET) 653-6288
Civil Air Patrol (PRB)
- Applications/Licenses ..... (717) 337-1212
- Rules 632-7175

Coast Stations (PRB)
- Applications/Licenses ..... (717) 337-1212
- Rules/Hearings 632-7175

Commercial Operators—(FOB)
- Examinations (D.C. Area) ..... (301) 962-2729
- Examinations (Other Areas) 632-7240
- All other matters 632-7240

Commission Proceedings 632-7000
Common Carrier Radio (CCB)
- International & Satellite 632-7265
- Mobile Services 632-6400
- Microwave Services 634-1706

Complaints—
- Broadcast (TV & Radio) 632-7048
- Advertising Questions 632-7551
- Political Broadcasting 632-7586
- Programming Questions/Religious
- Common Carrier—
- Informal Complaints & Inquiries 632-7553
- Telephone 632-7553
- Telegraph/Telegram 632-7553
- Pole Attachments (CCB) 632-4887
- Rates 632-7553
- Interference to Radio & TV
- Washington, DC Area ..... (301) 962-2727
- All Other Areas—Refer to local field installations

Compliance—
- Registration (MMB) 254-3407
- Common Carrier Accounting (CCB) 634-1861
- Experimental (OET) 653-8141
- Incidental Radiation (OET) 653-6288
- Land Mobile (PRB) 632-7125
- Aviation & Marine (PRB) 632-7197
- Personal & Amateur (PRB) 632-7197

Conferences
- International—CCIR, WARC (OET) 653-8126
- CCITT (CCB) 632-3214

Conflict of Interest (OGC) 632-6990
Congressional Liaison (OLA) 632-6366
Consumer Assistance/Small Business 632-7000
Control Devices (non-licensed) (OET) 653-6288
Copy Contractor 857-3800
Cordless Telephone (Pt. 15) (OET) 653-6288
Court Cases (OGC) 632-7112
Customer Owned Equipment—
- Attach to Telephone (CCB) 634-1833

Customer Toll Dialing (CCB) 632-7553
Depreciation Rules (CCB) 632-7500
Development Stations
- Aviation or Marine (PRB) ..... (717) 337-1431
- Common Carrier (CCB) 634-1706
- Experimental (OET) 653-6288
- Dial-a-Porn Complaints 632-7553

Diathermy Approval (OET) ..... (301) 725-1585
Digital Terminations Systems (DTS) 634-1706
Digital Electronic Message Svc 634-1706
Direct Broadcasting Satellites 632-9356
Direct Distance Dialing (CCB) 632-5550
Domestic Public (CCB)
- Auxiliary Test and Repeater Stations 653-5560
- Cellular Radio 632-6400
- Land Mobile Radio Service 653-5560
- Microwave 634-1706
- Rural Radio 653-5560

Duplication Contractor (ITS)—
- Washington, DC 9-857-3800
- Gettysburg, PA ..... (717) 337-1433

Eavesdropping (Electronic) (OGC) 632-6990
Electronic Switching (Telephone) (CCB) 634-1800
Emergency Broadcasting System (EBS) 632-3906
Employment Verification 632-6234
Enforcement—Common Carrier Bureau 632-4887
Enforcement—Private Radio Bureau Forfeitures Show Cause Orders Revocations, Suspensions 632-7197
- Land Mobile (PRB) 632-7125
- Aviation & Marine 632-7197
- Personal & Amateur 632-7197

Requests for Enforcements
- Washington, DC Area (FOB) ..... (301) 962-2727
- All other areas—Refer to local field office (FOB)

Engineering Surveys (OET) 632-7080
Environmental Law (NEPA)(OGC) 632-6990
Equipment Measurement (OET) ..... (301) 725-1585
Examinations—(FOB)
- Washington, DC Area ..... (301) 926-2727
- Outside Washington, DC 632-7240

Ex Parte Rules (OGC) 632-6990
Facsimile—Wire (CCB) 634-1800
Fairness Doctrine 632-7586
FCC Rules (Interpretations) (OGC) 632-6990
Fee Information 632-FEES
Field Disturbance (Pt.15) 653-6285
Field Offices
- Common Carrier (CCB) 634-1861
- Field Public Service Staff 634-1940

Fire (PRB) ..... (717) 337-1212
Foreign Attachments—
- Telephone (CCB) 634-1833
- Interconnection (CCB) 634-1800

Forfeitures/Fines
- Mobile Services (Includes CB) 632-7197
- Collection of (OGC) 632-6444

Forms Distribution—
By form number only 632-7272
General form request 632-7000
Freedom of Information (OGC) 632-6990
Frequencies Allocations—
- Government (OET) 653-8147
- Non-Government (OET) 653-8106
- Allocation Treaties (OET) 653-8144
- International (OET) 653-8126
- Lists
- Government (OET) 653-8147
- Non-Government (OET) 653-8108
- Notification and Registration (OET) 653-8126
- Usage Data & Utilization (OET) 653-8106

General Counsel (OGC) 632-7020
General Mobile Radio (PRB) ..... (717) 337-1212
Harrassing Telephone Calls (CCB) 632-7553
Hearing Calendar (OLJ) 632-7680
Incidental Radiation (Rules) (OET) 653-6288
Information—General (OPA) 632-7000
Infraction Reports—International (OET) 653-8138
Injunctions (OGC) 632-7112
Inspections (FOB) 632-7014
Interception of Radio Comms (OGC) 632-6990
Interference Complaints
- Washington, DC Area (FOB) ..... (301) 962-2727
- All Other Areas (Refer to Local Field Office)
- Requests for Monitoring (FOB) 632-6975

International Conferences (Future) 653-8126
Conference (past) 632-7025
WARC (OET) 632-7025
- Conferences and Meetings (OET) 632-7025
- Frequency Allocations (OET) 632-7025
- Frequency Allocation Tables (OET) 632-7025
- Frequency Coordination (OET) 653-8126
- Frequency Lists (OET) 653-8126
- Interference (OET) 653-8126

Interlocking Directors (CCB) 632-4887
- Permits to Operate in Canada 653-8126
- Radio Publications (OET) 653-8126
- Satellites Systems Coordination 653-8153
- Telecommunications Union (OET) 653-8126
- Telegraph & Telephone Rates (CCB) 632-5550
- Treaties & Agreements (OET) 653-8144

Investigations—
- Unlicensed Operations
- Washington, DC Area (FOB) ..... (301) 962-2727
- All other areas refer to local field office (FOB)
- Interference
- Washington, DC Area (FOB) ..... (301) 962-2727
- All other areas refer to local field office (FOB)

Ionosphere (OET) 653-8166
IRAC (Interdepartment RAC) (OET) 632-7025
Land Mobile—
- Common Carrier (CCB) 653-5560
- Other than CC (PRB) ..... (717) 337-1212
- Public Safety ..... (717) 337-1212
- Special Emergency ..... (717) 337-1212
- Business ..... (717) 337-1212
- Other Industrial ..... (717) 337-1212
- Land Transportation ..... (717) 337-1212

Land Transportation (PRB) ..... (717) 337-1212

Law Suits Litigation (OGC).....632-7112
Law, General (OGC).....632-6990
Leased Facilities (CCB).....632-7553
Library (FCC) (OMD).....632-7100
License
- Amateur (PRB).....(717) 337-1212
- Business (PRB).....(717) 337-1212
- Commercial Operator (FOB).....632-7240
- Domestic Satellite.....634-1624
- Mobile Services (CCB).....632-6400
- Cellular.....632-6400
- Microwave (CCB).....634-1706
- Wire or Cables (Auth. or Cert.) (CCB).634-1800

Internat'l & Satellite (CCB).....632-7265
- Experimental (OET).....653-8146
- General Mobile (PRB).....(717) 337-1212
- Industrial (PRB).....(717) 337-1212
- Land Transportation (PRB).....(717) 337-1212
- Marine (PRB).....(717) 337-1212
- Microwave (Industrial) (PRB).....(717) 337-1421
- Operators Licenses (FOB).....632-7240
- Public Safety (PRB).....(717) 337-1212
- Radio (See Broadcast Services)

Lighting devices (RF) (Pt. 18) (OET).....653-6288
Local Government Radio (PRB).....(717) 337-1212
Manufacturing (PRB).....(717) 337-1212
Marine Services (PRB)
- Applications/Licenses.....(717) 337-1212
- Rules/Hearings.....632-7175

MD's Licensing.....634-1706
Measurement for
- Type Acceptance.....(301) 725-1585
- Type Approval.....(301) 725-1585
- Certification.....(301) 725-1585
- Notification.....(301) 725-1585
- Verification.....(301) 725-1585
- Registration (Part 68).....634-1833

Mergers and Acquisitions (CCB).....632-4887
Metered Service (CCB).....632-7553
Microwave–
- Auxiliary–Common Carrier (CCB).....634-1706
- Auxiliary–Mass Media (MM).....634-6307
- Closed Loop (CCB).....634-1706
- Data Base (OET).....653-8163
- Digital Electronic Message (CCB).....634-1706
- Multipoint Distribution (MDS) (CCB).....634-1706
- Ovens (OET) (Pt. 18).....653-6288
- Radio Relay (CCB).....634-1706
- General/Operational.....632-6497

Military Stations (OET).....653-8141
Mobile Telephone Services (CCB).....653-5560
Mobilization Planning (OET).....632-7025
Monitoring (FOB).....632-6975
- Monitoring Stations (FOB).....632-7593

Monitoring Telephone Svc. (CCB).....632-5550
Motor Carrier (PRB).....(717) 337-1212
Multipoint Distribution.....634-1706
National Environmental Policy (OGC).....632-6990
Navigation (Air or Water) (PRB).....632-7175
News Gathering/Publishing (PRB).....(717) 337-1212
Noise–Radio (OET).....632-7025
Obstruction Markings–Antenna (FOB).....632-7521
Offshore Radio Service (CCB).....653-5560
Off-the-Air Pickup (CCB).....634-1706
One-Way Paging and Signaling (CCB).....653-5560
Operating Revenues–
- Int'l., Telephone & Telegraph (CCB).....632-7084

Operator Licenses (FOB)–
- Commercial
  - Administration & Suspension of.....632-7240
  - Examinations (1st, 2nd & 3rd Class)
  - Washington, DC Area.....(301) 962-2728

Subject **Telephone**
- All Other Areas.....632-7240
- License Records (Commercial).....632-7240
- Restricted Radiotelephone Permit (FOB)
  - U.S. Citizens–DC.....(301) 962-2729
  - U.S. Citizens–All Other Areas.....632-7240
- Aliens–All Areas.....632-7240

Oral Arguments (OMD).....632-7535
Original Plant Cost (Telephone) (CCB).....632-3772
Paging–Common Carrier (CCB).....653-5560
Paging–One-way (PRB).....(717) 337-1212
Personnel–Employment (OMD).....632-7106
Physicians Radio–Private (PRB).....(717) 337-1212
Point-to-Point Microwave–
- Common Carrier (CCB).....634-1706
- Private (PRB).....(717) 337-1212

Pole Attachments (CCB).....632-4890
Political Broadcasting.....632-7586
Power (Electric, Gas, Water) (PRB).....(717) 337-1212
Press Relations (OPA).....632-5050
Press (Relay)(PRB).....(717) 337-1212
Privacy Act–Procedures (OGC).....632-6990
Private Carrier Comms (PRB).....(717) 337-1212
Private Operational Fixed Services (PRB)
- Microwave Applications
  - Technical Questions.....(717) 337-1212
  - Status of.....(717) 337-1212

Private Wire Systems (CCB).....634-1800
Procurement (OMD).....634-1528
Propagation–Radio Waves (OET).....632-7025
Property–Common Carrier (CCB).....634-1861
Public Affairs, Office of.....632-5050
Public Information–
- Consumer Assistance.....632-7260/632-7000
- Legislation.....632-6405
- Press & News Media.....632-5050

Public Reference Rooms–
- Carrier Reports (CCB).....632-7084
- Carrier Tariffs (CCB).....632-5550

Public Safety (PRB).....(717) 337-1212
Radar–
- Intrusion Alarms (OET).....653-6288
- Aviation or Marine (PRB)
  - Applications/Licenses.....(717) 337-1212
  - Rule Interpretations.....632-7175

Radiation hazards (OET).....653-8169
Radio Broadcasting (See Broadcasting Services)
Radio Complaints.....632-7048
Radio Control Devices
- Non-licensed (Pt. 15) (OET).....653-6288
- Non-licensed (Pt. 95) (OET).....653-6288
- (PRB).....632-4964
- Non-licensed (other Pts.) (PRB).....632-4964
- (OET).....653-6288

Radio Frequency Devices (OET).....653-6288
Radiograms (CCB).....632-7265
Radiolocation–Industrial (PRB).....(717) 337-1212
Radio Propagation (OET).....632-7025
Radiotelegraph–
- Common Carrier (CCB).....632-7265
- Marine (PRB)
  - Operator License, Issuance of (FOB).632-7240

Radiotelephone–
- Applications/Licenses.....(717) 337-1212
- Rule Interpretations.....632-7175
- Common Carrier Services (CCB).....653-5560
- Equipment.....(301) 725-1585
- Operator License Issuance of (FOB).632-7240
- Permits, Restricted (FOB).....632-7240

Railroad (PRB).....(717) 337-1212
Real Property (FOB Field Installations).....632-7593
Recording Phone Conversations (CCB).....632-7553
Records Management (OMD).....634-1535
Reduction of Carrier Service (CCB).....632-7553
Relay–Microwave (CCB).....634-1706
Relay Press (PRB).....(717) 337-1212
Religious Petition (RM 2493).....632-7000
Repair and Calibration.....(301) 725-1585
Rescue Squads (PRB).....(717) 337-1212
Restricted Radiation Devices (OET).....653-6288
Retirements (Telephone Plants) (CCB).....634-1861
Rules and Regulations–
- Aviation and Marine.....632-7175
- Business.....634-2443
- Other, Industrial.....634-2443
- Land Transportation.....634-2443

Subject **Telephone**
- Microwave (PRB).....634-2443
- Personal and Amateur.....632-4964
- Public Safety.....634-2443

Rules–Ship Earth Station.....632-7175
- Interpretation of (Gen.) (OGC).....632-6990

Rural Radio (CCB).....653-5560
Safety–Sea (PRB).....632-7175
Safety Manager (OMD).....632-7541
Sampling and Measurements.....(301) 725-1585
Satellite–Sanction (FOB)
- International Facilities (CCB).....632-7265
- Domestic Facilities (CCB).....634-1624
- International Coordination.....653-8144
- Maritime (PRB).....632-7175
- Rates (CCB).....632-5550
- Systems (CCB).....634-1624
- Spread Spectrum (OET).....653-8163
- Coordination and Interference (OET).....653-8153

Search & Rescue (FOB).....632-6975
Security Officer (OMD).....632-7143
Ship Inspections (FOB).....632-7014
Ship Licensing (PRB).....(717) 337-1212
Ship Rules/Exemptions.....632-7175
Single Side Band–Standards (OET).....653-6288
Special Emergency (PRB).....(717) 337-1212
Speed of Service–
- Telephone or Telegraph (CCB).....634-1800

Split Channel Operations (CCB).....653-5560
Standards–Licensed Gear (OET).....653-6288
State Guard (PRB).....(717) 337-1212
Statistics–
- Common Carrier (CCB).....632-0745

Studio Transmitter Links–
- Mass Media (MMB).....634-6307
- Common Carrier (CCB).....634-1706

Submarine Cable (CCB).....632-7265
Sunspot Cycle (OET).....653-8166
Taping of Phone Calls (OGC).....632-6990
Tariff Schedules (PRB).....(717) 337-1212
Telecommunications for the Deaf (CCB).....632-6999
Telephone Interconnection (CCB).....634-1800
Telegraph Service (CCB).....632-7876
Telephone Lines (CCB).....632-1800
Telephone Telegraph Rates (CCB).....632-5550
Teletypewriter Exchanges (TWX) (CCB).....632-5550
TELEX
- International & Domestic (CCB).....632-7265

Testing Equipment.....(301) 725-1585
Tie-Line–Telegraph Telephone (CCB).....632-5550
Toll Charges (CCB).....632-5550
Tort Claims (Legal) (OGC).....632-6990
Towers–Painting and Lighting of (FOB).....632-7521
Towing (PRB).....(717) 337-1212
Transfers–
- Microwave License (CCB).....634-1706

Transit Systems (PRB).....(717) 337-1212
Transportation–Land (PRB).....(717) 337-1212
Treaties–
- Administration Interpretation (OGC).....632-6990
- Frequency Allocation (OET).....653-8126

Treaty Library (OET).....653-8126
Troposphere (OET).....632-7025
- Interference (D.C. Area) (FOB).....(301) 962-2729
- All other areas–Refer to Local Field Office
- Military (OET).....653-8141
- Pickup (Common Carrier) (CCB).....634-1706

Type Acceptance (OET).....(301) 725-1585
Type Approval (OET).....(301) 725-1585
Ultrasonics Equipment (OET).....653-8247
Unlicensed Operators–
- Investigation of (FOB).....632-6345
- Administrative Sanctions (FOB).....632-7240

Violations Records
- FOB Violation Records (FOB).....632-7278

Walkie-Talkies (OET).....653-6288
Watch Officer (Monitoring) (FOB).....632-6975
Wire Facilities (CCB).....634-1800
Wireless Microphones–
- Non-licensed (OET).....653-6288
- Licensed (PRB).....(717) 337-1212
- Licensed (MMB).....632-7505

Wiretapping (OGC).....632-6990
Yellow Page Advertising (CCB).....632-7553

How to File Comments in an FCC Rulemaking

Following are guidelines established by the FCC to assist in filing comments on a Notice for Proposed Rulemaking.

Your experience

The FCC is interested in any experiences, judgments or insights you might have that would shed light on issues and questions raised in an inquiry or rulemaking.

Facts

Your comments should explain who you are and what your interest is. State the facts briefly, but fully. Clearly explain your experience and any additional evidence that supports your position.

Be specific

Your comments should be explicit. If the details of the proposed rule or if only one of several provisions of the rule are objectionable to you, make this clear. If the rule would be acceptable with certain safeguards, explain them and why they are needed.

Other opinions

Your comments should include facts that might support a different position. Discuss them and explain why the public interest requires that the matter be resolved as you propose.

Filing date

Submit your written comments to: Secretary, Federal Communications Commission, 1919 M St., N.W., Washington, D.C. 20554.

If you want your comments to be received as a formal filing, you must submit an original and five copies. However, you may simply submit one copy to be filed in the docket as an informal comment.

Docket number

Be sure to note the docket number or rulemaking number on your comments.

Public documents

You can obtain copies of a Notice of Inquiry or a Notice of Proposed Rulemaking by contacting the FCC's duplicating contractor, the Downtown Copy Center, at 202-452-1422, or one of the private distributors of FCC releases. A list of distributors is available from the Consumer Assistance and Information Division, 1919 M St., N.W., Washington, D.C. 20554, 202-632-7000 or 202-632-7260.

All Notices of Inquiry and Proposed Rulemakings are printed in the Federal Register soon after they are released by the Commission. The Federal Register is available in most public libraries across the country.

DAB 1992

(continued from page 13)

The two newest players in the DAB debate will probably move further into the forefront and may become the catalysts for moving developments further along.

Standards setting

The Electronic Industries Association (EIA) plans to hold continuing committee and sub or working group meetings to examine DAB systems and develop a standard. It will be at least 1993 or later, however, before any definite action on DAB comes from that committee.

And the House subcommittee on Telecommunications and Finance plans additional hearings on DAB. (Perhaps this time, unlike its first hearing, Congressmen can actually question DAB system proponents other than NAB).

One additional group that became more active on DAB late last year was the DAB Task Force's Technical Advisory Group. The TAG also was planning a series of meetings to discuss the emerging DAB systems. It will be interesting to see if its technical work could provide some face-saving for NAB, which has backed itself into a Eureka 147 corner.

A Picture Says a Thousand Words

Top left: **Mount Vernon, Wash.'s amazing sinking station**... Following a Thanksgiving flood, the staff at KBRC-AM gave thanks for responsive listeners, however, the facility still was a wash. The station now broadcasts from new studios—on Riverside Drive.

Top right: **The Business of Broadcasting**... When KTNQ decided to move its five-tower array, it didn't realize how expensive and scarce land was in the City of Industry, Calif. So, it sold its prime commercial property for the development of two giant warehouses, while maintaining the towers at the site. Talk about putting your money where your signal is...

Left: **Thanks for the memories**... The view made it hard to concentrate at Radio 1991 in San Francisco, but all in all, the event was deemed a quality show.

Right: **Tiptoe through the Test Tones**... The annual NAB convention drew a record crowd of 51,217 and a surprise visit from 1960's crooner Tiny Tim.

Bottom: **The FCC** ... at last dealt with the longstanding AM docket 87-267, kind of. Many engineers claim the action actually creates disincentives to AM improvement. Commission Chairman Al Sikes quipped, "By any sane analysis, AM is a very sick service."

Taking a Hard Look at Soft Times

(continued from page 39)
looking closely at purchasing and capital items for budgeting, as well as the expense line.

"Money is tight," Kramer noted. "We're having to cut back, look at what we're spending and try to obtain the maximum benefit for all our stations."

For Kramer, some hard decisions have to be made in allocating funds. "Some of our stations have gotten into projects that we couldn't control; so we've had to roll with the flow. We've dedicated funds to these projects, but because these stations needed money, others couldn't get it."

...If the NAB's Radio 1991 convention in San Francisco in September was any indication, some manufacturers are optimistic about the end of the purchasing drought within the industry.

Like the rest of the industry, according to Kramer, Viacom is "looking to consolidate and save operating expenses, to reduce operating costs—not just today but down the road."

The drive to save on operating expenses has led some marginal stations to enter into local marketing agreements (LMAs) and other time brokerage schemes as quick fixes for hard times.

Star Media's Leonard noted, "Operators are looking to consolidate expenses in any way they can. They are pursuing LMAs as a way to solve short-term problems, because an LMA can reduce staffing and programming costs."

Still, said Leonard, "the majority of LMAs are not going to work. The survivors will be those LMAs that serve strategic purposes. Two operators who don't 'gel' well together, and are just trying to cut costs by creating an LMA, won't make it in the long run."

These agreements also are coming under the scrutiny of Congress to make sure that the public interest is still served, and to guarantee that a licensee does not abandon his responsibilities by brokering away his station time.

The "Television and Radio Broadcast Bulk Time Sale Limitation Act of 1991" was introduced in the House on Nov. 4, 1991. If enacted, the bill would require the FCC to start a rulemaking to prescribe rules that impose limits on such agreements, ensure they are entered into by qualified parties and monitor them.

In a prepared statement, the National Association of Broadcasters (NAB) responded to the bill by saying, "Broadcasters need a clearer definition of what is allowable and what is not in time brokerage agreements. However, this bill appears to do more to kill them than define them. We hope that its sponsors will recognize the value of such agreements in helping many stations stay competitive and preserve local service to their communities."

What will the future hold for the radio industry? Star's Leonard is predicting a pretty soft year for 1992—"flat with perhaps just a slight improvement.

"Radio revenues track almost linearly with retail sales growth," Leonard explained. As of November 1991, consumer confidence polls indicated that people are not rushing out to buy big-ticket items, and this hesitation will no doubt be reflected in the radio market.

The SBE's Whitaker also was cautious about the future, advising his audience at the SBE convention to "hold on for a rough ride" for the next two years.

And yet, if the NAB's Radio 1991 convention in San Francisco in September was any indication, some manufacturers are optimistic about the end of the purchasing drought within the industry. Even such big-ticket items as transmitters were introduced at the convention, which represents confidence in the economy. After all, you don't put that much money into R&D and marketing if you don't think you'll be selling any product.

Whitaker also forecast a light at the end of the tunnel by the year 2000. According to a recent survey, he said, the U.S. has been ranked superior to Japan in microprocessor, workstation, personal computer, software and related technological capabilities. That ranking may help turn the international economic situation back in favor of the U.S., and may signal a new age of prosperity for the nation. And it's all less than 10 years away.

FCC Refines Its Fine Schedule

In 1991, the FCC initiated an agenda of standard fine rates for specific violations. While not foolproof, they are a refined alternative to the often-vague, ill-defined guidelines of the past.

by Harold Hallikainen

On Aug. 1, 1991, the FCC released Policy Statement 91-217, which established standard forfeitures for specific violations of the Commission's rules.

While the standards serve only as a starting point for determining actual fines, they do establish a priority as to which rules the Commission considers most critical.

Following are eight of the most prominent forfeiture areas, based on all violation notices issued by the FCC to broadcast stations in 1988 and 1989.

✓ Safety ($20,000)

The FCC is concerned about public safety, especially tower lighting and marking. Make sure daily tower light inspections are completed properly.

Ensure that the FAA is notified immediately of failures requiring notification (any top lamp, any flashing lamp). Detected failures and repairs are to be logged. It's suggested that inspections also be logged.

A quarterly inspection of all lighting control, alarms and indicators is required. At this time, also check tower painting (a color chart is available from Hale Color Charts, 800-777-1225).

✓ FCC Procedures ($20,000)

This severe penalty applies to "misrepresentation or lack of candor" and construction or operation without authorization. Some likely violations in this area include falsifying logs or being less than truthful in response to FCC violation notices.

Station construction is to be as authorized on the construction permit. Operation is to be only as authorized (file a 302 within 10 days of beginning operation for a nondirectional AM or FM).

Failure to permit an inspection can yield an $18,750 forfeiture. Stations are to be available for inspection any time they are operating.

✓ Interference ($12,500 to $17,500)

Typical violations that fall into this category include excessive power, excessive antenna height, overmodulation, excessive occupied bandwidth, excessive spurious emissions, off-frequency operation, DA parameters out of tolerance, etc.

✓ Emergency Broadcast System ($12,500)

Frequent EBS violations include an inoperational generator, receiver or decoder; missing log entries regarding EBS test transmission and reception; use of an unauthorized EBS generator; and inability to fulfill EBS obligations from an off-premises control point.

✓ Main Studio Rule ($10,000)

As stations move studios to adjacent larger markets, enter time brokerage agreements and turn programming responsibilities over to others, careful consideration of the main studio rule is required.

Recent FCC interpretation of this rule appears to have extended its applicability. Be careful.

✓ Required Frequency Coordination ($10,000)

Most of the U.S. now is covered by frequency coordinating committees, which coordinate the use of Part 74 frequencies to minimize interference. These coordination processes are to be fulfilled before filing an application with the FCC.

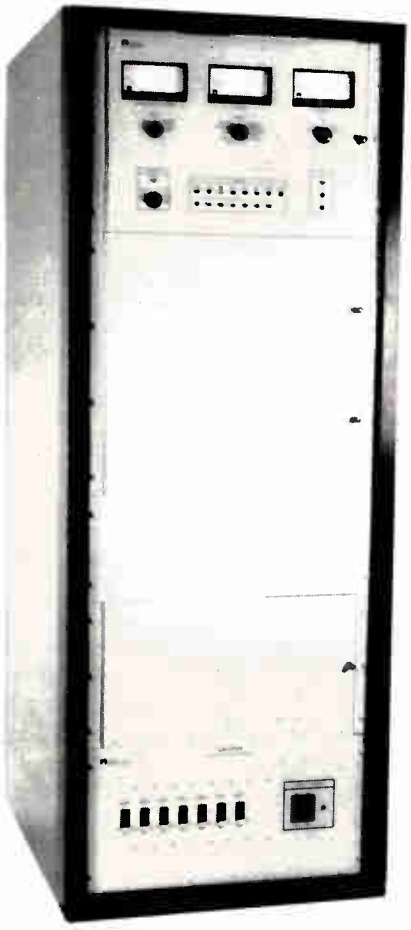
✓ Technical Log Violations ($5,000)

Simple: Station logs still are required. Review the requirements.

✓ Station Identification ($5,000)

Some stations announce every community but the one they are licensed to after the call letters. Call letters must be immediately followed by the licensed community. If desired, the frequency, channel number and station licensee may be inserted between the call letters and the community.

Harold Hallikainen is president of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems. He teaches electronics at Cuesta College, San Luis Obispo, and also is an **RW** *columnist.*



The inventor of high powered solid-state AM has perfected solid-state FM

You know us as worldwide suppliers of cost-effective, power-efficient solid-state AM transmitters.

Now we're proud to offer Nautel reliability, efficiency and serviceabiltiy in two new solid-state FM transmitters.

AMPFET FM4 4kW
AMPFET FM7 7kW

Get the full story on our complete line.
Call, write or FAX today.

Phone: (902) 823-2233 Canada • **Fax:** (902) 823-3183 • **Telex:** 019-22552

Nautel
(Nautical Electronic Laboratories Limited)
R.R. #1, Tantallon, Halifax County,
Nova Scotia, Canada B0J 3J0

Nautel Maine Inc.
201 Target Industrial Circle
Bangor, Maine 04401 U.S.A.

nautel

Circle (119) On Reader Service Card

RDS

(continued from page 16)

but other American manufacturers also are likely to offer products once RBDS takes hold domestically.

Broadcaster support

NAB Manager of Technical Regulatory Affairs John Marino said U.S. broadcasters support RDS, but want to make sure the industry is not totally driven by the receiver industry. In late 1991, an NAB RDS task force was formed to define the broadcasters' position on RDS.

If receiver manufacturers offer the same RDS radios sold in Europe, including the text function and the ability to switch from one translator to another, broadcasters will be satisfied, Marino said.

Displaying call letters and offering automatic format selection are not the only RDS features companies are eyeing. RDS's potential as a replacement for EBS has been pushed strongly by the technology's proponents. By July 1992, broadcasters in the Jefferson County, Texas, area will have completed testing and most will have switched to the RDS alerting system.

The county, which is dominated by the petrochemical industry, decided to go with the RDS system because it is much more automatic and has fewer links that can fail than the decades-old EBS system. According to the project's consultant, Sage Alerting Systems, other communities have expressed interest in using RDS for emergency alerting.

Unlike EBS, RDS does not depend on disc jockeys or other designated operators to decide whether an emergency is valid before initiating an alert. With RDS, the emergency alert is automatic—unless a station decides to manually override it.

The RDS subcommittee has run into a few obstacles in pursuit of a standard—mainly a problem with Cue Paging, a paging subcarrier that also operates at 57 kHz. It is located on more than 270 radio stations.

Last year, RDS receiver manufacturers and RDS proponents expressed concern that adopting a hybrid RDS—Cue Paging standard would inhibit RDS significantly.

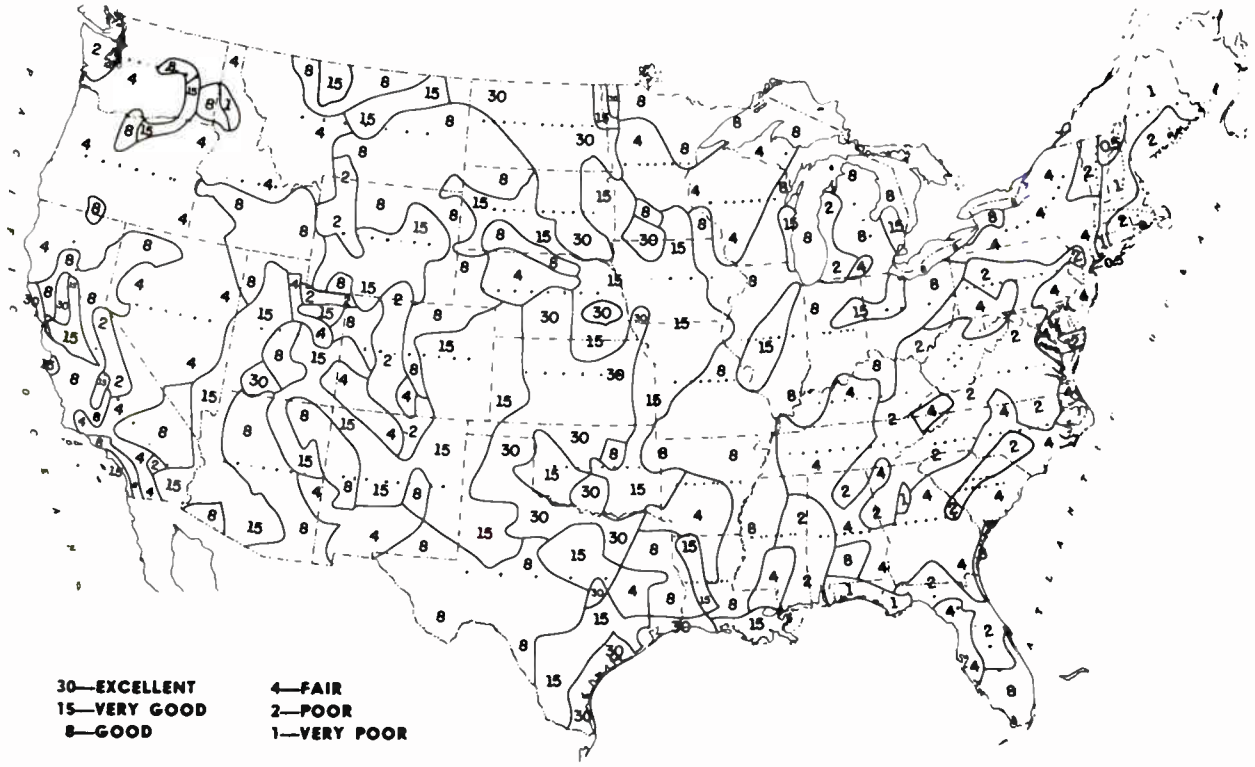
Cue Paging in its original form caused problems with RDS receivers, including lengthy delays in text display, according to manufacturers. However, Cue Paging made some software changes to its systems, and tests last summer in California showed that the two systems could be compatible.

John Gatski is news editor of **RW**.

U.S. FM Channel Allocations

Channel 201	88.1 MHz	Channel 251	98.1 MHz
Channel 202	88.3 MHz	Channel 252	98.3 MHz
Channel 203	88.5 MHz	Channel 253	98.5 MHz
Channel 204	88.7 MHz	Channel 254	98.7 MHz
Channel 205	88.9 MHz	Channel 255	98.9 MHz
Channel 206	89.1 MHz	Channel 256	99.1 MHz
Channel 207	89.3 MHz	Channel 257	99.3 MHz
Channel 208	89.5 MHz	Channel 258	99.5 MHz
Channel 209	89.7 MHz	Channel 259	99.7 MHz
Channel 210	89.9 MHz	Channel 260	99.9 MHz
Channel 211	90.1 MHz	Channel 261	100.1 MHz
Channel 212	90.3 MHz	Channel 262	100.3 MHz
Channel 213	90.5 MHz	Channel 263	100.5 MHz
Channel 214	90.7 MHz	Channel 264	100.7 MHz
Channel 215	90.9 MHz	Channel 265	100.9 MHz
Channel 216	91.1 MHz	Channel 266	101.1 MHz
Channel 217	91.3 MHz	Channel 267	101.3 MHz
Channel 218	91.5 MHz	Channel 268	101.5 MHz
Channel 219	91.7 MHz	Channel 269	101.7 MHz
Channel 220	91.9 MHz	Channel 270	101.9 MHz
Channel 221	92.1 MHz	Channel 271	102.1 MHz
Channel 222	92.3 MHz	Channel 272	102.3 MHz
Channel 223	92.5 MHz	Channel 273	102.5 MHz
Channel 224	92.7 MHz	Channel 274	102.7 MHz
Channel 225	92.9 MHz	Channel 275	102.9 MHz
Channel 226	93.1 MHz	Channel 276	103.1 MHz
Channel 227	93.3 MHz	Channel 277	103.3 MHz
Channel 228	93.5 MHz	Channel 278	103.5 MHz
Channel 229	93.7 MHz	Channel 279	103.7 MHz
Channel 230	93.9 MHz	Channel 280	103.9 MHz
Channel 231	94.1 MHz	Channel 281	104.1 MHz
Channel 232	94.3 MHz	Channel 282	104.3 MHz
Channel 233	94.5 MHz	Channel 283	104.5 MHz
Channel 234	94.7 MHz	Channel 284	104.7 MHz
Channel 235	94.9 MHz	Channel 285	104.9 MHz
Channel 236	95.1 MHz	Channel 286	105.1 MHz
Channel 237	95.3 MHz	Channel 287	105.3 MHz
Channel 238	95.5 MHz	Channel 288	105.5 MHz
Channel 239	95.7 MHz	Channel 289	105.7 MHz
Channel 240	95.9 MHz	Channel 290	105.9 MHz
Channel 241	96.1 MHz	Channel 291	106.1 MHz
Channel 242	96.3 MHz	Channel 292	106.3 MHz
Channel 243	96.5 MHz	Channel 293	106.5 MHz
Channel 244	96.7 MHz	Channel 294	106.7 MHz
Channel 245	96.9 MHz	Channel 295	106.9 MHz
Channel 246	97.1 MHz	Channel 296	107.1 MHz
Channel 247	97.3 MHz	Channel 297	107.3 MHz
Channel 248	97.5 MHz	Channel 298	107.5 MHz
Channel 249	97.7 MHz	Channel 299	107.7 MHz
Channel 250	97.9 MHz	Channel 300	107.9 MHz

Estimated Ground Conductivity



Courtesy of Continental Electronics

Useful Engineering Formulas

REACTANCE FORMULAS

$$C = \frac{1}{2\pi f X_C} \qquad X_C = \frac{1}{2\pi f C}$$

$$L = \frac{X_L}{2\pi f} \qquad X_L = 2\pi f L$$

RESONANT FREQUENCY FORMULAS

$$F = \frac{1}{2\pi\sqrt{LC}} \qquad f_{kHz} = \frac{159.2}{\sqrt{LC}}$$

$$L = \frac{1}{4\pi^2 f^2 C} \qquad L_{\mu HY} = \frac{25{,}330}{f^2 C}$$

$$C = \frac{1}{4\pi^2 f^2 L} \qquad C_{\mu FO} = \frac{25{,}330}{f^2 L}$$

Where f is in kHz
L is in microhenries
C is in microfarads

RESISTORS IN SERIES

$$R_{TOTAL} = R_1 + R_2 + R_3 + \cdots$$

CONVERSION FACTORS

$\pi = 3.14$ $\qquad 2\pi = 6.28$

$\pi^2 = 9.87$ $\qquad \log\pi = 0.497$

1 meter = 3.28 feet
1 inch = 2.54 centimeters
1 radian = 57.3°

FREQUENCY AND WAVELENGTH FORMULAS

$$f_{kHz} = \frac{3 \times 10^5}{\lambda_{METERS}} \qquad \lambda_{METERS} = \frac{3 \times 10^5}{f_{kHz}}$$

$$f_{MHz} = \frac{984}{\lambda_{FEET}} \qquad \lambda_{FEET} = \frac{984}{f_{MHz}}$$

$0.625\lambda = 225° = {}^5/_8$ WAVE
$0.5\lambda = 180° =$ HALF WAVE
$0.311\lambda = 112°$
$0.25\lambda = 90° =$ QUARTER WAVE

RESISTORS IN PARALLEL

EQUAL RESISTORS

$$R_{TOTAL} = \frac{R}{n}$$

Where n is the total number of resistors

UNEQUAL RESISTORS

$$R_{TOTAL} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots}$$

$$R_{TOTAL} = \frac{R_1 R_2}{R_1 + R_2} \qquad R_1 = \frac{R_T R_2}{R_2 - R_T}$$

If the current through a resistor doubles, the power dissipated quadruples

BINARY TO BASE 10 CONVERSION

$1\ (2^3) = 8$
$0\ (2^2) = 0$
$1\ (2^1) = 2$
$1\ (2^0) = +\ 1$
11

DIRECT POWER FORMULA

$$P = I^2R$$

Where I is the common point or base current in amperes, and R is the common point or base resistance in ohms

INDIRECT POWER FORMULA

$$P = IE(effy)$$

Where I is the final P.A. current in amperes, E is the final P.A. voltage in volts, and effy is the transmitter efficiency expressed in decimal form (79% = 0.79)

Courtesy of Delta Electronics

FAST FAX

Reader Service

Keep your product files up to date by requesting **FREE** literature from the companies whose products and services are featured in this issue. As you read through the issue, note the Reader Service numbers on ads and articles that you'd like to know more about, and circle those corresponding numbers below. Then fill out the rest of the form and FAX it to us at:

703-998-2966

No fax machine? No problem! Use the card delivered with this issue and mail it back to us! Thanks for reading **Radio World**!

"Please Fill Out And Return This Card Today!"

Tiana Hickman
Circulation Manager

Radio World

Feb. 19, 1992, Sect. B Use until Feb. 1, 1993

FREE Subscription/Renewal Card

I would like to receive or continue receiving **Radio World** FREE each month. ☐ YES ☐ NO

Signature _____ Date _____

Please print and include all information:

Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ ZIP _____

Business Telephone ( ) _____

Please circle only one entry for each category:

I. Type of Firm

D. Combination AM/FM station
A. Commercial AM station
B. Commercial FM station
C. Educational FM station
E. Network/group owner
F. Recording studio
G. TV station/teleprod facility
H. Consultant/ind engineer
I. Mfg, distributor or dealer
J. Other _____

II. Job Function

A. Ownership
B. General management
C. Engineering
D. Programming/production
E. News operations
F. Other (specify) _____

III. Purchasing Authority

1. Recommend 2. Specify 3.Approve

Reader Service

Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below.

001	023	045	067	089	111	133
002	024	046	068	090	112	134
003	025	047	069	091	113	135
004	026	048	070	092	114	136
005	027	049	071	093	115	137
006	028	050	072	094	116	138
007	029	051	073	095	117	139
008	030	052	074	096	118	140
009	031	053	075	097	119	141
010	032	054	076	098	120	142
011	033	055	077	099	121	143
012	034	056	078	100	122	144
013	035	057	079	101	123	145
014	036	058	080	102	124	146
015	037	059	081	103	125	147
016	038	060	082	104	126	148
017	039	061	083	105	127	149
018	040	062	084	106	128	150
019	041	063	085	107	129	151
020	042	064	086	108	130	152
021	043	065	087	109	131	153
022	044	066	088	110	132	154

FREE Subscription/Renewal

Fill out the information above and return this card to reserve a FREE subscription to RADIO WORLD. Or, if you are already a subscriber, fill out and return to RENEW your subcription, ensuring continued service for 12 more months.

FREE Product Literature

Keep abreast of the latest in radio equipment by keeping your literature files up to date. Check this issue for advertisements and editorial items of interest. Then circle the corresponding Reader Service Inquiry numbers above to receive more information. Circle every item that interests you, there is no charge for this service!

"Please Fill Out And Return This Card Today!"

Tiana Hickman
Circulation Manager

Radio World
Feb. 19, 1992, Sect. B Use until Feb. 1, 1993

FREE Subscription/Renewal Card

I would like to receive or continue receiving **Radio World** FREE each month. ☐ YES ☐ NO

Signature _____ Date _____

Please print and include all information:

Name _____ Title _____
Company/Station _____
Address _____
City _____ State _____ ZIP _____
Business Telephone ( ) _____

Please circle only one entry for each category:

I. Type of Firm

D. Combination AM/FM station
A. Commercial AM station
B. Commercial FM station
C. Educational FM station
E. Network/group owner
F. Recording studio
G. TV station/teleprod facility
H. Consultant/ind engineer
I. Mfg, distributor or dealer
J. Other _____

II. Job Function

A. Ownership
B. General management
C. Engineering
D. Programming/production
E. News operations
F. Other (specify) _____

III. Purchasing Authority

1. Recommend 2. Specify 3.Approve

Reader Service

Please first fill out contact information at left. Then check each advertisement for corresponding number and circle below.

001	023	045	067	089	111	133
002	024	046	068	090	112	134
003	025	047	069	091	113	135
004	026	048	070	092	114	136
005	027	049	071	093	115	137
006	028	050	072	094	116	138
007	029	051	073	095	117	139
008	030	052	074	096	118	140
009	031	053	075	097	119	141
010	032	054	076	098	120	142
011	033	055	077	099	121	143
012	034	056	078	100	122	144
013	035	057	079	101	123	145
014	036	058	080	102	124	146
015	037	059	081	103	125	147
016	038	060	082	104	126	148
017	039	061	083	105	127	149
018	040	062	084	106	128	150
019	041	063	085	107	129	151
020	042	064	086	108	130	152
021	043	065	087	109	131	153
022	044	066	088	110	132	154

FREE Subscription/Renewal

Fill out the information above and return this card to reserve a FREE subscription to RADIO WORLD. Or, if you are already a subscriber, fill out and return to RENEW your subcription, ensuring continued service for 12 more months.

FREE Product Literature

Keep abreast of the latest in radio equipment by keeping your literature files up to date. Check this issue for advertisements and editorial items of interest. Then circle the corresponding Reader Service Inquiry numbers above to receive more information. Circle every item that interests you, there is no charge for this service!

Keep Your Files Up to Date! Use Radio World's FREE Reader Service.

Just fill out the above card and FAX it to us at:

703-998-2966

We'll take care of the rest. Thanks for reading **Radio World**!

PRODUCT SHOWCASE

PRODUCT SHOWCASE

Digital DJ™

Digital DJ Satellite System $7,995.00!

SMN - JSA - UNISTAR - Moody - Etc
Digital DJ replaces all your old audio Cart sources with high quality *digital* audio from a computer hard disk.

Complete Satellite Systems From $198.00 / Mo
Multi-day Satellite programming is a snap. Full ID, Jingle, Magic Call & Liner rotation and live assist options. Auto spot Set fill, Subs for illegal spots. Real Time operation with auto update after power failure. Many options. Easy installation and operation. Eliminate your paper Log. It's all on the screen including live rotating tags & copy, news and lists. Call for new Demo disk and brochure.

- **Satellite Stations:** Eliminate book tapes, stacks of carts, super switches and old automation with a complete programming system.
- **Automation:** Replace all your multi-cart playbacks. Get real walk-away.
- **CD Programming:** Soon Digital DJ will random program CD tracks with playlists from **Music Log.**

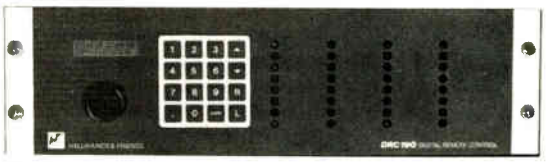
Our 12th Year - 1000+ Stations

The Management
1-800-334-7823 - 1-817-625-9761 - Fax 817-624-9741
P.O. Box 1-36457 Ft. Worth, Tx. 76136

READER SERVICE NO. 24

PROGRAM•ABILITY

Programmable Digital Remote Control.
What others promise, Hallikainen & Friends delivers to your exact specs with the DRC 190. With its extended BASIC language, the DRC 190 can control, alarm, display and log measured and calculated system parameters. Typical installations also generate a daily report showing the minimun, maximum and average of each parameter, simplifying oversight of the system. For true flexibility of user control over evolving equipment demands, get with the program, get the DRC 190.



PROGRAMMABLE EXPANDABLE AFFORDABLE DRC 190

HALLIKAINEN & FRIENDS
141 Suburban E4, San Luis Obispo, CA 93401-7590 USA
805-541-0200

READER SERVICE NO. 114

ECONCO

Econco
REBUILT POWER TUBES

Approximately One Half the Cost of New

3,000 Hour Unconditional Guarantee

Call for Our Price List

Econco 1318 Commerce Ave. Woodland, CA 95695
Phone: 916-662-7553 Fax: 916-666-7760 Telex: 176756
Toll Free: 800-532-6626 From Canada: 800-848-8841

READER SERVICE NO. 137

If you haven't tried this pre-amp, you don't know how good your microphones can sound.

If you read ads for microphone pre-amps you'll find they all, regardless of price, promise the same things: low distortion, low noise, and great noise rejection.

PROMISES. . . PROMISES

Sontec promises you something better. Install our MPA-1 pre-amp. If it's not cleaner and more transparent than what you're now using, just return it for credit. Now that is a promise!

Sontec Electronics
Audio Drive, Goldbond VA 24094
703-626-7256

READER SERVICE NO. 73

PRODUCT SHOWCASE

PRODUCT SHOWCASE

SERVICES

CONSULTANTS

EVANS ASSOCIATES
Consulting Communications Engineers
FCC Applications, Design & Field Engineering
Broadcast Engineering Software
216 N. Green Bay Rd.
Thiensville, WI 53092
(414) 242-6000
Member AFCCE

W. LEE SIMMONS & ASSOC., INC.
BROADCAST TELECOMMUNICATIONS CONSULTANTS
1036 William Hilton Pkwy
Ste 200F
Hilton Head Is., SC 29928
(803) 785-4445

SOFTWARE
FM CHANNEL SEARCH
FM Database pool
MSDOS
EGA Graphics-Color
Broadcast Technical Consulting
Doug Vernier
Broadcast Consultant
1600 Picturesque Drive
Cedar Falls, IA 50613
319-266-8402

MIRKWOOD ENGINEERING
Rural & Remote Site Field Engineering
50 Park Ave.
Claremont, NH 03743
603/542-6784

GOODRICH enterprises, inc.
Parts and technical service for all
MCMARTIN TRANSMITTERS, CONSOLES
EXCITERS, RECEIVERS
TRANSMITTER AND INDUSTRIAL TUBES.
11435 Manderson St.
Omaha, Nebraska 68184 U.S.A.
PH: 010-1-402-493-1886 FAX: 010-1-402-493-6822.6
TELEX: 940103 WUPUBTLX BSN

MULLANEY ENGINEERING, INC.
Consulting Engineers
•Design & Optimization of AM Directional Arrays
•Analysis for New Allocation, Site Relocation, And Upgrades
AM FM TV LPTV
Wireless Cable
(MDS/MMDS/ITFS/OFS)
•Environmental Radiation Analysis
•Field Work
•Expert Testimony
9049 Shady Grove Court
Gaithersburg, MD 20877
Phone: (301) 922.6-0115
Fax: (301) 590-9757

Moffet, Larson & Johnson, Inc.
Consulting Telecommunications Engineers
Two Skyline Place
5203 Leesburg Pike # 800
Falls Church VA 22041
703-824-5660
800-523-3117
Member AFCCE

RadioWorld
Your Source for Broadcast Engineering News, Features and Equipment Updates

RADIO SYSTEMS ENGINEERING
FCC Applications • Design • Installation • Field Service
Experienced & Affordable
4289 Roanridge
Las Vegas, Nevada 89120
24 Hr: (702) 454-2085
FAX: 702-898-8731
(800) 551-1667

T.Z. Sawyer
Technical Consultants
1-800-255-AMDA
AM Directional Antenna Proofs
AM-FM-TV-LPTV
FCC Applications & Exhibits
Station Inspections
6204 Highland Drive
Chevy Chase, MD 20815-6610
Telefax 301-913-5799

Teletech, Inc.
BROADCAST CONSULTANTS AND ENGINEERS
- FCC Applications & Field Engineering
- Frequency Searches & Coordination
- Tower Erection & Maintenance
- Facility Design & Construction

CONTACT:
Kenneth W. Hoehn
23400 Michigan Ave
Dearborn, MI 48124
(313) 562-6873

Huntsville Antenna Engineering
There is hope for AM radio! AM station unipole antennas with circular polarization & beam tilt. Broadband your present AM tower Series R shunt fed.
205-353-6747
Kenneth Casey
Consulting Radio Engineer

Lahm, Suffa & Cavell, Inc.
Consulting Engineers
- *Interference Resolution*
- *Coverage Improvement*
- *RF Hazard Studies*
- *Custom Software*
- *AM Antenna Improvement*
- *Former Chief Engineers*
- *Suburban Washington Based*

3975 University Dr., Suite #450
Fairfax, Virginia 22030
Phone 703-591-0110
Fax 703-591-0115

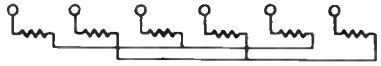
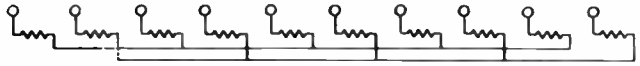
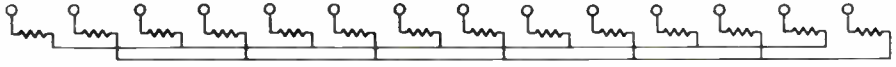
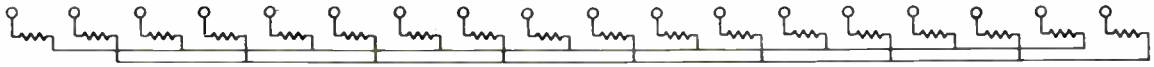
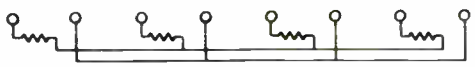
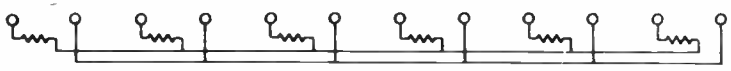
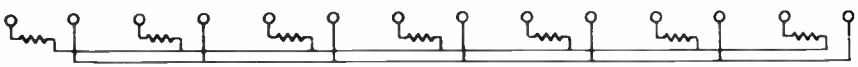
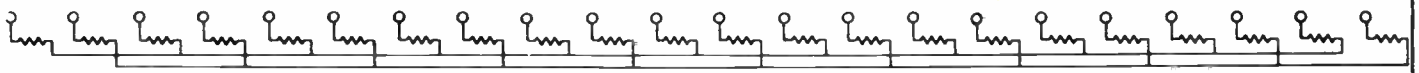
Consulting Communications Engineers
- FCC Data Bases
- FCC Applications and Field Engineering
- Frequency Searches and Coordination
- AM-FM-CATV-ITFS-LPTV

OWL ENGINEERING, INC.
1306 W. County Road. F,
St. Paul, MN 55112
(612)631-1338 "Member AFCCE"

For Information Or To Include Your Ad In Radio World's Broadcast Equipment Exchange, Call Simone Mullins at 1-800-336-3045

DISTRIBUTOR DIRECTORY

Audio Dividing Pads

CIRCUIT	NO OUTPUTS	DB LOSS	INPUT 1 2 / OUTPUT A 3 4 · B 5 6 · C 7 8 · D 9 10 · E 11 12 · F 13 14 · G 15 16 · H 17 18 · J 19 20 · K 21 22	EACH RESISTOR
BAL	2	5.0		100Ω
BAL	3	8.5		150Ω
BAL	4	12.0		180Ω
BAL	5	14.0		200Ω
BAL	6	15.6		214Ω
BAL	8	13.1		235Ω
UNBAL	2	6.0		200Ω
UNBAL	3	9.5		300Ω
UNBAL	4	12.0		360Ω
UNBAL	5	14.0		400Ω
UNBAL	6	15.6		428Ω
UNBAL	8	18.1		466Ω
BAL	10	20.0		245Ω

Courtesy of Continental Electronics

DIRECTORIES & PROFILES

In the following pages, you will find three tools for keeping track of vendors and their products.

PRODUCT SOURCE BOOK

A

Acoustic Materials
+4 Audio
ASC - Tube Traps
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Acoustic Systems
Alpha Audio Acoustics
Anything Audio
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audiotechniques
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Services/EME
Broadcasters General Store
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris Allied
Hy James, Inc.
Martin Audio/Video Corp
New World Music & Sound
Oakwood Audio Labs Ltd.
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
Posthorn Recordings
Pro Media
Quintessence Audio
RF Specialties of Missouri
RPG Diffusor Systems Inc
Radio Resources & Services
Research Associates Inc
Ritz Audio-Visual Associates, Inc
Roscom General
Schoeps/Posthorn Recordings
Sonex Division of Illbrook Inc
Suministros Gonzalez
UAR Professional Systems
Walters-Storyk Design Group

Amplifiers, Audio
+4 Audio
ATI (Audio Technologies Inc)
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Dan Alexander Audio
Altec Lansing Bdct/Prod. Pdcts
Anything Audio
Ashly Audio, Inc.
Audio Broadcast Group, Inc.
Audio Dynamics, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audiotechniques
Audio Video of Orlando
Audisar
Auditronics
BGW Systems, Inc.
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Benchmark Media Systems Inc
Best Audio
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Devices, Inc.
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Bryston/Bryston Vermont Ltd.
Clear-Com Systems
Conex Electro-Systems, Inc.
Control Technology Inc.
Crouse-Kimzey Company
D.N. Latus & Co., Inc.
Delta Electronics Inc.
Dynacord
ESE
Electro-Voice Inc.
Electronic Industries, Inc.
Erko Technologies
Excalibur Electronics
Full Compass Systems, Ltd.
Furman Sound, Inc.
Fusion Electronics, Inc.
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Group One Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
Harris Allied
Henry Engineering
Holzberg Inc.
Hy James, Inc.
ICB Audio
JBL Professional
J.N.S. Electronics, Inc.
Jensen Transformers Inc.
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Lines Video Systems
Logitek Electronic Systems Inc.
Martin Audio/Video Corp
McCurdy Radio Industries
McMartin Incorporated
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
OPAMP Inc.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
QSC Audio Products
Quintessence Audio
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RTS Systems
Radio Design Labs
Radio Resources & Services
Ram Broadcast Systems
Ramko Research
RANE Corporation
Renkus-Heinz, Inc.
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
RRADCO Group
Russco Electronics Mfg. Inc.
Sequoia Electronics
Sescom Inc.
Shure Brothers Inc
Sierra Automated Systems
Somich Engineering
Sonocraft Corp
Sontec Electronics
Spectra Sonics
Stram Electronics Corp
Studer
Suministros Gonzalez
Symetrix Inc.
TOA Electronics Inc
Tandberg Educational, Inc.
Tapecaster
Telo Technology
UREI
Valley International
Videoquip Research Limited
Ward-Beck Systems Ltd.
Wide Range Electronics Corporation
Wohler Technologies
Yamaha Music Corp. of America
Zercom Corporation

Amplifiers, RF
AVR Communications Limited East
AVR Communications Limited West
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Belar Electronics Laboratory, Inc.
Bext Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Services/EME
Broadcasters General Store
Cancomm
Cirrus Technologies Inc
Comad Communications Limited
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Elcom Bauer
Erko Technologies
Full Compass Systems, Ltd.
Fusion Electronics, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris Allied
Holzberg Inc.
J.N.S. Electronics, Inc.
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Litronix Corporation
MCL Inc.
Marcom
Nady Systems
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pro Media
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Roscom General
RRADCO Group
Spectra Sonics
Suministros Gonzalez
Tepco Corporation
Tobias & Company Ltd

Amplifiers, Audio Distribution
+4 Audio
ATI (Audio Technologies Inc)
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Acoustic Technology Inc.
Anything Audio
Aphex Systems, Ltd.
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Audisar
Auditronics
BGW Systems, Inc.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Benchmark Media Systems Inc
Best Audio
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Audio Corp
Broadcast Devices, Inc.
Broadcast Electronics
Broadcast Equipment Sales
Broadcast Services/EME
Broadcasters General Store
Bryston/Bryston Vermont Ltd.
Control Technology Inc.
Crouse-Kimzey Company
Datatek Corp
Di-Tech Inc.
Dynair Electronics
ESE
Electronic Industries, Inc.
Excalibur Electronics
FM Systems Inc.
Full Compass Systems, Ltd.
Funke & Associates
Fusion Electronics, Inc.
Gaines Audio
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Grass Valley Group Inc
Guarantee Radio Supply Corporation
Hall Electronics
Harris Allied
Hedco
Henry Engineering
Holzberg Inc.

Hy James, Inc.
J.N.S. Electronics, Inc.
Jim Walters Co.
LPB Inc
Landy Associates Inc
Lasalle Music and Pro Audio
Leitch Incorporated
Logitek Electronic Systems Inc.
McCurdy Radio Industries
Milam Audio Co.
Modulation Sciences, Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
OPAMP Inc.
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Portland Instruments/ROH
Posthorn Recordings
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RTS Systems
Radio Design Labs
Radio Resources & Services
Radio Systems
Ram Broadcast Systems
Ramko Research
RANE Corporation
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
RRADCO Group
Russco Electronics Mfg. Inc.
Sequoia Electronics
Sescom Inc.
Shure Brothers Inc
Sontec Electronics
Spectra Sonics
Stram Electronics Corp
Suministros Gonzalez
TOA Electronics Inc
Tobias & Company Ltd
UAR Professional Systems
Versatech Industries, Inc.
Videoquip Research Limited
Ward-Beck Systems Ltd.
West Starr International
Wheatstone Corporation
Wide Range Electronics Corporation

Antennas, Anti-Icing devices
Broadcast Services/EME
Continental Electronics
Crouse-Kimzey Company
Dielectric Communications
Electronics Research, Inc.
Environmental Technology Inc
GBS-Giesler Broadcasting Supply
Harris-Allied
Jampro Antennas
Marcom
Northeast Broadcast Lab Inc
Professional Audio Supply
Radiation Systems
RF Specialties of Florida
Radio Resources & Services
Stellar Distributing Inc.

Antennas, FM
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cablewave Systems, Div of RFS
Cancomm
Capital Electronics Inc
Cirrus Technologies Inc
Comad Communications Limited
Comark Communications
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
D.N. Latus & Co., Inc.
Dielectric Communications
Electronic Industries, Inc.
Electronics Research, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Mart Haller Co.-Exporters
Harmon's Tower Service
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
IER (Industrial Equip. Reps.)
Jampro Antennas
John E. Hillman Associates
John Nix
LDL Communications
Lita Broadcasting Distributors
Litronix Corporation
Marcom
Micro Communications Inc
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Paramount Communications Systems
Parcom Inc.
Payne Engineering
PMA Marketing
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Richard Hirschmann of America
Roscom General
S.W.R. Inc.
Scala Electronic Corporation
Shively Labs
Stellar Distributing Inc.
Suministros Gonzalez
Tennaplex Systems, Ltd.
Tobias & Company Ltd
Transcom Corporation

Antennas, Translators and Boosters
Broadcast Services/EME
Comex Worldwide Corporation
Communications Technologies, Inc.
Continental Electronics
Crouse-Kimzey Company
Electronics Research, Inc.
Harris-Allied
Holzberg Inc.
Jampro Antennas
Marcom
RF Specialties of Florida
Radio Resources & Services
Roscom General
Shively Labs
Stellar Distributing Inc.
T.Z. Sawyer Technical Consultants

Antennas, Tuning & Multiplexing
Continental Electronics
Consulting Radio Engineer
Electronics Research, Inc.
Frederick L. Spaulding, P.E.
Hammett & Edison Inc
Harris-Allied
Holzberg Inc.
Jampro Antennas
LBA Technology Inc
Marcom
RF Specialties of Florida
S.W.R. Inc.
Stellar Distributing Inc.
T.Z. Sawyer Technical Consultants

Automation, Station Business
Audio Video of Orlando
Barrett Associates, Inc.
Columbine Systems Inc
Computer Concepts Corp. Intl Division
Custom Business Systems, Inc.
Enterprise Systems Group Inc
Gentner Communications Corporation
IBSS
IGM Communications
The Management
Master Software Systems
Prophet Systems
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
Radio Resources & Services
Register Data Systems
Roscom General
Schafer Digital
Summit Software Systems

Automation, Newsroom
Associated Press Broadcast Services
Barrett Associates, Inc.
Broadcasters General Store
Cirrus Technologies Inc
Columbine Systems Inc.
Comprompter Inc
Control Technology Inc
DHK Group
Gerstmann Software
IBSS
IGM Communications
Media Computing, Inc.
RF Specialties of California
RF Specialties of Missouri
Radio Resources & Services
Schafer Digital
Sine Systems, Inc.
Wireready Newswire Systems Inc

Automation, Radio Program
AVR Communications Limited East
AVR Communications Limited West
Absolute Broadcast Automation
Arrakis
Audio Broadcast Group, Inc.
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Chrontrol Corporation
Cirrus Technologies Inc
Computer Concepts Corp. Intl Division
Concept Productions
Conex Electro-Systems, Inc.
Control Technology Inc.
Crouse-Kimzey Company
DHK Group
Drake-Chenault
ESE
Enterprise Systems Group Inc
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Harris-Allied
Hy James, Inc.
IBSS
IGM Communications
Innovative Automation
Kingdom Technology
The Management
MacroMedia
McCurdy Radio Industries
Music Director Programming
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Parcom Inc.
Pristine Systems, Inc.
Prophet Systems
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Ram Broadcast Systems
Register Data Systems
Schafer World Communications
Sentry Systems
Sono-Mag Corporation
Systemation
TM Communications
Tennaplex Systems Ltd
Versatech Industries, Inc.

B

Batteries
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Services Corporation
BJM Electronics Ltd.
Capital Electronics Inc
D.N. Latus & Co., Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Fusion Electronics, Inc.
Guarantee Radio Supply Corporation
Holzberg Inc.
Landy Associates Inc
Lines Video Systems
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Periphex, Inc.
Peirce-Phelps, Inc
Photocomm (Solar Signage)
Ritz Audio-Visual Associates, Inc

Sonocraft Corp
Spectra Sonics

Brokers, Station Appraisers
Ray H. Rosenblum

Building, Prefabricated
Andrew Corporation
Broadcast Comm Systems Inc
Broadcast Services/EME
Fort Worth Tower Inc
Harris-Allied
LDL Communications
Payne Engineering
RF Specialties of Missouri
RF Specialties of Washington, Inc.
ROHN Inc
Skyline Antenna Management
Tower Structures, Inc

C

Cabinets, Cases and Racks
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Amco Engineering Co.
American Media Services
Anvil Cases
Anything Audio
Arrakis Systems
Atlas/Soundolier
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audio Video of Orlando
BJM Electronics Ltd.
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Bud Industries, Inc.
Calzone Case Co.
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Emcor Products/Crenlo Inc
The Express Group
Fiberbilt Cases Inc.
Fidelipac Corporation
Full Compass Systems, Ltd.
GKM Mfg. Corp.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
C.B. Hannay & Son, Inc.
Harris-Allied
Holzberg Inc.
Hy James, Inc.
J.N.S. Electronics, Inc.
Kintronic Laboratories Inc
LPB, Inc.
Landy Associates Inc
Lasalle Music and Pro Audio
Lines Video Systems
Martin Audio/Video Corp
Milam Audio Co.
Murphy Studio Furniture
Nalpak Video Sales Inc.
Netcom
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Ram Broadcast Systems
Research Technology International
Ritz Audio-Visual Associates, Inc
Roscom General
Ruslang Corp
Sonocraft Corp
Sono-Mag Corporation
Spectra Sonics
Star Case Manufacturing Co Inc
J Storeel Corp.
Studio Technology
Suministros Gonzalez
Thermodyne Intl Ltd
Thermodyne International Ltd.
Tobias & Company Ltd
Wide Range Electronics Corporation
Winsted Corp
Zero Stantron

Cart Machines, NAB
A/V Technology International, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Audi-Cord Corporation
Audio Broadcast Group, Inc.
Audio Dynamics, Inc.
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Auditronics
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fidelipac Corporation
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
International Tapetronics (ITC)
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Lindahl Sales Corp
Lita Broadcasting Distributors
Manger Eng-Beau Motors Div.
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Otari Corporation
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
PMA Marketing
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
Sequoia Electronics
Sono-Mag Corporation
Suministros Gonzalez
Tapecaster
Transcom Corporation

Cart Machines, Digital
A/V Technology International, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Arrakis Systems
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Auditronics
Broadcast Supply West
BARCO-EMT GmbH
Barrett Associates, Inc.
BASYS Automation Systems
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Denon
Electronic Industries, Inc.
Fidelipac Corporation
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hartmann Associates
Hy James, Inc.
International Tapetronics
International Music Company
Jim Walters Co.
John E. Hillman Associates
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Lita Broadcasting Distributors
The Management
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Otari Corporation
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
PEP, Inc
PMA Marketing
Professional Audio Supply
Pro Media
Prophet Systems
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
Schafer Digital
Sequoia Electronics
Sono-Mag Corporation
Suministros Gonzalez
TM Century, Inc.
360 Systems
Tobias & Company Ltd
Transcom Corporation

Cassette Recorders
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Accurate Sound Corporation
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fidelipac Corporation
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
Hy James, Inc.
International Tapetronics
Intl Electro-Magnetics
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Milam Audio Co.
Nakamichi America Corp

New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
PMA Marketing
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
Sonocraft Corp
Sono-Mag Corporation
Sound America Inc.
Studer
Tandberg Educational, Inc.
TASCAM
Tobias & Company Ltd
Transcom Corporation
Uher of America
Wide Range Electronics Corporation

Codecs
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
California Digital
Comrex
Control Technology Inc.
Corporate Computer Systems
Dolby Laboratories Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Hy James, Inc.
Intraplex
Jim Walters Co.
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Martin Audio/Video Corp
Milam Audio Co.
Moseley Assoc
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Sony Business & Professional Group
Studer
Suministros Gonzalez
Telectro Systems Corporation
Tobias & Company Ltd
UAR Professional Systems
Yamaha Music Corp. of America

Compact Disc (CD) Players
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Electronics Inc
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Denon America Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Gefen Systems
Giesler Broadcasting Supply, Inc.
Gotham Audio Corp
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
Jim Walters Co.
John E. Hillman Associates
LPB Inc
Landy Associates Inc
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
The Management
Martin Audio/Video Corp
Milam Audio Co.
Nakamichi America Corp
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
ReVox
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
RRADCO Group
Schafer Digital
Sonocraft Corp
Sono-Mag Corporation
Sony Business & Professional Group
Studer
Suministros Gonzalez
TM Communications
Tandberg Educational, Inc.
TASCAM
Tobias & Company Ltd
Transcom Corporation
UAR Professional Systems
Yamaha

Compact Disc (CD) Recorders
+4 Audio
Audio Video of Orlando
Broadcast Services/EME
Crouse-Kimzey Company
Denon America Inc
GBS-Giesler Broadcasting Supply
Gotham Audio Corp
Harris-Allied
Holzberg Inc.
John E. Hillman Associates
Kenwood
Professional Audio Supply
Pyramid Audio Inc
Quintessence Audio
RF Specialties of Florida
Roscom General
RRADCO Group
Schafer Digital
Studer
Yamaha

Components, Transistors
Audiotechniques
BJM Electronics Ltd.
Barrett Associates, Inc.
Capital Electronics Inc
D.N. Latus & Co., Inc.
Electronic Industries, Inc.
Fusion Electronics, Inc.
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Martin Audio/Video Corp
Parcom Inc.
Richardson Electronics/RF Gain
RF Specialties of Missouri
Richardson Electronics
Riggins Electronic Sales
Suministros Gonzalez
Tandberg Educational, Inc.
THAT Corporation
Thor Electronics Corp.
Wide Range Electronics Corporation

Components, Capacitors
American Media Services
BJM Electronics Ltd.
Barrett Associates, Inc.
Capital Electronics Inc
Commercial Radio Company
D.N. Latus & Co., Inc.
Electronic Industries, Inc.
Fusion Electronics, Inc.
Hall Electronics
IER (Industrial Equip. Reps.)
ITT Jennings
LSI Jennings
Lita Broadcasting Distributors
Martin Audio/Video Corp
Parcom Inc.
Richardson Electronics/RF Gain
RF Specialties of Missouri
Richardson Electronics
Riggins Electronic Sales
Suministros Gonzalez
Surcom Associates, Inc.
Tandberg Educational, Inc.
Wide Range Electronics Corporation

Components, Resistors
Altronic Research
BJM Electronics Ltd.
Barrett Associates, Inc.
Capital Electronics Inc
Commercial Radio Company
D.N. Latus & Co., Inc.
Electronic Industries, Inc.
Guarantee Radio Supply Corporation
Lita Broadcasting Distributors
Martin Audio/Video Corp
Parcom Inc.
Power Film Systems, Inc.
RF Specialties of Missouri
Riggins Electronic Sales
Shallco
Suministros Gonzalez
Tandberg Educational, Inc.
Tech Laboratories, Inc.
Wide Range Electronics Corporation

Computer Hardware
AVR Communications Limited East
AVR Communications Limited West
Alpha Products
BJM Electronics Ltd.
CBSI (Custom Business Systems)
Columbine Systems Inc.
Computer Concepts Corporation
Concept Productions
Custom Business Systems, Inc.
DigiDesign Inc
Enterprise Systems Group Inc
Gefen Systems
Gentner Communications Corporation
Guarantee Radio Supply Corporation
Lasalle Music and Pro Audio
The Management
Media Computing, Inc.
Media Touch Systems
Nordic Software, Inc.
Parcom Inc.
Parsons Audio
Quintessence Audio
Register Data Systems
Schafer Digital
Sonocraft Corp
TM Communications
Tandberg Educational, Inc.
Tennaplex Systems Ltd
Time & Temperature Company of S.D.
Turtle Beach Systems

Computer Software and Peripherals
Alpha Products
BJM Electronics Ltd
CBSI (Custom Business Systems)
Cirrus Technologies Inc
Columbine Systems Inc.
Communications Data Services
Computer Concepts Corporation
Concept Productions
Custom Business Systems, Inc.
Datel Corporation
DigiDesign Inc
Doug Vernier Broadcast Consulting
Enterprise Systems Group Inc
Gefen Systems
Gentner Communications Corp.
IGM Communications
Jensen Transformers Inc.

Lasalle Music and Pro Audio
Litronix Corporation
The Management
Master Software Systems
Media Computing, Inc.
Media Touch Systems
Nordic Software, Inc.
Parcom Inc.
Parsons Audio
Plastic Reel Corp. of America
Pristine Systems, Inc.
Quintessence Audio
Radio Computing Services, Inc.
Radiosoft
Ramko Research
Register Data Systems
Schafer Digital
Star Case Manufacturing Co Inc
TM Communications
Tandberg Educational, Inc.
Tennaplex Systems Ltd
Text Technologies, Inc.
Time & Temperature Company of S.D.
Turtle Beach Systems
Wireready Newswire Systems Inc

Consoles, On-Air
AEQ
A/V Technology International, Inc.
ATI (Audio Technologies Inc)
Allen & Heath
Amco Engineering Co.
AMEK/TAC U.S. Operations
Anything Audio
Arrakis Systems
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Auditronics
Autogram Corp
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Audio Corp
Broadcast Automation Inc
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Broadcast Supply West (BSW)
Cirrus Technologies Inc
Continental Electronics
Comrex
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Hallikainen & Friends, Inc.
Harris-Allied
Harrison by GLW
Holzberg Inc.
Howe Technologies Corporation
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
LPB, Inc.
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Lines Video Systems
Logitek Electronic Systems Inc.
The Management
Martin Audio/Video Corp
McCurdy Radio Industries
Milam Audio Co.
Neotek Corporation
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Douglas Ordon & Company, Inc.
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Penny & Giles Inc.
Peirce-Phelps, Inc
PMA Marketing
Pro Media
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Ram Broadcast Systems
Ramko Research
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
RRADCO Group
Russco Electronics Mfg. Inc.
Schafer World Communications
Sequoia Electronics
Sony Business & Professional Group
Soundcraft
Studer
Suministros Gonzalez
Telo Technology
Tobias & Company Ltd
Transcom Corporation
UAR Professional Systems
Ward-Beck Systems Ltd.
Wheatstone Corporation
Yamaha Music Corp. of America

Consoles, Production
+4 Audio
A/V Technology International, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Dan Alexander Audio
Allen & Heath
Allen and Heath
Amco Engineering Co.
AMEK/TAC U.S. Operations
Anything Audio
Arrakis Systems
Audio Broadcast Group, Inc.
Audiologic
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Auditronics
Autogram Corp
Broadcast Supply West
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Audio Corp
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
DDA
Electronic Industries, Inc.
Full Compass Systems, Ltd.
GML, Inc.
Giesler Broadcasting Supply, Inc.
Grass Valley Group Inc
Group One Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Harrison by GLW
Henry Engineering
Holzberg Inc.
Howe Technologies Corporation
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Lines Video Systems
Logitek Electronic Systems Inc.
Mackie
The Management
Martin Audio/Video Corp
McCurdy Radio Industries
Milam Audio Co.
Neotek Corporation
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Douglas Ordon & Company, Inc.
Otari Corporation
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Penny & Giles Inc.
Peirce-Phelps, Inc
PMA Marketing
Pro Media
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Ram Broadcast Systems
Ramko Research
Research Associates, Inc.
ReVox
Riggins Electronic Sales
Roscom General
RRADCO Group
Russco Electronics Mfg. Inc.
Schafer World Communications
Schoeps/Posthorn Recordings
SECK
Sequoia Electronics
Sony Business & Professional Group
Soundcraft
Spectra Sonics
Steve Vanni Assoc Inc.
Studer
Suministros Gonzalez
Telo Technology
Tobias & Company Ltd
Transcom Corporation
UAR Professional Systems
Ward-Beck Systems Ltd.
Wheatstone Corporation
Wide Range Electronics Corporation
Yamaha Music Corp. of America

Consoles, Remote
+4 Audio
AVR Communications Limited East
AVR Communications Limited West
Dan Alexander Audio
Allen & Heath
AMEK/TAC U.S. Operations
Arrakis Systems
Audio Broadcast Group, Inc.
Audiologic
AudioLine, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Audio Corp
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Comrex Corporation
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
DDA
Dynacord
Electronic Industries, Inc.
Excalibur Electronics
Full Compass Systems, Ltd.
Furman Sound, Inc.
Giesler Broadcasting Supply, Inc.
Grass Valley Group Inc
Guarantee Radio Supply Corporation
Hall Electronics
Hallikainen & Friends, Inc.
Harris-Allied
Harrison by GLW
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
Lasalle Music and Pro Audio
Lines Video Systems
Logitek Electronic Systems Inc.
Mackie
The Management
Martin Audio/Video Corp
Milam Audio Co.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Douglas Ordon & Company, Inc.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Posthorn Recordings
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.

Radio Resources & Services
Ram Broadcast Systems
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
RP Communications
Russco Electronics Mfg. Inc.
Schafer World Communications
Schoeps/Posthorn Recordings
SECK
Sequoia Electronics
Soundcraft
Spectra Sonics
Studer
Studio Technologies
Suministros Gonzalez
Telfax Communications
Tobias & Company Ltd
Tri-Tech, Inc.
UAR Professional Systems
Ward-Beck Systems Ltd.
Whirlwind
Wide Range Electronics Corporation
Yamaha Music Corp. of America
Zercom Corporation

Consulting, Engineering and Design Services
+4 Audio
ASC - Tube Traps
AVC Systems
Acoustic Technology Inc.
Acoustilog, Inc.
Alactronics
Alpine Marketing Communications Ltd.
American Digital Radio
Anything Audio
Audio Concepts and Engineering Services
Audio Dynamics, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audisar
Barrett Associates, Inc.
Bill Elliott Bdct. Consultants
Bdct. Design & Construction
Broadcast Equipment Sales & Engineering
Broadcast Services of Colorado
Broadcast Services/EME
Broadcast Systems Associates
Broadcasting and Electronic Svrs Lab
CSI Telecommunications
CTI Installations, Inc.
Carl T. Jones Corporation
Carolina Global Maps, Inc.
Central Tower, Inc.
Circuit Doctors Inc
Cliff Gill Enterprises, Inc
Cohen, Dippell and Everist, P.C.
Comex Worldwide Corporation
Commercial Radio Company
Communications Data Services
Communications Technologies, Inc
Communications General Corp.
Control Technology Inc
Consulting Radio Engineer
D.N. Latus & Co., Inc.
Dataworld
Datel Corporation
Digital Recorders
Diversified Communications Systems
Doug Vernier Broadcast Consulting
duTreil, Lundin & Rackley, Inc.
E Harold Munn, Jr & Associates
Electronics Research, Inc.
The Express Group
First Atlantic Group, Inc.
Frederick L. Spaulding, P.E.
Full Compass Systems, Ltd.
GKM Mfg. Corp.
Ronald J. Grandmaison, P.E. Consultant
Hammett & Edison Inc
Harris-Allied
Hatfield & Dawson Consult Engr
Holzberg Inc.
Hy James, Inc.
IBSS
IDB Communications Group, Inc
Innovative Automation
Intraplex, Inc.
John Furr and Associates
Jules Cohen & Associates P.C.
Keating Technical Services
Kenneth R Meades
Kintronic Laboratories Inc
LBA Technology Inc
Lasalle Music and Pro Audio
Lawrence Behr Associates Inc
Lawrence L. Morton Associates
Lines Video Systems
Litronix Corporation
Magrill Engineering
Marcom
McClanathan & Associates
Micro Communications Inc
MidAmerica Electronics Service, Inc.
Milam Audio Co.
Moffet, Larson & Johnson, Inc.
Mullaney Engineering, Inc.
Multiphase Consulting
National Supervisory Network
Netcom
Normex Electronic Co. Ltd.
Northeast Broadcast Lab, Inc.
Nott Ltd.
Fred A. Nudd Corporation
Rick Nudd, Ltd.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Owl Engineering, Inc.
Pacific Recorders & Engineering Corp.
Parsons Audio
Paul Dean Ford, P.E.
Payne Engineering
Peirce-Phelps, Inc
PMA Marketing
Quintessence Audio
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RPG Diffusor Systems Inc
Radio Systems Engineering
Radiotechniques Engineering Corp
Raines Electromagnetics
Research Associates, Inc.
Ray H. Rosenblum
RP Communications
RRADCO Group
SCA Data Systems Inc.
Sailors Audio
SG Communications
Silliman and Silliman
Sine Systems, Inc.
W Lee Simmons & Associates Inc
Skyline Antenna Management
Spectra Sonics
Spencer Broadcast
Steven L DeLay Co
Steve Vanni Assoc Inc.
Stram Electronics Corp
Studio Technology
T.Z. Sawyer Technical Consultants
Target Tuning, Inc.
Teletech Inc
Tennaplex Systems Ltd
Transtector Systems Inc.
UAR Professional Systems
U.S. Tower Services
Walter Wulff & Associates
Walters-Storyk Design Group
Warren Electronic Systems
Wide Range Electronics Corporation

Contract Engineering Services
AVC Systems
Audio Concepts and Engineering Services
Bill Elliott Bdct. Consultants
Broadcast Automation Inc
Bdct. Design & Construction
Broadcast Equipment Sales & Engineering
Broadcasting and Electronic Srvs Lab
Circuit Doctors Inc
Electronic Research
Full Compass Systems, Ltd.
Funke & Associates
Holzberg Inc.
Innovative Automation
John Nix
Jules Cohen & Associates P.C.
Keating Technical Services
Lasalle Music and Pro Audio
Lines Video Systems
Magrill Engineering
MidAmerica Electronics Service, Inc.
Multiphase Consulting
National Supervisory Network
Netcom
Old Dominion Broadcast Eng. Serv.
Parsons Audio
Payne Engineering
PMA Marketing
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
Radio Systems Engineering
Research Associates, Inc.
RRADCO Group
SG Communications
Skyline Antenna Management
Steven L DeLay Co
Stram Electronics Corp
Target Tuning, Inc.
Tech Laboratories Inc
Teletech Inc
U.S. Tower Services
Versatech Industries, Inc.
Walter Wulff & Associates
Warren Electronic Systems

D

DAB
American Digital Radio
LinCom
USA Digital Radio

Digital Audio Loggers
Eventide Inc.
Radio Computing Service, Inc.

Digital Audio Tape (DAT) Machines
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Equipment Sales
Broadcast Services/EME
Broadcasters General Store
Concept Productions
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fostex Corp. of America
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Gotham Audio Corp
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
International Music Company
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
The Management
Martin Audio/Video Corp
Milam Audio Co.
The Music Director Programming
Nakamichi America Corp
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
Roscom General
RRADCO Group
Schafer Digital
Sono-Mag Corporation
Sony Business & Professional Group
Suministros Gonzalez
TASCAM
Tobias & Company Ltd
UAR Professional Systems

Digital Audio Workstations
+4 Audio
AKAI
AKG Acoustics
Arrakis
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
BSS, A Div. of AKG Acoustics
Alpha Audio
Anything Audio

AudioLine, Inc.
Audio Video of Orlando
Broadcast Supply West (BSW)
BASYS Automation Systems
Bradley Broadcast Sales
Broadcast Electronics Inc
Broadcast Services/EME
Broadcasters General Store
Cirrus Technologies Inc
Computer Concepts Corporation
Computer Concepts Corp. Intl Division
Control Technology Inc.
Crouse-Kimzey Company
DigiDesign Inc
Full Compass Systems, Ltd.
Gentner Communications Corporation
Harris-Allied
Hybrid Arts
Hy James, Inc.
IBSS
ICB Audio
Intraplex, Inc.
ITC
Kingdom Technology
Lasalle Music and Pro Audio
Lexicon Inc.
The Management
Martin Audio/Video Corp
Milam Audio Co.
New England Digital
New World Music & Sound
Oakwood Audio Labs Ltd.
Orban associates, Div of AKG
Douglas Ordon & Company, Inc.
Otari Corporation
Parsons Audio
Pristine Systems, Inc.
Pro Media
Prophet Systems
Pyramid Audio, Inc.
RF Specialties of Missouri
Register Data Systems
Research Associates Inc
Studer
Symetrix Inc.
TM Century, Inc.
TM Communications
Turtle Beach Systems
UAR Professional Systems
Waveframe Corporation

Digital Hard Disk Recorders/Reproducers
+4 Audio
AKAI
Anything Audio
Arrakis
Audio Video of Orlando
Broadcast Supply West
BARCO-EMT GmbH
Bradley Broadcast Sales
Broadcast Electronics Inc
Broadcast Services/EME
Cirrus Technologies Inc
Computer Concepts Corp. Intl Division
Crouse-Kimzey Company
Digital Broadcast Systems Inc
Gentner Communications Corporation
Harris-Allied
IGM Communications
MacroMedia
The Management
Media Touch Systems
Pyramid Audio Inc
Quintessence Audio
Register Data Systems
Roscom General
Schafer World Communications
Studer
Waveframe Corporation

Distributor, International
A/V Technology International, Inc.
Acoustic Technology Inc.
American Loop Systems
American Media Services
Audio Services Corporation
BEE Sound, Inc.
Barrett Associates, Inc.
Bradley Broadcast Sales
Broadcasters General Store
Broadcast Supply West (BSW)
Burlington Audio/Video Tapes
Cirrus Technologies Inc
Comex Worldwide Corporation
Commercial Radio Company
Control Technology Inc.
Electrex Company
Enterprise Systems Group Inc
Full Compass Systems, Ltd.
Guarantee Radio Supply Corporation
Harris-Allied
IBSS
IER (Industrial Equip. Reps.)
John E. Hillman Associates
LBA Technology Inc
Lake Systems
Lita Broadcasting Distributors
Marcom
Professional Audio Supply
Peirce-Phelps, Inc
Pomar Electronics
Pyramid Audio Inc
Raks Corporation of America, Inc.
Roscom General
Schafer International
Sequoia Electronics
Suministros Gonzalez
Thor Electronics Corp.
Tobias & Company Ltd
VIF International
Warren Electronic Systems

Distributor, National
A/V Technology International, Inc.
AVR Communications Limited East
AVR Communications Limited West
American Broadcast Financial
American Loop Systems
Audio Broadcast Group, Inc.
Audiotechniques
Audio Video of Orlando
BJM Electronics Ltd.
Boynton Studio, Inc.
Bradley Broadcast Sales
Broadcast Cartridge Service Inc.
Broadcast Services/EME
Broadcast Supply West (BSW)
Burlington Audio/Video Tapes
Cancomm
Cartridge Express
Cirrus Technologies Inc
Clark Wire & Cable
Commercial Radio Company
Control Technology Inc.
Crouse-Kimzey Company
Crouse-Kimsey of Annapolis
Electrex Company
Focal Press Broadcasting Pubs.
Full Compass Systems, Ltd.
Funke & Associates
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
Lake Systems
Marcom
Mark IV Audio
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Penny & Giles Inc.
Peirce-Phelps, Inc
Posthorn Recordings
Pyramid Audio Inc
Richardson Electronics/RF Gain
RF Specialties of Missouri
Radio Resources & Services
S C M S Inc.
Schoeps/Posthorn Recordings
Sequoia Electronics
Skyline Antenna Management
Sonocraft Corp
Spencer Broadcast
Tandberg Educational, Inc.
Tapex Corp
Thor Electronics Corp.
Warren Electronic Systems
Wide Range Electronics Corporation

Distributor, Regional
+4 Audio
AVC Systems
American Loop Systems
Audiomedia
Audio Video of Orlando
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Burlington Audio/Video Tapes
Cancomm
Capital Electronics Inc
Clements Company
Connector Distribution
Crouse-Kimsey of Annapolis
Electrex Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Jim Walters Co.
Lake Systems
Marcom
Martin Audio/Video Corp
Northeast Broadcast Lab, Inc.
Ocean Audio Inc.
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Posthorn Recordings
Professional Audio Marketing
Pyramid Audio Inc
RF Specialties of California
RF Specialties of Florida
RF Specialties of Texas
RF Specialties of Washington, Inc.
Riggins Electronic Sales
Roscom General
Schoeps/Posthorn Recordings
Sequoia Electronics
Tobias & Company Ltd
UAR Professional Systems

Dummy Loads
AVR Communications Limited East
AVR Communications Limited West
Altronic Research
Audio Broadcast Group, Inc.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Bird Electronics Corporation
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Coaxial Dynamics Inc
Commercial Radio Company
Continental Electronics
Control Technology Inc
Crouse-Kimzey Company
Dielectric Communications
Electro Impulse Laboratory, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
Kintronic Laboratories Inc
Marcom
Narda Microwave Corp
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RF Systems
Radio Resources & Services
Roscom General
Suministros Gonzalez
Tech Laboratories Inc
Tennaplex Systems Ltd
Tobias & Company Ltd
Trompeter Electronics

E

Encoders/Decoders, Tone and EBS Equipment
AVR Communications Limited East
AVR Communications Limited West
ASACA/SHIBASOKU CORP. of AMERICA
Audio Broadcast Group, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Bext Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Control Technology Inc.
Crouse-Kimzey Company
dbx Professional Products
Di-Tech Inc.
Electronic Industries, Inc.
Emergency Alert Receiver Inc
Giesler Broadcasting Supply, Inc.
Gorman Redlich Mfg. Co.
Hall Electronics
Harris-Allied
Hartmann Associates
Hedco
Holzberg Inc.
Hy James, Inc.
Intraplex, Inc.
J-Squared Technical Serivce
Landy Associates Inc
Marcom
Martin Audio/Video Corp
Monroe Electronics, Inc.

Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Riggins Electronic Sales
Roscom General
TFT Inc.
Tobias & Company Ltd
Zercom Corporation

Exciters, AM Stereo
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiologic
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Services/EME
Broadcasters General Store
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
dbx Professional Products
Delta Electronics Inc.
Electronic Industries, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
Jim Walters Co.
Marcom
Martin Audio/Video Corp
Micro Controls, Inc.
MidAmerica Electronics Service, Inc.
Motorola Inc./AM Stereo
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Pomar Electronics
Pyramid Audio Inc
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Tobias & Company Ltd
Transcom Corporation

Exciters, FM
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiologic
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Best Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
CCA Electronics
Cancomm
Cirrus Technologies Inc
Comad Communications Limited
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
dbx Professional Products
Elcom Bauer
Electronic Industries
Energy-Onix Broadcast Equipment Co.
F M Systems Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
Inovonics Inc
J-Squared Technical Serivce
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Litronix Corporation
Marcom
Martin Audio/Video Corp
McMartin Incorporated
Micro Controls, Inc.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pomar Electronics
Pyramid Audio Inc
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Roscom General
RRADCO Group
Suministros Gonzalez
Television Technology Corp.
Tepco Corporation
Tobias & Company Ltd
Transcom Corporation

F

Fiber-Optic Products
ADC Telecommunications, Inc.
Artel Communications Corp
Audio Video of Orlando
Barrett Associates, Inc.
Broadcast Services/EME
Broadcasters General Store
Cooper Industries/Belden Division
Dynair Electronics
Electronic Systems Laboratories, Inc.
Gentner Communications Corporation
Grass Valley Group Inc
IDB Communications Group, Inc
Intraplex, Inc.
Martin Audio/Video Corp
Parcom Inc.
Parsons Audio
Pittsburgh Int'l Teleport
Rockwell International
Roscom General
Selco Products
Sony Business & Professional Group
T-Tech

H

Headphones, Headsets
+4 Audio
AKG Acoustics
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
BSS, A Div. of AKG Acoustics
American Media Services
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
Audio-Technica U.S., Inc.
AudioLine, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Beyer Dynamic Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fostex Corp. of America
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
Jim Walters Co.
John E. Hillman Associates
LPB Inc
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Martin Audio/Video Corp
Milam Audio Co.
Nady Systems
Nakamichi America Corp
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Orban Associates, Div of AKG
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
R-Columbia Productions
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RTS Systems
Radio Resources & Services
Research Associates, Inc.
ReVox
Riggins Electronic Sales
Roscom General
RRADCO Group
Sennheiser Electronic Corporation
Sonocraft Corp
Sony Business & Professional Group
Sound America Inc.
Stanton Magnetics Inc.
Suministros Gonzalez
Systems Wireless Ltd.
TOA Electronics Inc
Tandberg Educational, Inc.
Telex Communications Inc
TV Equipment Assoc Inc
UAR Professional Systems
Yamaha Music Corp. of America

Heads and Refurbishing Services
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Amp Services
R.B. Annis Co Inc.
Barrett Associates, Inc.
Broadcast Services/EME
Crouse-Kimzey Company
Electronic Industries, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Intl Electro-Magnetics
JRF Magnetic Sciences
JRF Magnetic Sciences Inc
Manger Eng-Beau Motors Div.
Milam Audio Co.
Nortronics Company, Inc.
Parcom Inc.
Parsons Audio
Research Associates Inc
Riggins Electronic Sales
Saki Magnetics Inc.
Sprague Magnetics
Tandberg Educational, Inc.
Tapecaster
VIF International

Traffic
Columbine Systems Inc.
Computer Concepts Corporation
Custom Business Systems, Inc.
Master Software Systems
Summit Software Systems Inc

I

Interactive Systems
TV Answer

Intercoms
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Aiphone Intercom Systems
Atlas/Soundolier
Audio Services Corporation
Auditronics
Audio Video of Orlando
Grant Becker Enterprises
Best Audio
Beyer Dynamic Inc.
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Services/EME
Broadcasters General Store

Clear-Com Systems
Crouse-Kimzey Company
D.N. Latus & Co., Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
J.N.S. Electronics Inc
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lines Video Systems
McMartin Incorporated
New World Music & Sound
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Portland Instruments/ROH
Pro Media
Pyramid Audio, Inc.
R-Columbia Productions
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RTS Systems
Ram Broadcast Systems
Sailors Audio
Sonocraft Corp
Studio Technologies
Swintek Enterprises, Inc.
Systems Wireless Ltd.
TOA Electronics Inc
Telectro Systems Corporation
Telex Communications Inc
Vega, Wireless
Ward-Beck Systems Ltd.

L

Lightning Protection and Power Conditioning
AVR Communications Limited East
AVR Communications Limited West
Barrett Associates, Inc.
Grant Becker Enterprises
Best Power Technology, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Broadcasting and Electronic Svrs Lab
Cancomm
Capital Electronics Inc
Columbine Systems Inc.
Comad Communications Limited
Commercial Radio Company
Cortana Corporation
Current Technology, Inc.
Eagle Hill Electronics Inc
Electronic Industries, Inc.
Energy Control Systems
Full Compass Systems, Ltd.
Furman Sound, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
John E. Hillman Associates
John Nix
Kintronic Laboratories Inc
Lightning Eliminators
Lita Broadcasting Distributors
Litronix Corporation
MCG Electronics Inc.
Marcom
Northeast Broadcast Lab, Inc.
Professional Audio Supply
Paramount Communications Systems
Parcom Inc.
Peter W. Dahl Co.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Roscom General
Suministros Gonzalez
Tenco Tower
Transtector Systems Inc.

M

Machine Synchronizers for ATRs
+4 Audio
AVC Systems
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Bradley Broadcast Sales
Broadcast Services/EME
Chrontrol Corporation
Control Technology Inc.
Harris-Allied
Hy James, Inc.
Jim Walters Co.
Lasalle Music and Pro Audio
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Douglas Ordon & Company, Inc.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of Missouri
UAR Professional Systems

Microphones and accessories
+4 Audio
AKG Acoustics
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Audio Video of Orlando
BSS, A Div. of AKG Acoustics
Dan Alexander Audio
American Media Services
Anything Audio
Atlas/Soundolier
Audio Broadcast Group, Inc.
Audio Services Corporation
Audio-Technica U.S., Inc.
AudioLine, Inc.
Audiomedia
Audiotechniques
Audix Corp
BJM Electronics Ltd.
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Best Audio
Beyer Dynamic Inc.
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Bruel & Kjaer Instruments, Inc.
Capital Electronics Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electro-Voice Inc
Electronic Industries, Inc.
Fostex Corp. of America
Full Compass Systems, Ltd.
Fusion Electronics, Inc.
Giesler Broadcasting Supply, Inc.
Gotham Audio Corp
Group One Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Karl Heitz, Inc.
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Lines Video Systems
Martin Audio/Video Corp
Milam Audio Co.
Nady Systems
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Old Dominion Broadcast Eng. Serv.
Orban Associates, Div of AKG
Douglas Ordon & Company, Inc.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
PMA Marketing
Posthorn Recordings
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
R-Columbia Productions
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Design Labs
Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
Schoeps/Posthorn Recordings
Sennheiser Electronic Corporation
Shure Brothers Inc
Sonocraft Corp
Sontec Electronics
Sony Business & Professional Group
Sound America Inc.
Stram Electronics Corp
Studio Technologies
Suministros Gonzalez
Swintek Enterprises, Inc.
Systems Wireless Ltd.
TOA Electronics Inc
Tandberg Educational, Inc.
Tannoy-Tgi North America Inc
Telex Communications Inc
Tobias & Company Ltd
Trompeter Electronics
Vega, Wireless
Yamaha Music Corp. of America

Microwave Equipment
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audio Video of Orlando
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Comm Systems Inc
Broadcast Services/EME
Broadcasters General Store
Cablewave Systems, Div of RFS
Cancomm
Comex Worldwide Corporation
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Dolby Laboratories Inc.
Electronic Industries, Inc.
Environmental Technology, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
ITS Corporation
J.N.S. Electronics Inc
John E. Hillman Associates
Lines Video Systems
Marcom
Marti Electronics, Inc.
Micro Controls, Inc.
Narda Microwave Corp
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Parcom Inc.
Payne Engineering
PMA Marketing
Radiation Systems
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Richard Hirschmann of America
Rockwell International
RRADCO Group
Tepco Corp
TFT Inc.
Tobias & Company Ltd
Verda Corp
Will-Burt Company

MIDI Equipment
AKAI
ART, Applied Research & Tech
AVC Systems
Anything Audio
Aphex Systems, Ltd.
Audiologic
Audio Services Corporation
Audiotechniques
Audio Video of Orlando
Barrett Associates, Inc.
Bradley Broadcast Sales
Broadcast Services/EME

Broadcasters General Store
Full Compass Systems, Ltd.
ICB Audio
Lasalle Music and Pro Audio
The Management
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Professional Audio Supply
Parsons Audio
Peavey Electronics Corporation
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of Missouri
RANE Corporation
Sony Business & Professional Group
360 Systems
Turtle Beach Systems
UAR Professional Systems
Yamaha Music Corp. of America

Mobile Production Vans
Audio Broadcast Group, Inc.
Harris-Allied
IDB Communications Group, Inc
Landy Associates Inc
Lines Video Systems
Peirce-Phelps, Inc
Pyramid Audio, Inc.
RF Specialties of Missouri

Mobile Remote Broadcast Studios
Audio Video of Orlando
Broadcast Services/EME
California Digital
Harris-Allied
Lines Video Systems
Zercom Corporation

Monitors, AM
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Belar Electronics Laboratory, Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Commercial Radio Company
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Delta Electronics Inc.
Electronic Industries, Inc.
Funke & Associates
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
Hy James, Inc.
Inovonics, Inc
J.N.S. Electronics, Inc.
J-Squared Technical Serivce
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Marcom
Motorola Inc./AM Stereo
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Pro Media
Pyramid Audio Inc
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Roscom General
RRADCO Group
Suministros Gonzalez
TFT Inc.
Tobias & Company Ltd
Transcom Corporation

Monitors, FM
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Belar Electronics Laboratory, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Funke & Associates
Giesler Broadcasting Supply, Inc.
Gotham Audio Corp
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
Hy James, Inc.
Inovonics, Inc
J.N.S. Electronics, Inc.
J-Squared Technical Serivce
Jim Walters Co.
Landy Associates Inc
Marcom
McMartin Incorporated
Modulation Sciences, Inc.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pro Media
Pyramid Audio Inc
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Design Labs
Radio Resources & Services
Research Associates, Inc.
Roscom General
RRADCO Group
Studer
Suministros Gonzalez
TFT Inc.
Titus Technologies Lab
Tobias & Company Ltd
Transcom Corporation

Music and Sound Effects Libraries
+4 Audio
AVR Communications Limited East
AVR Communications Limited West
Airforce Broadcast Services Inc.
Anything Audio
Associated Production Music
AudioLine, Inc.
BP Consulting Group
Barrett Associates, Inc.
Broadcast Programming
Capitol Production Music
Classical Music Syndication
Control Technology Inc.
Creative Support Services
Drake-Chenault
Gefen Systems
Halland Broadcast Services Inc.
Hy James, Inc.
Jay Mitchell Assoc
The Music Director Programming
PMA Marketing
Promusic, Inc.
Pyramid Audio, Inc.
River City Sound Productions
Sopersound Music Library
Sound Ideas
Suministros Gonzalez
Summit Software Systems Inc
TM Communications
UAR Professional Systems
Valentino Production Music & Sound

N

NRSC Equipment
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audio Video of Orlando
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Circuit Research Labs
Cancomm
Continental Electronics
Control Technology Inc
Crouse-Kimzey Company
Delta Electronics Inc.
Electronic Industries, Inc.
Funke & Associates
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hnat Hindes
Holzberg Inc.
IBSS
Inovonics
Jim Walters Co.
Marcom
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Orban Associates, Div of AKG
Professional Audio Supply
Parcom Inc.
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Design Labs
Radio Resources & Services
Research Associates Inc
Sequoia Electronics
Suministros Gonzalez
TFT Inc.
Tobias & Company Ltd

Noise Reduction Equipment
+4 Audio
ART, Applied Research & Tech
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Acoustic Technology Inc.
Dan Alexander Audio
Anything Audio
Audio Broadcast Group, Inc.
Audio Dynamics, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Auditronics
Broadcast Supply West
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
dbx Professional Products
Dolby Laboratories Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Gotham Audio Corp
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Hy James, Inc.
Jim Walters Co.
Lasalle Music and Pro Audio
Marti Electronics, Inc.
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
OPAMP Inc.
Douglas Ordon & Co Inc
Professional Audio Supply
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Ram Broadcast Systems
Research Associates, Inc.
Roscom General
Sequoia Electronics
Studer
Suministros Gonzalez
Symetrix, Inc

Tectan Inc
THAT Corporation
UAR Professional Systems
Valley International

O

Optical Disk Technology
ASACA/SHIBASOKU CORP. of AMERICA

P

Patch Panels, Jacks, Plugs, Connectors
+4 Audio
ADC Telecommunications, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Acoustilog, Inc.
American Media Services
Anything Audio
Audio Accessories
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Auditronics
BJM Electronics Ltd.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Canare Cable Inc.
Commercial Radio Company
Connector Distribution
Connectronics Corporation
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
Dielectric Communications
Electronic Industries, Inc.
Fostex Corp. of America
Full Compass Systems, Ltd.
Furman Sound, Inc.
Fusion Electronics, Inc.
Gaines Audio
Gentner Electronics Corporation
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
Jim Walters Co.
Kings Electronics Co., Inc.
Kintronic Laboratories Inc
Landy Associates Inc
Lasalle Music and Pro Audio
Lines Video Systems
Martin Audio/Video Corp
McCurdy Radio Industries
Micro Communications, Inc.
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Penny & Giles Inc.
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Ram Broadcast Systems
Redco Audio Products
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
Shively Labs
Suministros Gonzalez
Switchcraft, Inc.
Tennaplex Systems Ltd
Trimm Inc.
Trompeter Electronics
UAR Professional Systems
Videoquip Research Limited
Wireworks Corp
Zercom Corporation

Phasors
AVR Communications Limited East
AVR Communications Limited West
Dan Alexander Audio
Audio Broadcast Group, Inc.
Barrett Associates, Inc.
Grant Becker Enterprises
Broadcast Equipment Sales & Engineering
Broadcasters General Store
Commercial Radio Company
Continental Electronics
Consulting Radio Engineer
Elcom Bauer
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
IER (Industrial Equip. Reps.)
Kintronic Laboratories Inc
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RF Systems
Roscom General
Suministros Gonzalez
T.Z. Sawyer Technical Consultants
Tobias & Company Ltd

Phono Cartridges
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
Audio-Technica U.S., Inc.
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Capital Electronics Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
Shure Brothers Inc
Sonocraft Corp
Stanton Magnetics Inc.
Suministros Gonzalez
UAR Professional Systems

Phono Turntables and Tone Arms
+4 Audio
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Henry Engineering
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
Russco Electronics Mfg. Inc.
Sequoia Electronics
Sonocraft Corp
Suministros Gonzalez
UAR Professional Systems

Power Supplies and Generators
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Anything Audio
Audio Services Corporation
Barrett Associates, Inc.
Best Power Technology, Inc.
Broadcasters General Store
Current Technology, Inc.
Deremer Radio
Full Compass Systems, Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
J.N.S. Electronics, Inc.
Jim Walters Co.
Kay Industries
Lasalle Music and Pro Audio
Leader Instruments Corporation
McMartin Incorporated
Norac Industrial Services Inc.
OPAMP Inc.
Professional Audio Supply
PhotoComm (Solar Signage)
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Washington, Inc.
RTS Systems
Radio Resources & Services
Spectra Sonics
Transtector Systems Inc.
Wide Range Electronics Corporation

Processing, Audio EQ and Limiting
+4 Audio
ART, Applied Research & Tech
ATI (Audio Technologies Inc)
AVC Systems

AVR Communications Limited East
AVR Communications Limited West
Acoustic Technology Inc.
Dan Alexander Audio
Altec Lansing Bdct/Prod. Pdcts
Anything Audio
Aphex Systems, Ltd.
Ashly Audio, Inc.
Audio Animation
Audio Broadcast Group, Inc.
Audio Concepts and Engineering Services
Audiologic
AudioLine, Inc.
Audiomedia
Audiotechniques
Audio Video of Orlando
Auditronics
Broadcast Supply West (BSW)
BSS
BEE Sound, Inc.
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Circuit Research Labs
California Digital
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Cutting Edge Technologies
D & R Electronics USA
DBX Professional Products
Delta Electronics Inc.
Dorrough Electronics
ESE
Electro-Voice Inc.
Electronic Industries, Inc.
Eventide Inc.
Full Compass Systems, Ltd.
Furman Sound, Inc.
GML, Inc.
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hnat Hindes
Holzberg Inc.
Hy James, Inc.
IBSS
Inovonics
JBL Professional
J.N.S. Electronics, Inc.
Jim Walters Co.
John E. Hillman Associates
Klark-Teknik
LPB Inc
Landy Associates Inc
Lasalle Music and Pro Audio
Leitch Incorporated
Lita Broadcasting Distributors
Logitek Electronic Systems Inc.
Martin Audio/Video Corp
Milam Audio Co.
Modulation Sciences, Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
OPAMP Inc.
Orban Associates, Div of AKG
Douglas Ordon & Co Inc
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
PMA Marketing
Posthorn Recordings
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Ram Broadcast Systems
RANE Corporation
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
Roscom General
RRADCO Group
Schoeps/Posthorn Recordings
Sequoia Electronics
Sescom Inc.
Somich Engineering
Sontec Electronics
Sony Business & Professional Group
Steve Vanni Assoc Inc.
Suministros Gonzalez
Symetrix Inc.
TOA Electronics Inc
Tobias & Company Ltd
UAR Professional Systems
Urei
Valley International
Ward-Beck Systems Ltd.
White Instruments, Div. CVANR
Yamaha Music Corp. of America

Processing, Studio Effects
+4 Audio
ART, Applied Research & Tech
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
BSS, A Div. of AKG Acoustics
Dan Alexander Audio
Anything Audio
Aphex Systems, Ltd.
Ashly Audio, Inc.
Audio Broadcast Group, Inc.
Audio Concepts and Engineering Services
Audiologic
Audio/Digital, Inc.
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
BEE Sound, Inc.
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Circuit Research Labs
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
dbx Professional Products
Digitech, div. of DOD Elect.
Dynacord
Electronic Industries, Inc.
Eventide Inc.
Full Compass Systems, Ltd.
Furman Sound, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hy James, Inc.
IER (Industrial Equip. Reps.)
Jim Walters Co.
John E. Hillman Associates
Klark-Teknik
Lasalle Music and Pro Audio
Lexicon Inc.
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Orban Associates, Div of AKG
Douglas Ordon & Company, Inc.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Roscom General
RRADCO Group
Sequoia Electronics
Spectra Sonics
Studio Technologies
Suministros Gonzalez
Titus Technologies Lab
Tobias & Company Ltd
UAR Professional Systems
Valley International
Videoquip Research Limited
Waveframe Corporation
White Instruments, Div. CVANR
Yamaha Music Corp. of America

Program Distributors and Services
Alpine Marketing Communications Ltd.
BP Consulting Group
Broadcast Programming
Classical Music Syndication
Concept Productions
Drake-Chenault
Harris-Allied
IDB Communications Group, Inc
Kenneth R. Meades
Jay Mitchell Assoc
The Music Director Programming
Zephyr Weather Information Service

Public Address (PA) Systems
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Loop Systems
Anything Audio
Ashly Audio, Inc.
Atlas/Soundolier
Audio Services Corporation
Audio Video of Orlando
Audisar
BEE Sound, Inc.
Grant Becker Enterprises
Best Audio
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Capital Electronics Inc
Control Technology Inc.
Digital Recorders
Electro-Voice Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Furman Sound, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Hy James, Inc.
JBL Professional
John E. Hillman Associates
Lasalle Music and Pro Audio
Lines Video Systems
McMartin Incorporated
Milam Audio Co.
New World Music & Sound
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of Missouri
RF Specialties of Texas
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
Sailors Audio
Sonocraft Corp
TOA Electronics Inc
Telectro Systems Corporation

R

RDS Equipment
Sage Alerting

RF Filters
AVR Communications Limited East
AVR Communications Limited West
Barrett Associates, Inc.
Grant Becker Enterprises
Bird Electronics Corporation
Broadcast Equipment Sales & Engineering
Cancomm
Coaxial Dynamics Inc
Comark Communications
Commercial Radio Company
Continental Electronics
Dielectric Communications
Electronic Industries, Inc.
Electronics Research, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Jampro Antennas
LDL Communications
Lasalle Music and Pro Audio
Marcom
Micro Communications Inc
Microwave Filter
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RF Systems
RF Technologies Corp.
Spectra Sonics
T.Z. Sawyer Technical Consultants
Tennaplex Systems Ltd
Tepco Corporation
Tobias & Company Ltd

Receivers, Radio
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Services Corporation
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bext Inc.
Bogen Communications, Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Control Technology Inc.
Crouse-Kimzey Company
Denon
Deremer Radio
Electronic Industries
Erko Technologies
Full Compass Systems, Ltd.
Gorman Redlich Mfg. Co.
Hall Electronics
Hamtronics, Inc.
Harris-Allied
Holzberg Inc.
J.N.S. Electronics, Inc.
Jim Walters Co.
Lasalle Music and Pro Audio
Lindahl Sales Corp
Marti Electronics, Inc.
McMartin Incorporated
Motorola Inc./AM Stereo
Nady Systems
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Pro Media
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Washington, Inc.
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
RRADCO Group
TFT Inc.
Target Tuning, Inc.

Receivers, Satellite
AVCOM of Virginia, Inc.
AVR Communications Limited East
AVR Communications Limited West
Antenna Technology Corporation
Audio Video of Orlando
Grant Becker Enterprises
Broadcast Services/EME
Broadcasting and Electronic Srvs Lab
California Digital
ComStream Corp
Control Technology Inc.
Erko Technologies
Hall Electronics
Harris-Allied
Holzberg Inc.
IDB Communications Group, Inc
Intraplex, Inc.
Marcom
McMartin Incorporated
Micro Phase Communications Inc
Parcom Inc.
RF Specialties of Pennsylvania, Inc.
Satellite Systems Corp
Tennaplex Systems Ltd
Wegener Communications, Inc.

Receivers, SCA
AVR Communications Limited East
AVR Communications Limited West
Antenna Technology Corporation
Applied Micro Technology, Inc.
Avocet Instruments
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Cancomm
Continental Electronics
Control Technology Inc.
Electronic Industries, Inc.
Emergency Alert Receiver Inc
Erko Technologies
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
J.N.S. Electronics Inc
Lita Broadcasting Distributors
Marti Electronics, Inc.
McMartin Incorporated
Micro Controls, Inc.
Modulation Sciences, Inc.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Roscom General
SCA Data Systems Inc.
SMC
Target Tuning, Inc.
Tennaplex Systems Ltd

Reel-to-Reel Recorders
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Accurate Sound Corporation
Dan Alexander Audio
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Automation, Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fostex Corp. of America
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Lindahl Sales Corp
Manger Eng-Beau Motors Div.
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Otari Corporation
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Redco Audio Products
Research Associates, Inc.
ReVox
Riggins Electronic Sales
Roscom General
RRADCO Group
Sailors Audio
Sequoia Electronics
Sono-Mag Corporation
Studer
Suministros Gonzalez
Tandberg Educational, Inc.
TASCAM
Telectro Systems Corporation
Tobias & Company Ltd
UAR Professional Systems
Uher of America
VIF International
Wide Range Electronics Corporation

Remote Control and Telemetry
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcast Software Ltd.
Broadcasters General Store
Burk Technology, Inc.
Cancomm
Chrontrol Corporation
Commercial Radio Company
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Delta Electronics Inc.
Electronic Industries, Inc.
Elenos, Inc
Full Compass Systems, Ltd.
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Hall Electronics
Hallikainen & Friends, Inc.
Harris-Allied
Holzberg Inc.
Hughey & Phillips Inc.
Hy James, Inc.
J-Squared Technical Serivce
John E. Hillman Associates
Marcom
Marti Electronics, Inc.
Micro Controls, Inc.
Monroe Electronics, Inc.
Moseley Associates
National Supervisory Network
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Photocomm (Solar Signage)
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
Sine Systems, Inc.
Sony Business & Professional Group
Suministros Gonzalez
TFT Inc.
Telo Technology
Telular, Inc.
Tobias & Company Ltd
Versatech Industries, Inc.
Videoquip Research Limited
Warren Electronic Systems

S

SCA Equipment
AVR Communications Limited East
AVR Communications Limited West
Applied Micro Technology, Inc.
Audio Broadcast Group, Inc.
Avocet Instruments
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burk Technology, Inc.
Cancomm
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Cutting Edge Technologies
Electronic Industries, Inc.
Erko Technologies
F M Systems Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ITS Corporation
J.N.S. Electronics Inc
J-Squared Technical Serivce
John E. Hillman Associates
Marti Electronics, Inc.
McMartin Incorporated
Micro Controls, Inc.
Modulation Sciences, Inc.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Orban Associates, Div of AKG
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.

Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
Roscom General
SCA Data Systems Inc.
SMC
Suministros Gonzalez
TFT Inc.
TOA Electronics Inc
Tennaplex Systems Ltd
Titus Technologies Lab
Tobias & Company Ltd

Satellite Equipment, Antennas
AVR Communications Limited East
AVR Communications Limited West
Andrew Corporation
Antenna Technology Corporation
Antennas for Communications, Inc.
Audio Video of Orlando
Broadcast Services/EME
Broadcasting and Electronic Srvs Lab
California Digital
Comex Worldwide Corporation
ComStream Corp
Comtech Antenna Systems, Inc.
Environmental Technology, Inc.
Harris-Allied
Holzberg Inc.
IDB Communications Group, Inc
John E. Hillman Associates
John Nix
Marcom
Microdyne Corporation
Old Dominion Broadcast Eng. Serv.
Pittsburgh Int'l Teleport
RF Specialties of Pennsylvania, Inc.
Satellite Systems Corp
Scientific Atlanta
Spacecom Systems
Tennaplex Systems Ltd
Warren Electronic Systems

Satellite Equipment, Electronics
AVC Systems
AVCOM of Virginia, Inc.
AVR Communications Limited East
AVR Communications Limited West
Antenna Technology Corporation
Audio Video of Orlando
Broadcast Supply West (BSW)
Broadcast Automation Inc
Broadcast Services/EME
Broadcasting and Electronic Svrs Lab
California Digital
Comex Worldwide Corporation
ComStream Corp
Dolby Laboratories Inc.
Erko Technologies
F M Systems Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Hallikainen & Friends, Inc.
Harris-Allied
Henry Engineering
Holzberg Inc.
IDB Communications Group, Inc
Intraplex, Inc.
John E. Hillman Associates
Kingdom Technology
Leitch Incorporated
MCL Inc.
Marcom
Microdyne Corporation
Narda Microwave Corp
Pittsburgh Int'l Teleport
PMA Marketing
RF Specialties of Pennsylvania, Inc.
Satellite Systems Corp
Schafer Digital
Scientific Atlanta
Spacecom Systems
Tectan Inc
Tennaplex Systems Ltd
Warren Electronic Systems
Wegener Communications, Inc.

Speakers and Enclosures
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Aiphone Intercom Systems
American Media Services
Anything Audio
Atlas/Soundolier
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
Audisar
Audix Corp
Auernheimer Labs and Co.
Auratone Corporation
BJM Electronics Ltd.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bogen Communications, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Dynacord
Electro-Voice Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Group One Ltd.
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
JBL Professional
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Lines Video Systems
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Douglas Ordon & Company, Inc.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Renkus-Heinz, Inc.
Research Associates, Inc.
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
Sailors Audio
Sonocraft Corp
Spectra Sonics
Studer
Suministros Gonzalez
TOA Electronics Inc
Tannoy-Tgi North America Inc
Telectro Systems Corporation
UREI
Wohler Technologies
Yamaha Music Corp. of America

STL Equipment
AVR Communications Limited East
AVR Communications Limited West
Artel Communications Corp
Audio Broadcast Group, Inc.
Audiomedia
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bext Inc.
Bradley Broadcast Sales
Broadcast Comm Systems Inc
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cancomm
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Corporate Computer Systems
Crouse-Kimzey Company
Dolby Laboratories Inc.
Electronic Industries, Inc.
F M Systems Inc.
Funke & Associates
Giesler Broadcasting Supply, Inc.
Graham-Patten Systems
Hall Electronics
Hamtronics, Inc.
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
Intraplex, Inc.
J.N.S. Electronics Inc
J-Squared Technical Serivce
Landy Associates Inc
Leaming Industries
Lita Broadcasting Distributors
Litronix Corporation
Marcom
Marti Electronics, Inc.
McMartin Incorporated
Micro Controls, Inc.
Moseley Associates
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Payne Engineering
PMA Marketing
Pomar Electronics
Pro Media
QEI Corporation
Radiation Systems
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RF Systems
Radio Resources & Services
Roscom General
Suministros Gonzalez
Systems Wireless Ltd.
TFT Inc.
Tectan Inc
Telular, Inc.
Tobias & Company Ltd
Transcom Corporation
T-Tech
Wegener Communications, Inc.

Studio Furniture
Acoustic Systems
Alactronics
Arrakis Systems
Audio Broadcast Group
Bradley Broadcast Sales
Broadcast Services/EME
Continental Electronics
Crouse-Kimzey Company
The Express Group
GBS-Giesler Broadcasting Supply
Harris-Allied
Holzberg Inc.
Landy Associates Inc
Murphy
Pacific Recorders and Engineering Corp.
Professional Audio Supply
Quintessence Audio
RF Specialties of Florida
Radio Resources & Services
Riggins Electronic Sales
Ruslang
Sailors Audio
Sequoia Electronics
Studio Technology
Winsted Corp
Wheatstone Corp

Switchers, Audio Routing
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
ASACA/SHIBASOKU CORP. of AMERICA
Audio Video of Orlando
BJM Electronics Ltd.
Broadcast Supply West (BSW)
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Best Audio
Bradley Broadcast Sales
Broadcast Devices Inc.
Broadcast Services/EME
Broadcasters General Store
Broadcasting and Electronic Srvs Lab
Chrontrol Corporation
Cirrus Technologies Inc
Computer Concepts Corporation
Conex Electro-Systems, Inc.
Control Technology Inc.
Crouse-Kimzey Company
Datatek Corp
DHK Group
Di-Tech Inc.
Dynair Electronics
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Gentner Electronics Corporation
Giesler Broadcasting Supply, Inc.
Grass Valley Group Inc
Hall Electronics
Harris-Allied
Harrison by GLW
Hedco
Holzberg Inc.
Hy James, Inc.
International Tapetronics
J.N.S. Electronics, Inc.
Jim Walters Co.

Landy Associates Inc
Logitek Electronic Systems Inc.
Martin Audio/Video Corp
McCurdy Radio Industries
Micro Controls, Inc.
Milam Audio Co.
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
OPAMP Inc.
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Pro-Bel
Pyramid Audio, Inc.
RE Instruments Corp
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Ram Broadcast Systems
Ramko Research
Research Associates, Inc.
Roscom General
Sierra Automated Systems
Sony Business & Professional Group
Studer
360 Systems
Titus Technologies Lab
Versatech Industries, Inc.
Videoquip Research Limited
West Starr International
Wheatstone Corporation
Wide Range Electronics Corporation
Yamaha Music Corp. of America

T

Tape, Cartridge
A/V Technology International, Inc.
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
Audiodyne Bdct Cartridge
AudioLine, Inc.
Audiomedia
Audiopak, Inc.
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Cartridge Service Inc.
Broadcast Cart Rewinding Service
Broadcast Electronics Inc
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burlington Audio/Video Tapes
Cartridge Express
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Fidelipac Corporation
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
International Tapetronics
J & I Audio/Video
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Marathon Products
Martin Audio/Video Corp
Milam Audio Co.
National Audio Co. Inc.
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
PMA Marketing
Polyline Corp - Polyquick Division
Pro Media
Pyramid Audio, Inc.
R & A Broadcast Services
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Research Associates, Inc.
Riggins Electronic Sales
RRADCO Group
Sonocraft Corp
Sony Business & Professional Group
Suministros Gonzalez
Tandberg Educational, Inc.
Tapex Corp
UAR Professional Systems
Western International

Tape, Cassette
AKAI
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Ampex Recording Media Corporation
Audio Broadcast Group, Inc.
Audio Services Corporation
Audiodyne Bdct Cartridge
AudioLine, Inc.
Audiopak, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Cartridge Service Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burlington Audio/Video Tapes
Continental Electronics
Crouse-Kimzey Company
Drake-Chenault
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
J & I Audio/Video
Jim Walters Co.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Martin Audio/Video Corp
Milam Audio Co.
Music Director Programming
Nakamichi America Corp
National Audio Co. Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Polyline Corp - Polyquick Division
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Raks Corporation of America, Inc.
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
RRADCO Group
Sonocraft Corp
Sony Business & Professional Group
Sound America Inc.
Suministros Gonzalez
UAR Professional Systems

Tape, DAT
A/V Technology International, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Ampex Recording Media Corporation
Anything Audio
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Cartridge Service Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burlington Audio/Video Tapes
Concept Productions
Crouse-Kimzey Company
Dic Digital
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
J & I Audio/Video
Jim Walters Co.
John E. Hillman Associates
Lasalle Music and Pro Audio
Martin Audio/Video Corp
Milam Audio Co.
The Music Director Programming
Nakamichi America Corp
National Audio Co. Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Professional Audio Supply
Panasonic/Prof Audio Systems (Ramsa)
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Polyline Corp - Polyquick Division
Posthorn Recordings
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Raks Corporation of America, Inc.
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
RRADCO Group
Sonocraft Corp
Sony Business & Professional Group
Suministros Gonzalez
UAR Professional Systems

Tape, Reel-to-Reel
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Ampex Recording Media Corporation
Audio Broadcast Group, Inc.
Audio Services Corporation
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Cartridge Service Inc.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burlington Audio/Video Tapes
Crouse-Kimzey Company
Drake-Chenault
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
ICB Audio
J & I Audio/Video
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Martin Audio/Video Corp
Milam Audio Co.
The Music Director Programming
National Audio Co. Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Polyline Corp - Polyquick Division
Posthorn Recordings

Pro Media
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates, Inc.
Riggins Electronic Sales
RRADCO Group
Sonocraft Corp
Sony Business & Professional Group
Suministros Gonzalez
Tek Media Supply Company
UAR Professional Systems
VIF International
Wide Range Electronics Corporation

Tape Cleaners, Erasers, and Evaluators
AVC Systems
Accurate Sound Corporation
American Media Services
Audio Video of Orlando
R.B. Annis Co Inc.
ASACA/SHIBASOKU CORP. of AMERICA
Audio Broadcast Group, Inc.
Audio Concepts and Engineering Services
Audiolab Electronics, Inc.
AudioLine, Inc.
Audiotechniques
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Burlington Audio/Video Tapes
Comad Communications Limited
Continental Electronics
Crouse-Kimzey Company
Electronic Industries, Inc.
Fidelipac Corporation
Full Compass Systems, Ltd.
Garner Industries
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hy James, Inc.
International Tapetronics
Landy Associates Inc
Lasalle Music and Pro Audio
Lauderdale Electronic Labs
Lipsner-Smith Company
Magnefax International, Inc.
Marathon Products
Martin Audio/Video Corp
Microtran Company
Milam Audio Co.
National Audio Co. Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Research Associates Inc
Research Technology International
Riggins Electronic Sales
Sonocraft Corp
Sequoia Electronics
Suministros Gonzalez
UAR Professional Systems
VIF International
Wide Range Electronics Corporation

Tape Duplicators
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Accurate Sound Corporation
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audio Video of Orlando
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales
Broadcast Services/EME
Control Technology Inc.
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Lindahl Sales Corp
Lita Broadcasting Distributors
Magnefax International, Inc.
Milam Audio Co.
The Music Director Programming
Nakamichi America Corp
National Audio Co. Inc.
New World Music & Sound
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Otari Corporation
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Raks Corporation of America, Inc.
Research Associates, Inc.
Ritz Audio-Visual Associates, Inc
Sonocraft Corp
Sony Business & Professional Group
Suministros Gonzalez
Telectro Systems Corporation
Telex Communications Inc
UAR Professional Systems
Valentino Production Music & Sound
Wide Range Electronics Corporation

Telephone Equipment, Hybrids
+4 Audio
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audio/Digital, Inc.
AudioLine, Inc.
Audiomedia
Audio Video of Orlando
BJM Electronics Ltd
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Circuit Development Co
Comrex Corporation
Control Technology Inc.
Crouse-Kimzey Company
D & R Electronics USA
ESE
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Graham-Patten Systems
Hall Electronics
Harris-Allied
Henry Engineering
Hy James, Inc.
IBSS
Intraplex, Inc.
Jim Walters Co.
John E. Hillman Associates
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Martin Audio/Video Corp
Microtran Company
Milam Audio Co.
Monroe Electronics, Inc.
Moseley Associates
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
Pyramid Audio, Inc.
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Sound America Inc.
Studer
Suministros Gonzalez
Symetrix Inc.
Telfax Communications
Telos Systems
Time & Temperature Company of S.D.
Tri-Tech, Inc.
Zercom Corporation

Telephone Equipment, Bandwidth Extenders
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
AudioLine, Inc.
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales
Broadcast Services/EME
Broadcasters General Store
Comrex Corporation
Corporate Computer Systems
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Gentner Communications Corporation
Giesler Broadcasting Supply, Inc.
Graham-Patten Systems
Hall Electronics
Harris-Allied
Hy James, Inc.
IBSS
Jim Walters Co.
John E. Hillman Associates
Lasalle Music and Pro Audio
Marcom
Moseley Associates
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Pro Media
Pyramid Audio, Inc.
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Suministros Gonzalez
Telfax Communications
Telular, Inc.
Titus Technologies Lab

Test Equipment, Distortion Analyzers
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Amber Electro Design Inc.
ASACA/SHIBASOKU CORP. of AMERICA
Audio Precision
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Boonton Electronics Corp
Bruel & Kjaer Instruments, Inc.
Commercial Radio Company
Continental Electronics
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Funke & Associates
Guarantee Radio Supply Corporation
Harris-Allied
Hartmann Associates
Holzberg Inc.
Hy James, Inc.
John E. Hillman Associates
Landy Associates Inc
Leader Instruments Corporation
Leitch Incorporated
Northeast Broadcast Lab, Inc.
Douglas Ordon & Company, Inc.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Posthorn Recordings
Potomac Instruments, Inc.
RE Instruments Corp
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Sound Technology
Suministros Gonzalez
TFT Inc.
Tektronix Inc

Test Equipment, Oscilloscopes
A/V Technology International, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
A. W. Sperry Instruments
ASACA/SHIBASOKU CORP. of AMERICA
Audio Video of Orlando

BJM Electronics Ltd.
Barrett Associates, Inc.
Broadcast Services/EME
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Gold Line Connector Inc.
James Grunder & Assoc Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
John E. Hillman Associates
Landy Associates Inc
Leader Instruments Corporation
Lindahl Sales Corp
Northeast Broadcast Lab, Inc.
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
RE America
RF Specialties of Missouri
Ram Broadcast Systems
Sailors Audio
A W Sperry Instruments
Suministros Gonzalez
Tektronix Inc

Test Equipment, RF Radiation Test Gear
AVR Communications Limited East
AVR Communications Limited West
Anritsu America Inc
Audio Video of Orlando
Barrett Associates, Inc.
Bird Electronics Corporation
Commercial Radio Company
Holaday Industries Inc.
John E. Hillman Associates
Narda Microwave Corp
Professional Audio Supply
RE America
RF Specialties of Missouri
Verda Corp

Test Equipment, Spectrum Analyzers
AVC Systems
AVCOM of Virginia, Inc.
Amber Electro Design Inc.
Anritsu America Inc
Antenna Technology Corporation
AudioControl Industrial
Audio Precision
Audiotechniques
BARCO-EMT GmbH
Barrett Associates, Inc.
Broadcasters General Store
Bruel & Kjaer Instruments, Inc.
Crouse-Kimzey Company
Delta Electronics Inc.
Full Compass Systems, Ltd.
Funke & Associates
Gold Line Connector Inc.
Gotham Audio Corp
Harris-Allied
Hartmann Associates
Holzberg Inc.
IFR Systems Inc.
IVIE
John E. Hillman Associates
Klark-Teknik
Martin Audio/Video Corp
Milam Audio Co.
New World Music & Sound
Numark Electronics
Douglas Ordon & Co Inc
Professional Audio Supply
Parsons Audio
Peirce-Phelps, Inc
Posthorn Recordings
Pyramid Audio, Inc.
RE America
RF Specialties of Missouri
Radio Resources & Services
Sailors Audio
Sound Technology
Tektronix Inc

Test Equipment, Test Systems
ADC Telecommunications, Inc.
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Acoustic Technology Inc.
Amber Electro Design Inc.
R.B. Annis Co Inc.
Audio Precision
Audisar
Beckman Industrial Corporation
Belar Electronics Laboratory, Inc.
Bird Electronics Corporation
Bruel & Kjaer Instruments, Inc.
Commercial Radio Company
Delta Electronics Inc.
Dorrough Electronics
Full Compass Systems, Ltd.
Funke & Associates
Gaines Audio
Gold Line Connector Inc.
James Grunder & Assoc Inc.
Hall Electronics
Harris-Allied
Hartmann Associates
Holzberg Inc.
J.N.S. Electronics, Inc.
John E. Hillman Associates
Landy Associates Inc
Leitch Incorporated
Magnetic reference Lab
Magni Systems
Northeast Broadcast Lab, Inc.
Douglas Ordon & Company, Inc.
Professional Audio Supply
Parcom Inc.
Parsons Audio
Potomac Instruments, Inc.
RE America
RE Instruments Corp
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
Radio Design Labs
Radio Resources & Services
Schmid Telecomm. America Inc
Sescom Inc.
Sound Technology
TFT Inc.
Tennaplex Systems Ltd
Tentel Corporation
Wohler Technologies

Time Code Equipment
+4 Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audio Services Corporation
Audiotechniques
Audio Video of Orlando
Bradley Broadcast Sales
Broadcast Services/EME
Broadcasters General Store
Control Technology Inc.
Crouse-Kimzey Company
ESE
Fostex Corp. of America
Full Compass Systems, Ltd.
Hall Electronics
Holzberg Inc.
Hy James, Inc.
JRF Magnetic Sciences
JRF Magnetic Sciences Inc
Jim Walters Co.
Landy Associates Inc
Lasalle Music and Pro Audio
Leitch Incorporated
Martin Audio/Video Corp
Milam Audio Co.
Northeast Broadcast Lab, Inc.
Douglas Ordon & Company, Inc.
Otari Corporation
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Posthorn Recordings
Pyramid Audio, Inc.
RF Specialties of Missouri
Research Associates, Inc.
Schafer Digital
Schoeps/Posthorn Recordings
Sequoia Electronics
Sony Business & Professional Group
Turtle Beach Systems
UAR Professional Systems
Wide Range Electronics Corporation

Timers and Clocks
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Broadcast Group, Inc.
Audio Video of Orlando
Auditronics
Autogram Corp
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Chrontrol Corporation
Cirrus Technologies Inc
Control Technology Inc.
Crouse-Kimzey Company
ESE
Electronic Industries, Inc.
Hall Electronics
Harris-Allied
Harrison by GLW
Holzberg Inc.
Hy James, Inc.
Jim Walters Co.
Landy Associates Inc
Leitch Incorporated
Martin Audio/Video Corp
Monroe Electronics, Inc.
Northeast Broadcast Lab, Inc.
Oakwood Audio Labs Ltd.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Pacific Recorders & Engineering Corp.
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Research Associates, Inc.
Roscom General
Sequoia Electronics
Sony Business & Professional Group
Suministros Gonzalez
Time & Temperature Company of S.D.

Tools and Gauges
Audiotechniques
BJM Electronics Ltd.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Caig Laboratories, Inc.
Canare Cable Inc.
Capital Electronics Inc
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Guarantee Radio Supply Corporation
Martin Audio/Video Corp
Professional Audio Supply
Paladin Corporation
Sailors Audio
Sequoia Electronics
Suministros Gonzalez
Vertigo
Brian R. White Co., Inc.

Towers
Aluma Tower Company, Inc.
American Media Services
Andrew Corporation
Barrett Associates, Inc.
Broadcast Comm Systems Inc
CTI Installations, Inc.
Capital Electronics Inc
Central Tower, Inc.
Continental Electronics
ERI Installations
Electronic Industries, Inc.
Electronic Research
Express Tower Co. Inc.
Fort Worth Tower Inc
Guarantee Radio Supply Corporation
Hall Electronics
Mart Haller Co.-Exporters
Harmon's Tower Service
Harris-Allied
Holzberg Inc.
IER (Industrial Equip. Reps.)
Jampro Antennas
John E. Hillman Associates
John Nix
LDL Communications
L & R Communications Ltd.
Lines Video Systems
Lita Broadcasting Distributors
Magnum Towers, Inc.
Miller Tower Company
Fred A. Nudd Corporation
Paramount Communications Systems
Parcom Inc.
Payne Engineering
Pirod Inc
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
ROHN Inc
Radio Resources & Services
Research Associates, Inc.
Roscom General
SG Communications
Skyhawk Communications
Skyline Antenna Management
Southern Tower Service Co., Inc.
SSAC Co
Stellar Communications Inc.
Suministros Gonzalez
Telex Communications Inc
Tenco Tower
Tower Structures, Inc
Transmission Structures Ltd.
U.S. Tower Services
Utility Tower Company
Will-Burt Company

Towers, Guys & Lights
Aluma Tower Company, Inc.
American Media Services
Andrew Corporation
Barrett Associates, Inc.
Broadcast Comm Systems Inc
Broadcast Services/EME
Central Tower, Inc.
Continental Electronics
Cortland Cable Company
Crouse-Kimzey Company
ERI Installations
Electronic Industries
Electronics Research, Inc.
Express Tower Co. Inc.
Flash Technology
Fort Worth Tower Inc
Guarantee Radio Supply Corporation
Mart Haller Co.-Exporters
Harmon's Tower Service
Harris-Allied
Holzberg Inc.
Hughey & Phillips Inc.
John E. Hillman Associates
John Nix
LDL Communications
Lauderdale Electronic Labs
Lita Broadcasting Distributors
Magnum Towers, Inc.
Fred A. Nudd Corporation
Rick Nudd, Ltd.
Professional Audio Supply
Paramount Communications Systems
Payne Engineering
Pirod Inc
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
ROHN Inc
Radio Resources & Services
Research Associates, Inc.
Roscom General
SSAC Co
Skyhawk Communications
Southern Tower Service Co., Inc.
Stellar Communications Inc.
Stellar Distributing Inc.
Suministros Gonzalez
Tenco Tower
Transmission Structures Ltd.
U.S. Tower Services
United Ropeworks
Utility Tower Company

Tower Services
Andrew Corporation
Broadcast Communications Systems, Inc.
CTI Installations, Inc.
Central Tower, Inc.
ERI Installations
Electronics Research, Inc.
Express Tower Co. Inc.
Fort Worth Tower Inc
Guarantee Radio Supply Corporation
Harmon's Tower Service
Hughey & Phillips Inc.
John E. Hillman Associates
John Nix
LDL Communications
L & R Communications Ltd.
Fred A. Nudd Corporation
Old Dominion Broadcast Eng. Serv.
Paramount Communications Systems
Payne Engineering
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Research Associates Inc
SG Communications
Sky Tower Service
Skyhawk Communications
Southern Tower Service Co., Inc.
Stellar Communications Inc.
Stellar Distributing Inc.
Teletech Inc
Tenco Tower
Transmission Structures Ltd.
U.S. Tower Services
Utility Tower Company

Transformers, Audio
AVR Communications Limited East
AVR Communications Limited West
Acoustic Technology Inc.
Audio Services Corporation
Audio Video of Orlando
Audisar
BJM Electronics Ltd.
Barrett Associates, Inc.
Grant Becker Enterprises
Bogen Communications, Inc.
Broadcasters General Store
Commercial Radio Company
Control Technology Inc.
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Fusion Electronics, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Jensen Transformers Inc.
McMartin Incorporated
Microtran Company
Milam Audio Co.
Old Dominion Broadcast Eng. Serv.
OPAMP Inc.
Professional Audio Supply
Parcom Inc.
Peavey Electronics Corporation
Peirce-Phelps, Inc
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
Radio Design Labs
Research Associates, Inc.
Riggins Electronic Sales
Russco Electronics Mfg. Inc.
Sescom Inc.
Shure Brothers Inc
Spectra Sonics
Suministros Gonzalez
Tandberg Educational, Inc.
Tapecaster

Transformers, RF
AVR Communications Limited East
AVR Communications Limited West
Barrett Associates, Inc.
Broadcasters General Store
Commercial Radio Company
Control Technology Inc.
Delta Electronics Inc.
Fusion Electronics, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Hy James, Inc.
Jampro Antennas
Kintronic Laboratories Inc
Lita Broadcasting Distributors
Marcom
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Peter W. Dahl Co.
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Systems
RF Technologies Corp

Transmission Line, Flexible Cable, Waveguide
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Andrew Corporation
Antennas for Communications, Inc.
Audio Video of Orlando
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cablewave Systems, Div of RFS Cancomm
Comark Communications
Comex Worldwide Corporation
Commercial Radio Company
Continental Electronics
Control Technology Inc
Crouse-Kimzey Company
Dielectric Communications
Electronic Industries, Inc.
Electronics Research, Inc.
Giesler Broadcasting Supply, Inc.
Hall Electronics
Harris-Allied
Hy James, Inc.
Jampro Antennas
John E. Hillman Associates
John Nix
LDL Communications
Landy Associates Inc
Lines Video Systems
Lita Broadcasting Distributors
Marcom
Micro Communications Inc
Myat, Inc.
Narda Microwave Corp
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
Payne Engineering
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
RF Technologies Corp
Radio Resources & Services
Research Associates Inc
Roscom General
S.W.R. Inc.
Scala Electronic Corporation
Shively Labs
Stellar Distributing Inc.
Suministros Gonzalez
Tenco Tower
Tennaplex Systems Ltd
Transcom Corporation

Transmitters, AM, 0-100 watts
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Besco International
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Digital Recorders
Energy-Onix Broadcast Equipment Co.
GBS-Giesler Broadcasting Supply
Guarantee Radio Supply Corporation
Holzberg Inc.
IBSS
IER (Industrial Equip. Reps.)
John E. Hillman Associates
LPB, Inc.
Nautel Electronic Laboratories
Nautel Maine Inc
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
PMA Marketing
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Washington, Inc.
Radio Resources & Services
Radio Systems
Roscom General
RRADCO Group
Tobias & Company Ltd
Transcom Corporation

Transmitters, AM, 100-1kW
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Barrett Associates, Inc.
Besco International
Broadcast Electronics Inc
Cirrus Technologies Inc
Commercial Radio Company
Continental Electronics
Control Technology Inc.
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
GBS-Giesler Broadcasting Supply
Guarantee Radio Supply Corporation
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
John E. Hillman Associates
Lita Broadcasting Distributors
MidAmerica Electronics Service, Inc.
Nautel Electronic Laboratories
Nautel Maine Inc
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Omnitronix, Inc.
Professional Audio Supply
PMA Marketing
Pomar Electronics
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Tobias & Company Ltd
Transcom Corporation

Transmitters, AM, 1kW-50kW
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Barrett Associates, Inc.
Besco International
CCA Electronics
Cirrus Technologies Inc
Commercial Radio Company
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Elcom Bauer

Energy-Onix Broadcast Equipment Co.
Fusion Electronics, Inc.
Fusion Electronics, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IER (Industrial Equip. Reps.)
John E. Hillman Associates
Lita Broadcasting Distributors
Litronix Corporation
McMartin Incorporated
MidAmerica Electronics Service, Inc.
Nautel Electronic Laboratories
Nautel Maine Inc
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Omnitronix, Inc.
Professional Audio Supply
PMA Marketing
Pomar Electronics
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Tobias & Company Ltd
Transcom Corporation

Transmitters, AM, 50kW +
AVR Communications Limited East
AVR Communications Limited West
Audiomedia
Barrett Associates, Inc.
Besco International
CCA Electronics
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Energy-Onix Broadcast Equipment Co.
Fusion Electronics, Inc.
Guarantee Radio Supply Corporation
Harris-Allied
Holzberg Inc.
IER (Industrial Equip. Reps.)
MidAmerica Electronics Service, Inc.
Nautel Electronic Laboratories
Nautel Maine Inc
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
PMA Marketing
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Tobias & Company Ltd
Transcom Corporation

Transmitters, FM, 0-100 watts
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Besco International
Bext Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
CCA Electronics
Cancomm
Cirrus Technologies Inc
Comad Communications Limited
Continental Electronics
Control Technology Inc.
Crouse-Kimzey Company
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Fusion Electronics, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
IBSS
IER (Industrial Equip. Reps.)
John E. Hillman Associates
Landy Associates Inc
Lita Broadcasting Distributors
Litronix Corporation
Marcom
McMartin Incorporated
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
TFT Inc.
Television Technology Corp.
Tobias & Company Ltd
Transcom Corporation

Transmitters, FM, 100-1kW
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Besco International
Bext Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
CCA Electronics
Cancomm
Cirrus Technologies Inc
Comad Communications Limited
Continental Electronics
Control Technology Inc.
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
John E. Hillman Associates
Landy Associates Inc
Lita Broadcasting Distributors
Litronix Corporation
Marcom
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pomar Electronics
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Television Technology Corp.
Telo Technology
Tobias & Company Ltd
Transcom Corporation

Transmitters, FM, 1kW-10kW
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Besco International
Bext Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
CCA Electronics
Cancomm
Cirrus Technologies Inc
Comad Communications Limited
Continental Electronics
Control Technology Inc.
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
John E. Hillman Associates
Landy Associates Inc
Lita Broadcasting Distributors
Litronix Corporation
Marcom
MidAmerica Electronics Service, Inc.
Nautel Electronic Laboratories
Nautel Maine Inc.
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pomar Electronics
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Television Technology Corp.
Telo Technology
Tobias & Company Ltd
Transcom Corporation

Transmitters, FM, 10kW +
AVR Communications Limited East
AVR Communications Limited West
Audio Broadcast Group, Inc.
Audiomedia
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Besco International
Bext Inc.
Bradley Broadcast Sales
Broadcast Electronics
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
CCA Electronics
Cancomm
Cirrus Technologies Inc
Continental Electronics
Control Technology Inc.
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Fusion Electronics, Inc.
Fusion Electronics, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
IER (Industrial Equip. Reps.)
John E. Hillman Associates
Landy Associates Inc
Lita Broadcasting Distributors
Litronix Corporation
Marcom
McMartin Incorporated
Northeast Broadcast Lab, Inc.
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
QEI Corporation
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Roscom General
RRADCO Group
Suministros Gonzalez
Television Technology Corp.
Telo Technology
Tobias & Company Ltd
Transcom Corporation

Transmitters, Shortwave, 0-1kW
Besco International
Cirrus Technologies Inc
Continental Electronics
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Guarantee Radio Supply Corporation
Harris-Allied
Holzberg Inc.
Lita Broadcasting Distributors
Old Dominion Broadcast Eng. Serv.
PMA Marketing
RRADCO Group

Tobias & Company Ltd
Transcom Corporation

Transmitters, Shortwave, 1kW-50kW
Besco International
CCA Electronics
Continental Electronics
Elcom Bauer
Energy-Onix Broadcast Equipment Co.
Harris-Allied
Holzberg Inc.
Lita Broadcasting Distributors
Old Dominion Broadcast Eng. Serv.
PMA Marketing
RRADCO Group
Tobias & Company Ltd
Transcom Corporation

Transmitters, Shortwave, 50kW +
Besco International
CCA Electronics
Continental Electronics
Energy-Onix Broadcast Equipment Co.
Harris-Allied
Holzberg Inc.
Old Dominion Broadcast Eng. Serv.
PMA Marketing
Tobias & Company Ltd
Transcom Corporation

Tubes, Transmitting
AVR Communications Limited East
AVR Communications Limited West
American Media Services
BJM Electronics Ltd.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Bethpage Associates Inc
Cirrus Technologies Inc
Commercial Radio Company
Continental Electronics
Control Technology Inc.
EEV
Econco
Electronic Industries, Inc.
Freeland Products, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Mart Haller Co.-Exporters
Harris-Allied
Holzberg Inc.
John E. Hillman Associates
Lita Broadcasting Distributors
Litronix Corporation
Marcom
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Parcom Inc.
PMA Marketing
Pomar Electronics
Richardson Electronics/RF Gain
RF Specialties of California
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Richardson Electronics
Suministros Gonzalez
Thor Electronics Corp.
Vacuum Tube Industries, Inc.

Tubes, Receiving
AVR Communications Limited East
AVR Communications Limited West
American Media Services
BJM Electronics Ltd.
Barrett Associates, Inc.
Bethpage Associates Inc
Capital Electronics Inc
Commercial Radio Company
D.N. Latus & Co., Inc.
EEV
Electronic Industries, Inc.
Guarantee Radio Supply Corporation
Mart Haller Co.-Exporters
John E. Hillman Associates
Lindahl Sales Corp
Lita Broadcasting Distributors
Old Dominion Broadcast Eng. Serv.
Professional Audio Supply
Pomar Electronics
Richardson Electronics/RF Gain
RF Specialties of Missouri
RF Specialties of Texas
Richardson Electronics
Thor Electronics Corp.
Vacuum Tube Industries, Inc.

W

Weather Radar Systems
Audio Video of Orlando
Erko Technologies

Weather Radios, NOAA
Audio Video of Orlando
Emergency Alert Receiver Inc
Hamtronics, Inc.
Harris-Allied
RF Specialties of Florida
Wireready Newswire Systems Inc

Wire, Audio
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
AudioLine, Inc.
Audiotechniques
Audio Video of Orlando
BJM Electronics Ltd.
Broadcast Supply West (BSW)
BARCO-EMT GmbH
Barrett Associates, Inc.
Grant Becker Enterprises
Beyer Dynamic Inc.
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Canare Cable Inc.
Capital Electronics Inc
Clark Wire & Cable
Commercial Radio Company
Connectronics Corporation
Continental Electronics
Control Technology Inc.
Cooper Industries/Belden Division
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Martin Audio/Video Corp
Milam Audio Co.
Nemal Electronics International, Inc
New World Music & Sound
Northeast Broadcast Lab, Inc.
Numark Electronics
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peavey Electronics Corporation
Peirce-Phelps, Inc
Posthorn Recordings
Pro Media
Pyramid Audio, Inc.
Quintessence Audio
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Redco Audio Products
Riggins Electronic Sales
Ritz Audio-Visual Associates, Inc
Roscom General
Spectra Sonics
Stram Electronics Corp
Suministros Gonzalez
Thor Electronics Corp.
Whirlwind
Wireworks Corp

Wire, Coax
AVC Systems
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audio Video of Orlando
BJM Electronics Ltd.
Broadcast Supply West (BSW)
Barrett Associates, Inc.
Grant Becker Enterprises
Bradley Broadcast Sales
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Broadcasters General Store
Cablewave Systems, Div of RFS
Canare Cable Inc.
Capital Electronics Inc
Clark Wire & Cable
Commercial Radio Company
Connectronics Corporation
Continental Electronics
Cooper Industries/Belden Division
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Fusion Electronics, Inc.
Giesler Broadcasting Supply, Inc.
Guarantee Radio Supply Corporation
Hall Electronics
Harris-Allied
Holzberg Inc.
Hy James, Inc.
IBSS
IER (Industrial Equip. Reps.)
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Lita Broadcasting Distributors
Martin Audio/Video Corp
Milam Audio Co.
Nemal Electronics International, Inc
Northeast Broadcast Lab Inc
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Peirce-Phelps, Inc
PMA Marketing
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
RF Specialties of Washington, Inc.
Radio Resources & Services
Riggins Electronic Sales
Roscom General
Scala Electronic Corporation
Suministros Gonzalez
Thor Electronics Corp.
Trompeter Electronics
Whirlwind
Wireworks Corp

Wire, Other
AVR Communications Limited East
AVR Communications Limited West
American Media Services
Audiotechniques
Audio Video of Orlando
BJM Electronics Ltd.
Broadcast Equipment Sales & Engineering
Broadcast Services/EME
Canare Cable Inc.
Clark Wire & Cable
Commercial Radio Company
Connectronics Corporation
Control Technology Inc.
Cooper Industries/Belden Division
Cortland Cable Co
Crouse-Kimzey Company
Electronic Industries, Inc.
Full Compass Systems, Ltd.
Guarantee Radio Supply Corporation
Hall Electronics
C.B. Hannay & Son, Inc.
Harris-Allied
Holzberg Inc.
John E. Hillman Associates
Landy Associates Inc
Lasalle Music and Pro Audio
Martin Audio/Video Corp
Nemal Electronics International, Inc
Old Dominion Broadcast Eng. Serv.
Omega Communications Company
Professional Audio Supply
Parcom Inc.
Parsons Audio
Pro Media
RF Specialties of California
RF Specialties of Florida
RF Specialties of Missouri
RF Specialties of Pennsylvania, Inc.
RF Specialties of Texas
Roscom General
Thor Electronics Corp.
Whirlwind
Wireworks Corp

SUPPLIER SOURCE BOOK

A

+4 Audio
PO Box 566
Salem, MA 01970
Contact: Peter Engel, President
508-745-8522

A/S Vibration, Inc.
15411 NE 95th Street
Redmond, WA 98052
Contact: Robert K. Arnold Jr., Sales Manager
206-867-1520 FAX: 206-882-2061

A/V Technology Intl
PO Box 97
West Newton, MA 02165
Contact: Gerard Abeles, Pres
617-965-3866 FAX: 617-965-1865

A & D Cartridge Rebuilding
3706 Vold Court
Eau Claire, WI 54701
Contact: Amy Casey/Diane Jump, Partners
715-835-8676

ACP-ABACUS
7402 Setting Sun Way
Columbia, MD 21046
Contact: Gene Bidun, President

ADC Telecommunications, Inc.
4900 West 78th Street
Minneapolis, MN 55435
Contact: Lynne High, PR Manager
612-938-8080 FAX: 612-946-3292

AEG Bayly Inc
167 Hunt St
Ajax, Ontario, L1S 1P6 Canada
Contact: Allan P Proctor
416-683-8200 FAX: 416-683-8186

AHB USA Ltd
5 Connair Road
Orange, CT 06477
Advertising Manager

AKAI
1316 E Lancaster
Fort Worth, TX 76102
Contact: James Martin, Product Specialist
817-336-5114 FAX: 817-870-1271

AKG Acoustics
1525 Alvarado Street
San Leandro, CA 94577
Contact: David Roudebush, Corporate Marketing Manager
510-351-3500 FAX: 510-351-0500

ANT Telecommunications Inc
211 Perry Pkwy, Ste 4
Gaithersburg, MD 20877
Contact: Natalie Hutson
301-670-9777

ARS Electronics
7110 DeCelis Place
Van Nuys, CA 91406
Contact: Marty Sanett
816-997-6200

ART, Applied Research & Tech
215 Tremont St
Rochester, NY 14608
Contact: Philip Betette, President
716-436-2720 FAX: 716-436-3942

ASC - Tube Traps
PO Box 1189
Eugene, OR 97440
Contact: Art Noxon, President
800-272-8823 FAX: 503-343-9245

ASACA/SHIBASOKU CORP OF AMER.
12509 Beatrice St
Los Angeles, CA 90066
Contact: Teresa Baker, Sales Coordinator
310-827-7144 FAX: 310-306-1382

ATI (Audio Technologies Inc)
328 W Maple Ave
Horsham, PA 19044
Contact: Sam Wenzel/Ed Mullin, President/Vice President
215-443-0330 FAX: 215-443-0394

AVAB America Inc
967 Howard St
San Francisco, CA 94103
415-421-3562

AVC Systems Division of Vaughn
6253 Bury Drive
Eden Prairie, MN 55346-1720
Contact: Jack Dailey
612-832-3232 FAX: 612-831-0791

AVCOM of Virginia Inc
500 Southlake Blvd
Richmond, VA 23236
Contact: Charlie Odom, Sales & Marketing
804-794-2500 FAX: 804-794-8284

AVR Communications, Ltd. East
8-595 Middlefield Road
Scarborough, ON M1V 3S2 CANADA
Contact: Paul Lico/Ian Schmidt
416-297-9377 FAX: 416-297-4757

AVR Communications, Ltd. West
2615 126 Ave., S.W.
Calgary, AB T2W 3V5 Canada
Contact: Wilf Rice, Sales Manager
403-251-0707 FAX: 403-281-2695

AVR Grp/Audio Video Research
65 Main Street, 4th Floor
Watertown, MA 02172

AZ USA, Inc. (Azonic)
1610 East Cliff Road
Burnsville, MN 55337
Contact: Brent Johnson, Owner
800-842-9790 FAX: 612-861-2103

A Steeple Jack Co
3722 Roma
Houston, TX 77080
Contact: Don Highley, President

A W Sperry Instruments
245 Marcus Blvd
Hauppauge, NY 11788
Contact: Dennis Carroll, VP Sales
516-231-7050 FAX: 516-434-3128

Absolute Broadcast Automation
82 Main St
Westernport, MD 21562
Contact: Jack Mullen, Jr
301-786-4661

Access Communications
208 Mohawk Trail
Deforest, WI 53532
Contact: Jim Miller, President

Accurate Sound Corp
3475A Edison Way
Menlo Park, CA 94062
Contact: Ronald M. Newdoll, President
415-365-2843 FAX: 415-365-3057

Accu-Weather Inc
619 W College Ave
State College, PA 16801
Contact: Sheldon Levine, Director of Sales
814-237-0309 FAX: 814-238-1339

Acoustic Systems
415 East St Elmo Rd
Austin, TX 78745
Contact: Tim Jarvis, Sales Mgr
800-531-5412 FAX: 512-444-2282

Acoustic Technology Inc
1704 Warwickshire Court East
Bedford, TX 76021
Contact: Alan Groh, General Manager
817-540-5544 FAX: 817-540-5544

Acoustilog, Inc.
19 Mercer St
New York, NY 10013
Contact: Alan Fierstein, President
212-925-1365

Acoustlonics Sound/Shelex
PO Box 3752
Hollywood, CA 90078
Contact: Shelly A Herman, Owner

Adams-Smith
34 Tower St
Hudson, MA 01749
617-562-3801

Adcom Inc
3408 Tullmore Road
Cleveland Heights, OH 44118
Contact: John Bancroft

Adelphon
PO Box 7256
Ft Worth, TX 76111
Contact: Henry Mcginnis, Pres
817-335-8666

Advanced Broadcast Comm. Serv.
241 N.E. 10th Avenue
Cape Coral, FL 33909
Contact: Paul Wolf, President

Advanced Receiver Research
PO Box 1242
Burlington, CT 06013
Contact: Jay Rusgrove, Owner

Agfa-Gevaert Inc Magnetic Tape
275 North St
Teterboro, NJ 07608
201-288-4100

Alphone Corporation
1700 130th Ave NE
Bellevue, WA 98005
Contact: Robin Anderson, Marketing Coordinator
206-455-0510 FAX: 206-455-0071

Airforce Broadcast Services
216 Carlton Street
Toronto, ON M5A 2L1 Canada
Contact: Richard Loth, Director of Mktg & Sales
416-961-2541 FAX: 416-961-7754

Air System Technologies, Inc.
14232 Marsh Lane, Suite 339
Dallas, TX 75234
Contact: Tom Becker, Pres.
214-402-9660 FAX: 214-556-9375

Alactronics
192 Worcester St
Wellesley, MA 02181
617-239-0000 FAX: 617-431-8710

Alamar USA
471 Division Street
Campbell, CA 95008
Contact: Jessie Blount, Marketing Manager

Alden Electronics Inc
40 Washington St
Westboro, MA 01581
617-366-8851

Alderfer & Associates
298 Town Mountain Road
Asheville, NC 28804
Contact: G.M. Alderfer, President

Alesis Corporation
3630 Holdrege Avenue
Los Angeles, CA 91006
Contact: Allen Wald
213-467-8000 FAX: 213-836-9192

Dan Alexander Audio
5935 Market Street
Oakland, CA 94608
Contact: Dan Alexander
510-601-1146 FAX: 510-652-4022

Allen & Heath
5 Connair Road
Orange, CT 08477
Contact: Charles Augustowski, VP Marketing
203-795-3594 FAX: 203-795-6814

Allied Broadcast Equipment
Richmond, IN—*please see Harris Allied.*

Allied Tower Co
12450 Old Glaveston
Webster, TX 77598
Contact: Doug Moore, Sales Manager
713-486-7691

Alpha Audio Acoustics
PO Box 5403
Richmond, VA 23220
Contact: Michael Binns, President
804-358-3852 FAX: 804-356-9496

Alpha Electronics
1365 39th Street
Brooklyn, NY 11218
Contact: S Popiol

Alpha Products
242 West Avenue
Darien, CT 06820
Contact: Robert Maffei, Director of Marketing Research
203-656-1806 FAX: 203-656-0756

Alpha Recording Corp
2049 W Broad Street
Richmond, VA 23220-2075
Contact: C Nicholas Colleran Jr, President

Alpine Marketing Comm Ltd
3300 Edinbourough Way, Suite 306
Edina, MN 55435
Contact: James Preste, President/CEO
612-830-8242 FAX: 612-830-8245

Altec Lansing Bdct/Prod. Pdcts
PO Box 26105
Oklahoma City, OK 73126
Contact: Rick Sanchez, Bdct & Prod Marketing Manager
800-877-1771 FAX: 818-444-1342

Altronic Research Inc
PO Box 249
Yellville, AR 72687
Contact: Doug Starkey, Marketing Director
800-482-5623 FAX: 501-449-6000

Aluma Tower Co Inc
PO Box 2806
Vero Beach, FL 32961-2806
Contact: T.E. Gottry, VP/General Manager
407-567-3423 FAX: 407-567-3432

Amber Electro Design
6969 Trans-Canada Highway
St Laurent PQ, H4T 1V8 CANADA
Contact: Vincent Desouza, Sales Manager
514-333-1301 FAX: 514-333-1388

Amco Engineering
3801 N Rose St
Schiller Park, IL 60176
Contact: Jim Walenda, Marketing Manager
708-671-6670 FAX: 708-671-9469

Amek/Tac US Operations
10815 Burbank Blvd
N Hollywood, CA 91601
Contact: Steve Harvey, National Sales Manager
816-508-9788 FAX: 818-508-8619

American Broadcast Financial
4359 S. Howell Avenue, Suite 106
Milwaukee, WI 53207-5056
Contact: Pat Martin, President
414-482-2638 FAX: 414-483-1980

American Digital Radio
402 Tenth Avenue
Haddon Heights, NJ 08035
Contact: Edward A. Schober, President
609-546-8008 FAX: 609-546-1841

American Loop Systems
43 Davis Road, Suite 2
Belmont, MA 02178
Contact: Robert Gilmore, President
617-776-5667 FAX: 617-666-5228

American Media Services
1836 Barnett
Weatherford, TX 76087
Contact: Genie Sims, Owner
800-345-1953 FAX: 800-356-1953

Amp Services
224 Datura Street, Ste 614
W Palm Beach, FL 33401
Contact: Tom Rappolt, Vice President Sales & Marketing
800-826-0601 FAX: 407-655-1808

Amperex Electronics Corp
100 Providence Pike
Slatersville, RI 02876
Contact: Greg J Murphy
401-762-3800

Ampex Equipment Co.
401 Broadway
Redwood City, CA 94063
Contact: Al Fisher, Director of Marketing
415-367-2011 FAX: 415-367-2761

Ampex Recording Media Corp
401 Broadway M/S 22-02
Redwood City, CA 94063
Contact: Richard A. Antonio, VP US Sales & Customer Service
415-367-3809 FAX: 415-367-4132

Amtel Systems Inc
14 Cushing Avenue
Nashua, NH 03060-1811
603-880-9011

Analog Digital Synergy, Inc.
120 S.W. 21 Terrace, C-104
Fort Lauderdale, FL 33312
Contact: Lutz Meyer, President
305-791-1501 FAX: 305-791-8986

Anderson Consulting
3801 Fifth Avenue South
Great Falls, MT 59405
Contact: Frank Anderson, Owner

Andrew Corp
10500 W 153rd St
Orland Park, IL 60462
Contact: J.D. Tuttle, Marketing Communications Manager
708-349-3300 FAX: 706-349-5442

Anixter Brothers, Inc
4711 Golf Road
Skokie, IL 60076
Contact: Vince Buckman
708-677-2600

R B Annis Co Inc.
1101 N Delaware St
Indianapolis, IN 46202
Contact: R.B. Annis, President
317-637-9282 FAX: 317-637-9282

Anritsu America Inc
15 Thornton Rd
Oakland, NJ 07436
Contact: Hugh Felger, Marketing Manager
201-337-1111 FAX: 201-337-1033

Antenna Technology
1140 East Greenway St.
Mesa, AZ 85203
Contact: Gary Hatch, Dir of Intl Sales & Marketing
602-264-7275 FAX: 602-896-7667

Antennas For Communications
326 Cypress Road
Ocala, FL 32672
Contact: Ronald S. Posner, Chairman
904-687-4121 FAX: 904-687-1203

Anvil Cases
15650 Salt Lake Avenue
City of Industry, CA 91745
Contact: Gabe Nakash, Marketing Manager
818-968-4100 FAX: 818-968-1703

Anything Audio
63 Melcher St
Boston, MA 02210
Contact: Dave Malekpour, President
800-788-2675 FAX: 617-426-2763

Aphex Systems Ltd
11068 Randall St
Sun Valley, CA 91352
Contact: Paul Freudenberg, Sales Manager
818-767-2929 FAX: 818-767-2641

Applied Micro Technology
3116 Merriam Lane
Kansas City, KS 66106
Contact: Steve Hathaway, Engineer
913-362-9422 FAX: 913-362-9477

Arben Design
600 W Roosevelt Rd
W Chicago, IL 60185
312-231-5077

Armstrong Transmitters
5046 Smoral Road
Camillus, NY 13031
Contact: Bob White, President
315-488-1269 FAX: 315-488-1365

Arrakis Systems Inc
2619 Midpoint Dr
Ft Collins, CO 80525
Contact: Michael Palmer, President
303-224-2248 FAX: 303-493-1076

The Art Studio
1300 Timberline Office Park
Austin, TX 78746
Contact: Jack Wilson

Artel Communications Corp
22 Kane Industrial Dr
Hudson, MA 01749
Contact: Judith Flynn, Marketing/Communication Manager
508-562-2100 FAX: 508-562-6942

Ashly Audio, Inc
100 Fernwood Ave
Rochester, NY 14621
Contact: Robert French, Sr VP Mktg
716-544-5191 FAX: 716-266-4589

Associated Press Broadcast Services
1825 K St., NW
Washington, DC 20006
202-955-7214

Associated Production Music
6255 Sunset Blvd, Ste. 820
Hollywood, CA 90028
Contact: Connie Red, Broadcast Sales Director
800-543-4276 FAX: 213-461-9102

Atlantic Research Corp
5390 Cherokee Ave
Alexandria, VA 22312
703-642-4000

Atlas/Soundolier
1859 Intertech Drive
Fenton, MO 63026
Contact: Bud Waters, National Sales Manager
314-349-3110 FAX: 314-349-1251

Audi-Cord Corporation
1845 West Hovey Avenue
Normal, IL 61761-4315
Contact: Andrew M. Rector, Jr., President/Marketing Manager
309-452-9461 FAX: 309-452-0893

Audient Marketing Services
PO Box 7217
Mission Hills, CA 91346
Contact: Erika Lopez

Audio & Recording Systems
3986 Edidin Drive
Jacksonville, FL 32211-2172
Contact: Robert Woolf, Owner

Audio Accessories Inc
Mill St/P.O. Box 174
Marlow, NH 03456
Contact: Timothy J Symonds, Operations Manager
603-446-3335 FAX: 603-446-7543

Audio Animation Inc.
6632 Central Avenue Pike
Knoxville, TN 37912
Contact: James M. Ruse, Product Development & Mkting Mgr
615-689-2500 FAX: 615-689-7815

Audio Broadcast Group Inc
2342 S Division Ave
Grand Rapids, MI 49507
Contact: David E Veldsma, President
616-452-1596 FAX: 616-452-1652

Audio Control Industrial
22410 70th Avenue West
Mountlake Terrace, WA 98043
Contact: Tom Walker, President
206-775-8461 FAX: 206-778-3161

Audio Concepts & Engineering
P.O. Box 25652
Richmond, VA 23260
Contact: Jeff Loughridge, President
804-550-3337 FAX: 804-550-3291

Audio Dynamics, Inc.
137 W. Buckingham Circle, Suite B
Charlottesville, VA 22901
Contact: Steve Yates, President
804-296-4111 FAX: 804-296-4111

Audiodyne Bdct Cartridge Rebld
725 N Bush Avenue
Fresno, CA 93727
Contact: Allan Tatarian, President
209-252-2767

Audio Eng Assoc
1029 N Allen Ave
Pasadena, CA 91104
Contact: Wes Dooley, Pres
818-798-9127

Audio Innovators
5001 Baum Blvd
Pittsburgh, PA 15213
Contact: Martha Wilson

Audiolab Electronics Inc
5831 Rosebud Lane, Bldg C
Sacramento, CA 95841
Contact: Ron Stofan, VP Marketing
916-348-0200 FAX: 916-348-1512

Audio Labs
9 Roxbury
Keene, NH 03431
Contact: C Keith, Manager

Audioline Inc
2323J Bluemound Rd
Waukesha, WI 53186
Contact: Barbara Gutknecht, Mktg Dir
414-785-9166 FAX: 414-785-0789

Audio Logic
5639 South Riley Lane
Salt Lake City, UT 84107
Contact: Bruce Holt
801-268-8400 FAX: 801-262-4966

Audiomedia Associates
PO Box 29264
New Orleans, LA 70189
Contact: Corey Meyer, Pres
504-586-0140

Audiopak Inc
1680 Tyson Drive, P.O. Box 3100
Winchester, VA 22601
Contact: Gordon Stafford, VP Sales
703-667-8125 FAX: 703-667-6379

Audio Precision
PO Box 2209
Beaverton, OR 97075
Contact: Tom Mintner, Director of Sales & Marketing
503-627-0832 FAX: 503-641-8906

Audio Service Corp
10639 Riverside Dr
N Hollywood, CA 91602
Contact: Gwen Madrid, Director of Marketing
818-980-9891 FAX: 818-980-9911

Audiotechniques Inc
1600 Broadway, 8th floor
New York, NY 10019
Contact: Doug Cook, VP/GM
212-586-5989 FAX: 212-489-4936

Audio-Technica U S, Inc
1221 Commerce Road
Stow, OH 44224
Contact: Garry Elliott, National Sales Manager
216-686-2600 FAX: 216-686-0719

Audio Video of Orlando
4207 Vineland Road, Suite #M-13
Orlando, FL 32811
407-872-1660 FAX: 407-872-1655

Audio-Video Engineering Co
65 Nancy Blvd
Merrick, NY 11566
516-546-4239

Audio/Digital Inc
8500 Balboa Blvd.
Northridge, CA 91329
Contact: Gary Hardesty, Director of JBL Systems Group
818-893-8411 FAX: 818-893-3639

Audisar
Box 1561
Bellevue, WA 98009
Contact: Robert Munger, Owner
206-454-2040

Auditronics Inc
3750 Old Getwell Rd
Memphis, TN 38118
Contact: Murray Shields, Dir of Sales & Marketing
901-362-1350 FAX: 901-365-8629

Audix Corp
19439 SW 90th Court
Tualatin, OR 97062
Contact: Cliff Castle, VP Sales
510-463-1112 FAX: 510-463-2149

Auernheimer Labs & Co
4561 E Florence Ave
Fresno, CA 93725
Contact: Curly Auernheimer, Owner
209-442-1048

Auratone Corp
PO Box 180698
Coronado, CA 92178-0698
Contact: Jack Wilson, President
619-297-2820 FAX: 619-296-8734

Autogram Corp
1500 Capital Ave
Plano, TX 75074
Contact: Ernie T Ankele Jr, President
214-424-8585 FAX: 214-423-4465

Automated Call Processing Corp
220 Jackson St, #300
San Francisco, CA 94111
Marketing Manager

Avocet Instruments
15280 Blackberry Hill Road
Los Gatos, CA 95032
Contact: Eric Lane, President
408-354-4468 FAX: 408-395-1585

B

B & K Precision
6460 W Cortland
Chicago, IL 60635
Contact: Martin Plude, Adv Mgr
312-889-9087

B&B Systems
28111 North Ave Stanford
Valencia, CA 91355
Contact: B Burnsed, Pres

BARCO-EMT Gmbh
Postfach 2 00
W-7634 Kippenheim GERMANY
Contact: Dipl. Ing. Gerhard Moller, Audio Product Manager
78-25-10-11 FAX: 78-25-22-85

BBE Sound, Inc.
5500 Bolsa Ave Ste 245
Huntington Beach, CA 92649
Contact: Helen R. Eun, Office Manager
714-897-6766 FAX: 714-895-6728

BCRS
5501-B Richland St
Greensboro, NC 27409
Contact: Paul Allen, Product Manager

BEC Technologies Inc
PO Box 618066
Orlando, FL 32861-8066
Contact: John Totten

BGW Systems Inc
13130 South Yukon
Hawthorne, CA 90251
Contact: Joe Demeo, Sales Manager
800-468-AMPS FAX: 310-676-6713

BJM Electronics Ltd
2589 Richmond Terrace
Staten Island, NY 10303
Contact: Robert Manzo, President
718-442-0223 FAX: 718-442-1451

BP Consulting Group
2211 Fifth Avenue
Seattle, WA 98121
Contact: John Sherman, VP/Sales
800-426-9082 FAX: 206-441-6582

BSS, A Div. of AKG Acoustics
1525 Alvarado Street
San Leandro, CA 94577
Contact: David Roudebush, Corporate Marketing Manager
510-351-3500 FAX: 510-351-0500

BSW (Broadcast Supply West)
7012 27th St West
Tacoma, WA 98406
Contact: Patrick Medved, VP Sales
800-426-8434 FAX: 800-231-7055

BTC Test & Measurement
7500 Six Forks Road
Raleigh, NC 27615
Contact G J Thursby, President

Bald Mountain Lab
230 Bellevue Rd
Troy, NY 12180
Contact: Robert Henry
315-279-9753

Barrett Associates Inc
3205 Production Ave
Oceanside, CA 92054
Contact: Mike Cruz
619-433-5600 FAX: 619-433-1590

Barron Associates
831 Washington St
Wilmington, DE 19801
Contact: William Wohl, Sr Account Executive

Basys Automation Systems
5 Odell Plaza
Yonkers, NY 10701
Contact: Frank De Mayo, Senior Vice President
914-376-4800 FAX: 914-376-0865

Basys Inc
501 Marcara Avenue
Sunnyvale, CA 94086
Contact: Peter Kolstad
415-969-9810

Basys International
45 Mortimer St
London, WIV 1PF England

Beck & Associates
8222 Jamestown #117-A
Austin, TX 78758
Contact: Mr. Beck, President

Becker Enterprises
4110 West Bank Avenue
Tampa, FL 33624
Contact: Grant Becker, Owner
813-960-8153

Beckman Industrial Corp
3883 Ruffin Rd
San Diego, CA 92123-1898
Contact: Carol Dorsey, Marcom Manager
619-495-3200 FAX: 619-268-0172

Beecher-Scott Inc
1128 Granada Way
St Paul, MN 55128
Contact: Jane Scott

Beekman Labs
455 Central Park Ave
Scarsdale, NY 10583
Contact: Stewart Popiol, Export Manager

Belar Electronics Laboratory
119 Lancaster Ave
Devon, PA 19333
Contact: Arno Meyer, President
215-687-5550 FAX: 215-687-2686

Belden Elec Wire & Cable
PO Box 1980
Richmond, IN 47375
Contact: Bill Hayes, Marketing Communications Manager
317-983-5200

Dick Bellow Sales Inc
13405 Floyd Cir Ste 102
Dallas, TX 75243
Contact: Sales Mgr

Benchmark Media Systems Inc
5925 Court Street Road
Syracuse, NY 13206-1707
Contact: R. Rory Rall, Sales Manager
315-437-6300 FAX: 315-437-6119

Benchmark Sound Company
3819 Brewerton Rd
N Syracuse, NY 13212
Contact: Allen H Burdick, Owner

M A Benington Inc
2459 Cuchura Dr
Birmingham, AL 35244
Contact: Mike Benington, Pres

Besco International
5946 Club Oaks Dr
Dallas, TX 75248
Contact: Rob Malany, Sales Manager
214-630-3600 FAX: 214-226-9416

Best Audio
5914 Kester Avenue
Van Nuys, CA 91411
Contact: Laurence Estrin, President
818-763-2378 FAX: 818-765-7398

Best Power Technology, Inc
PO Box 280
Necedah, WI 54646
Contact: Kenneth E. Urban, Mgr of Marketing Communications
608-565-7200 FAX: 608-565-2221

Bethpage Associates Inc
507 Superior Avenue
Newport Beach, CA 92663
Contact: Jerry Page, Vice President
714-722-6733 FAX: 714-722-6508

Bext Inc
739 Fifth Ave, Suite 7A
San Diego, CA 92101
Contact: Dennis Pieri, Marketing Director
619-239-8462 FAX: 619-239-8474

Beyer Dynamic Inc
56 Central Avenue
Farmingdale, NY 11735
Contact: Mike Solomon, Market Development Manager
516-293-3200 FAX: 516-293-3288

Bill Elliott Bdct Consultants
6709 Ridge Road, Suite 300B
Port Richey, FL 34668
Contact: Bill Elliott, President
813-849-3477

Binary Keyboard
607 Ashland Road
Middlesex, NJ 08846
Contact: Paul Rosberger, Owner

Birch Scarbarough Research
12350 NW 39th Street
Coral Springs, FL 33065-2404
Contact: Merle Hope Lambert, Director of Corporate Comm.

Bird Electronic Corp
30303 Aurora Rd
Solon, OH 44139
Contact: William F. Kail, Dir Domestic Sales
216-248-1200 FAX: 216-248-5426

Blanton Tower Leasing
118 Magothy Bridge Road
Severna Park, MD 21146
Contact: Charles Blanton, President

Bogen Communications, Inc.
50 Spring Street
Ramsey, NJ 07446
Contact: David A. Chambers, Dir of National Sales
201-934-8500 FAX: 201-934-9832

Bogner Broadcast Equipment
PO Box 67
Valley Stream, NY 11582-0067
Contact: Leonard King
516-997-7800

Bonneville Products
130 Social Hall Ave
Salt Lake City, UT 84111
Contact: Douglas Borba, Mktg Dir
801-237-2400

Boonton Electronics Corp
791 Route 10
Randolph, NJ 07869
Contact: David Jenkins, Marketing Manager
201-584-1077 FAX: 201-584-3037

Boynton Studio Inc
Melody Pines Farm
Morris, NY 13808
607-263-5695 FAX: 607-263-2373

Bradley Broadcast Sales
8101 Cessna Ave
Gaithersburg, MD 20879
Contact: Art Reed, General Manager
301-948-0650 FAX: 301-330-7198

Brentlinger Bdct Engineering
4338 E Acoma Drive
Phoenix, AZ 85032
Contact: Charles Brentlinger

Bretford/Knox
9715 Soreng Ave
Schiller Park, IL 60176
312-678-2545

Broadcast Automation Inc
4125 Keller Springs, Suite 122
Dallas, TX 75244
Contact: Earl Bullock, President
214-380-6800 FAX: 214-380-0823

Broadcast Cartridge Service
15131 Triton Ln Ste 108
Huntington Beach, CA 92649
Contact: Lora L. Crafton, Pres
714-898-7224 FAX: 714-891-6977

Broadcast Cart Rewinding Svcs
5501-B Richland Street
Greensboro, NC 27409
Contact: Paul Allen, Owner
919-855-6726 FAX: 919-230-0006

Broadcast Circuit Systems
2260 Lake Avenue, #130
Ft Wayne, IN 46805-5353
Contact: J Didier

Broadcast Comm Systems Inc
PO Box 730
New Glarus, WI 53574
Contact: Jean Muehlfelt, Marketing Vice President
608-527-5670 FAX: 608-527-5674

Broadcast Components Corp
470 Mamaroneck Ave, Suite 205
White Plains, NY 10605
Marketing Manager

Broadcast Consultants
34 Lorna Drive
Auburn, MA 01501
Contact: Robert Lund

Broadcast Data Systems
1515 Broadway, 37th Floor
New York, NY 10036
Contact: Joanne Smith

Bdcst Design & Construction
317 Howard
Mt. Clemens, MI 48043
Contact: Frank Raymo, Owner
313-465-3226 FAX: 313-465-2560

Broadcast Devices Inc
5 Crestview Ave
Peekskill, NY 10566
Contact: Bob Tarsio, Product Manager
914-737-5032

Broadcast Electronics Inc
4100 N 24th Street, P.O. Box 3606
Quincy, IL 62305
Contact: Russ Erickson/Bob Arnold, Mgr RF Sales/Mgr Audio Sales
217-224-9600 FAX: 217-224-9607

Broadcast Equipment Sales
PO Box 20331
Jackson, MS 39289-1331
Contact: Jeffery Corkren, Pres
601-857-8573 FAX: 601-857-2346

Broadcast Microwave Services
7322 Convoy Ct
San Diego, CA 92111
619-560-8601

Broadcast Programming
2211 Fifth Ave
Seattle, WA 98121
Contact: John Carlile, VP/Sales & Marketing
800-426-9082 FAX: 206-441-6582

Broadcast Services/EME
Reedy Creek Road
Four Oaks, NC 27524
Contact: Neal Davis, President
800-525-1037 FAX: 919-934-1537

Broadcast Services/EME
PO Box 309
Front Royal, VA 22630
Contact: Keith Arnett, Vice President/Marketing
800-345-7112 FAX: 703-635-9762

Broadcast Services/EME
4110 N. Main Street
High Point, NC 27265
Contact: Dennis Ford/Bill Gordon, Field Sales Reps
800-942-6005

Broadcast Services/EME
1605 E. Palmdale, Suite G
Palmdale, CA 93550
Contact: Tony Mezey, Field Sales Rep
800-523-1037

Broadcast Services of Colorado
12211 West Alameda Parkway, #101
Lakewood, CO 80228
Contact: Paul Montoya, Owner/Manager
303-988-4733 FAX: 303-987-2735

Broadcast Software Ltd.
1076 Sixth Avenue North
Naples, FL 33940
Contact: Gary Schmidt, President
813-649-5978 FAX: 813-649-1933

Broadcast Systems Associates
PO Box 422
Auburn, NH 03032
Contact: Steve Vanni, Owner
603-483-5365

Broadcast Systems Inc
8601 Six Forks Road, #403
Raleigh, NC 27615
800-531-5232

Broadcast Tech Partners
1 Fawcett Place
Greenwich, CT 06836
Contact: Mr Eugene Cooper

Broadcasters General Store
2480 SE 52nd St
Ocala, FL 32671
Contact: Chris Shute, Vice President
904-622-9058 FAX: 904-629-7000

Broadcasting & Elect. Srvs Lab
PO Box 178
Newton, UT 84327
Contact: John Griffin, Owner
801-563-3088

Browning Labs
8151 NW 74th Ave
Miami, FL 33166
Contact: Robert Brown, Pres

Bruel & Kjaer Instruments
185 Forrest St
Marlboro, MA 01752
Contact: J A Pelz, Adv Mgr
508-481-7000 FAX: 508-485-0519

Bryston/Bryston Vermont Ltd
979 Franklin Ln
Maple Glen, PA 19002
Contact: Martin Bartelstone, VP
800-673-2899

Bud Industries Inc
4605 East 355th St
Willoughby, OH 44094
Contact: Blair K. Haas, VP, Marketing
216-946-3200 FAX: 216-951-4015

Burk Technology
7 Lomar Dr
Pepperell, MA 01463
Contact: Phil Halter, Sales Manager
508-433-8877 FAX: 508-433-8981

Burlington Audio/Video Tapes
106 Mott St
Oceanside, NY 11572
Contact: Rudy Schwartz, Vice President
800-331-3191 FAX: 516-678-8959

C

CANARE
511 5th St, #G
San Fernando, CA 91340
Contact: Barry Brenner, General Manager
818-365-2446 FAX: 818-365-0479

CBSI (Custom Business Systems)
PO Box 67
Reedsport, OR 97467
Contact: Steve Kenagy, VP Mktg
800-547-3930 FAX: 503-271-5721

CCA Electronics, Inc.
360 Bohannon Road
Fairburn, GA 30213
Contact: John Binsfeld, VP Sales & Marketing
404-964-3530 FAX: 404-964-2222

CCI
2001 Hickory Valley Rd
Chattanooga, TN 37421
Contact: John Brady, Pres

C.D. Electronics
PO Box 7326
Klamath Fall, OR 97602
Contact: Alan Fonseca, Owner

C M Baker Electronics
PO Box 500
Richland, PA 17087
Contact: Craig Baker, Owner

C.P. Crossno & Associates
PO Box 18312
Dallas, TX 75218
Marketing Manager

CRL (Circuit Research Labs)
2522 W Geneva
Tempe, AZ 85282
Contact: William Ammons, Television Products Marketing
800-535-7648 FAX: 602-438-8227

CSI Telecommunications
PO Box 29002
San Francisco, CA 94129-0002
Contact: Michael S. Newman, Vice President of Engineering
415-751-8845 FAX: 415-387-7201

CTI Installations Inc
2855 Highway 261
Newburgh, IN 47630
Contact: Ray R. Ryan, Pres
812-853-6374 FAX: 812-853-6652

Cablewave Systems
60 Dodge Ave
North Haven, CT 06473
Contact: Bill Meala, Sales
203-239-3311 FAX: 203-234-7718

Calg Laboratories, Inc.
16744 W. Bernardo Drive
San Diego, CA 92127-1904
Contact: Mark Lohkemper, Manager
619-451-1799 FAX: 619-451-2799

Calaway Engineering
165 E Sierra Madre
Sierra Madre, CA 91024
Contact: J L Calaway, Owner

California Digital
12131 London Grove Court
Moorpark, CA 93021
Contact: Paul Donahue, Owner
805-523-2310 FAX: 805-523-2310

California Microwave
990 Almanor Ave
Sunnyvale, CA 94086
408-720-6229

Cal Switch
13717 S Normandie Avenue
Gardena, CA 90249
Contact: Gayle Danielson

Calzone Case Co
225 Black Rock Ave
Bridgeport, CT 06605-1204
Contact: Joseph Calzone, III, President
203-367-5766 FAX: 203-336-4406

CanComm
15280 Blackberry Hill Road
Los Gatos, CA 95032
Contact: Eric Lane, President
408-354-4468 FAX: 408-395-1585

Capital Electronics Inc
425 Glenwood Avenue
Raleigh, NC 27603-1287
Contact: David Marlette, President
919-832-2811 FAX: 919-856-0421

Capitol Production Music
6922 Hollywood Blvd, Ste 718
Hollywood, CA 90028
Contact: Dave Carroll, Marketing Manager
800-421-4163 FAX: 213-461-1543

Carl E Smith Consulting Engrs
PO Box 807
Bath, OH 44210
Marketing Manager

Carl T. Jones Corporation
7901 Yarnwood Court
Springfield, VA 22153-2899
Contact: Donna Fabian, Facility Administrator
703-569-7704 FAX: 703-569-6417

Carolina Global Maps, Inc.
PO Box 8026
Greenville, NC 27835
Contact: Melinda Wall, General Manager
800-248-6277 FAX: 919-752-9155

Carroll Enterprises
PO Box 593
Cordova, TN 38018-0593
Contact: C R Carroll, President
901-386-2390

Cartridge Express
12814 Somerset Place
Chino, CA 91710
Contact: John Jackson, Owner
714-591-0944

Cartwright Communications
7812 Red Sky Drive
Cincinnati, OH 45249
Contact: Bill Cartwright, President
513-489-1755 FAX: 513-489-1449

Carvin Corp
1155 Industrial Ave
Escondido, CA 92025
619-747-1710

Catel Telecommunications Inc
4050 Technology Blvd
Fremont, CA 94537
Contact: Julie Latchford, Customer Svc
415-659-8988

Celwave
Route 79
Marlboro, NJ 07746
Contact: Steve Oldinger, Ad Mgr
201-462-1880 FAX: 201-462-6919

Central Tower Inc
2855 Highway 261
Newburgh, IN 47630
Contact: Terrence A. Becht, VP Marketing
812-853-0595 FAX: 812-853-6652

Champion Motor Coach Inc
5573 North St
Dryden, MI 48428
Contact: Paul Degrieck, Mktg Mgr

Charles S Wright
414 Star Hill Dr
Swansboro, NC 28584
Contact: Charles Wright, Professional Engineer

Chester Cable Div Celwave System
PO Drawer D
Chester, NY 10918
914-469-2141

Chuck Rancilio Assoc Inc
PO Box 28869
St Louis, MO 63123
Contact: Chuck Rancilio, Owner

Circuit Development Co
50 20th St
Brooklyn, NY 11232
Contact: Charles Sanfilippo, GM
718-768-4889 FAX: 718-768-3958

Circuit Doctors Inc
Box 358, 842 N. Summit Blvd
Frisco, CO 80443
Contact: R Michael King, President
303-668-3167 FAX: 303-668-1369

Chrontrol Corp
9707 Candida St
San Diego, CA 92126
Contact: Jim Durham, Vice President of Engineering
619-566-5656 FAX: 619-566-0140

Cirrus Technologies Inc
37 Main Street, Suite 4
Concord, MA 01742
Contact: Howard M. Crow, Jr., CEO & President
508-371-0483 FAX: 508-371-7360

Clarcom Computers
PO Box 131
Vandalia, IL 62471
Contact: Neil Clark

Clark Wire & Cable
1801 Holste Rd
Northbrook, IL 60062
Contact: Susan Clark, President
708-272-9889 FAX: 708-272-9564

Classical Music Syndication
478 North Main Street
Wallingford, CT 06492
Contact: Hastings Baker, CEO
203-269-1823

Clear-Com Intercoms
945 Camelia Street
Berkeley, CA 94710
Contact: Michael Goddard, National Sales Manager
510-527-6666 FAX: 510-527-6699

Clements Co
PO Box 1286
Carpinteria Beach, CA 93013
Contact: Jerry Clements, Pres
805-684-5415 FAX: 805-684-9316

Cliff Gill Enterprises
2884 Woodridge Circle
Carlsbad, CA 90292
Contact: Cliff Gill, President
714-927-8397 FAX: 714-927-1083

Cloud Nine BBS
13328 Firebrick Drive
Houston, TX 77041
Contact: David Armstrong

Coastcom Inc
2312 Stanwell Dr
Concord, CA 94520
Contact: E M Buttner

Coaxial Dynamics Inc
15210 Industrial Pkwy
Cleveland, OH 44135
Contact: John R. Ittel, Product Manager
216-267-2233 FAX: 216-267-3142

Cohen, Dippell & Everist, P.C.
1300 L St, NW, Suite 1100
Washington, DC 20005
Contact: Julius Cohen, President
202-898-0111 FAX: 202-898-0895

Coherent Communications
13756 Glenoaks Blvd
Sylmar, CA 91342
Contact: Ivan Kruglak
818-362-9393

Columbine Systems Inc
1707 Cole Blvd
Golden, CO 80401
Contact: Mike Oldham, Director, Sales & Marketing
303-237-4000 FAX: 303-237-0085

Comad Communications Ltd
1165 Monteagle Blvd
Belleville, ONT K8P 5G3 Canada
Contact: Emil Adamyk, President
613-969-1465 FAX: 613-969-0541

Comark Communications Inc
Rte 309 & Advance Lane
Colmar, PA 18915
Contact: Ellen J. Rainey, Manager, Corporate Communications
215-822-0777 FAX: 215-882-9129

Comex Worldwide Corporation
1645 NW 79th Avenue
Miami, FL 33126
Contact: Jack Rickel, President and CEO
305-594-0850 FAX: 305-591-7298

Commercial Radio Co
Duttonsville School Dr
Cavendish, VT 05142
Contact: Dan Churchill, GM
802-226-7582 FAX: 802-226-7738

Communications Data Services
6105-E Arlington Blvd
Falls Church, VA 22044
Contact: Rich Biby, President
703-534-0034 FAX: 703-534-7884

Communications General Corp.
2685 Alta Vista Drive
Fallbrook, CA 92028-9683
Contact: Robert Gonsett, President
619-723-2700 FAX: 619-723-4000

Communications Technologies
PO Box 1130
Marlton, NJ 08053
Contact: Clarence Beverage, President
609-985-0077 FAX: 609-985-8124

Competition Specialties
723 E. Fesler Street
Santa Maria, CA 93454-4515
Contact: Jim Mussell

Comprompter Inc
141 South 6th St
La Crosse, WI 54601
Contact: Ralph King, Pres
608-785-7766 FAX: 608-782-4674

Compucan
251 West Renner Road
Richardson, TX 75080
Contact: Michele Geopferick

Computer Concepts Corp
8375 Melrose Dr
Lenexa, KS 66216
Contact: Richard Habedank, Sales Manager
800-255-6350 FAX: 913-541-0169

Computer Concepts - Intl Div.
PO Box 2826
College Station, TX 77841
Contact: Stephen S. Sampson, Director
409-268-7441 FAX: 409-268-7751

Comrex Corp
65 Nonset Path
Acton, MA 01720
Contact: Lynn Distler, VP Sales
508-263-1800 FAX: 508-635-0401

Comsearch Inc
11720 Sunrise Valley Dr
Reston, VA 22091
Contact: Jerry Schulman, Mktg Mgr
703-620-6300

ComStream Corporation
10180 Barnes Canyon Road
San Diego, CA 92121
Contact: Andy Paul, Vice President Sales
619-458-1800 FAX: 619-453-8953

Comtech Antenna Systems
3100 Communications Rd
St Cloud, FL 34769
Contact: Thomas C. Christy, VP of Marketing
407-892-6111 FAX: 407-957-3402

Comtech Data
350 N Hayden Rd
Scottsdale, AZ 85257
Contact: Ray Kelsey, Dir Mky

Concept Productions
1224 Coloma Way
Roseville, CA 95661
Contact: Dick Good, Sales Mgr
916-782-7754 FAX: 916-786-8304

Concept Unlimited
9311 San Padro, Suite 1060
San Antonio, TX 78216
Contact: Dave Rettinger

Conex Electro-Systems Inc
PO Box 1342
Bellingham, WA 98227
Contact: Bill Hamelin, Sales Engineer
800-645-1061 FAX: 206-676-4822

Connector Distribution
2985 East Harcourt St
Rancho Dominguez, CA 90221
Contact: Judy Vallette, Sales Manager
301-632-2466 FAX: 301-632-5431

Connectronics Corp
652 Glenbrook Rd
Stamford, CT 06906
Contact: Richard Chilvers, President
203-324-2889 FAX: 203-326-7027

Connect Systems Inc
23731 Madison St
Torrance, CA 90505
Contact: Kirk Mckloren
213-373-6803

Consulting Radio Engineer
PO Box 1888
Carson City, NV 89702
Contact: D.C. Williams, P.E.
702-885-2400 FAX: 702-885-8705

Consultronics
269 Portage Road
Lewiston, NY 14092-1710
Contact: Ron Evans

Continental Electronics Corp.
PO Box 270879, 4212 S. Buckner Blvd
Dallas, TX 75227
Contact: Steve Claterbaugh, Advertising/Sales Promotion
214-381-7161 FAX: 214-381-4949

Control Concepts Corp
PO Box 1380
Birmingham, NY 13902-1380
607-724-2484

Control Technology Inc
2950 SW 2nd Ave
Ft Lauderdale, FL 33315
Contact: James C. Woodworth, President
305-761-1106 FAX: 305-764-3298

Cooper Industries/Belden Div
PO Box 1980
Richmond, IN 47375
Contact: John L. Hitch, Mktg Communications Mgr
800-BELDEN-1 FAX: 317-983-5294

Cool-Amp Conducto-Lube Co
15834 Upper Boones Ferry Road
Lake Oswego, OR 97035
Contact: Jeanne McKinney, Secretary
503-624-6426 FAX: 503-624-6436

Corporate Computer Systems
33 West Main Street
Holmdel, NJ 07733
Contact: David Lin, Product Manager
908-946-3800 FAX: 908-946-7167

Cortana Corporation
5412 Hwy. 64 E, PO Box 2548
Farmington, NM 87499-2548
Contact: David Stockmar, Vice President
505-325-5336 FAX: 505-326-2337

Cortland Cable Co
PO Box 330, 177 Port Watson St
Cortland, NY 13045-0330
Contact: John J. Dower, President
607-753-8276 FAX: 607-753-3183

Countryman Associates Inc
417 Stanford Ave
Redwood City, CA 94063
415-364-9988

Creative Support Services
1950 Riverside Dr
Los Angeles, CA 90039
Contact: Mike Fuller, Owner
800-468-6874 FAX: 213-660-2070

Cremio Inc
1600 Fourth Avenue NW
Rochester, MN 55901
Contact: Dan Estes

Crouse-Kimzey Company
P.O. Box 155999
Fort Worth, TX 76155-0999
Contact: Mark Bradford, General Manager
817-283-7700 FAX: 817-283-8133

Crouse-Kimzey of Annapolis
P.O. Box 6300
Annapolis, MD 21401-0300
Contact: Kathleen Karas, Branch Manager
410-757-6100 FAX: 410-757-6666

Crown International Inc
1718 W Mishawaka Rd
Elkhart, IN 46517
219-294-8000 FAX: 219-294-9329

Current Technology
101 West Buckingham Road
Richardson, TX 75081
Contact: Martin Sandy Sandberg, Broadcast Sales Manager
214-238-5300 FAX: 214-238-0911

Cutting Edge Technologies
2501 W 3rd St.
Cleveland, OH 44113
Contact: Joseph Foti, Vice President
216-241-3343 FAX: 216-621-2801

D

D1 Products Inc
95 E Main St
Huntington, NY 11743
Contact: B Kutny
516-673-6866 FAX: 516-673-6893

D & R Electronics USA
Rt 3, Box 184-A
Montgomery, TX 77356
Contact: Paul Westbrook, President
409-588-3411

Dace
3890 Willow Crest Ave, #4
North Hollywood, CA 91604
Contact: William Paul, Engineer

DB Engineering
29863 Wisteria Valley Road
Canyon Country, CA 91351
Contact: David Partolone, Engineer

dbx Professional Products
1525 Alvarado Street
San Leandro, CA 94577
Contact: David Roudebush, Mktg Mgr
510-351-3500 FAX: 510-351-0500

D.L. Markley & Associates
2104 West Moss Avenue
Peoria, IL 61604
Contact: D.L. Markley, President/Consultant

D N Latus & Co Inc
PO Box 1720
Helena, MT 59624
Contact: D. N. Latus, President
406-442-3940

DDA
200 Sea Lane
Farmingdale, NY 11735
Contact: Sam C Spennacchio, National Sales Manager
516-249-3660 FAX: 516-420-1863

DGI Communications
627 Boulevard
Kenilworth, NJ 07033
Contact: Fred D'Alessandro

DHK Group (Macro Media/Audisk)
170 S. Dawson Drive
Camarillo, CA 93010
Contact: Larry Baley, Partner
805-484-8260 FAX: 805-482-3268

DMF
53 Park Ridge Lane
Pittsburgh, PA 15228
Contact: Mathew Barr

DYMA Engineering Inc
Box 1535
Los Lunas, NM 87031
Contact: Wally Cunningham, VP
505-865-6700

Da-Lite Screen Co Inc
PO Box 137
Warsaw, IN 46580
219-267-8101

Dameron Communications Service
4364 Great Oak Drive
N. Charleston, SC 29418
Contact: Griffin Dameron

Data For Small Systems
2020 Pennsylvania Ave
Washington, DC 20006
Contact: Rich Pomeroy
703-276-9442

Datatek Corp
1121 Bristol Rd
Mountainside, NJ 07092
Contact: Rick Rainey, Sales Manager
201-654-8100 FAX: 201-232-6381

Dataworld
PO Box 30730
Bethesda, MD 20824
Contact: John L. Neff, President
800-368-5754 FAX: 301-656-5341

Datel Corporation
1515 North Court House Road
Arlington, VA 22201
Contact: William Meintel, Broadcast Consultant
703-276-9007 FAX: 703-276-9008

Datum Inc
1363 S State College Blvd
Anaheim, CA 92805
714-533-6333

Dave Gorman Consulting
PO Box 401
Dublin, PA 18917
Contact: Dave Gorman

Davilyn Corp
13406 Saticox St
N Hollywood, CA 91605
Contact: Vince Diguilio, Sales
818-787-3334 FAX: 818-787-4732

Dayton Industrial Corp
4411 Bee Ridge Road, #319
Sarasota, FL 34233
Contact: Don Roetele, Consultant

Delta Electronics Inc
5730 General Washington Dr
Alexandria, VA 22312
Contact: Barth Pitchford, Sales/Design Engineer
703-354-3350 FAX: 703-354-0216

Delta Lab Research Inc
1 Progress Way
Wilmington, MA 01887
Contact: Jim Camacho, Ad Mgr

Denon America Inc
222 New Road
Parsippany, NJ 07054
Contact: Laura Tyson, Sales Manager
201-575-7810 FAX: 201-808-1608

Deremer Radio
33 Main Street
Seward, NE 68434
Contact: William Hohnstein, Owner
402-643-3338

Dic Digital
222 Bridge Plaza South
Fort Lee, NJ 07024
Contact: Kevin Kennedy, National Marketing Manager
201-224-9344 FAX: 201-224-9363

Dictaphone Corp
3191 Broadbridge Avenue
Stratford, CT 06497
Contact: Lorna Guarascio

Dielectric Communications
Tower Hill Rd
Raymond, ME 04071
Contact: Colleen Mitchell, Dir Marketing Services
207-655-4555 FAX: 207-655-4669

Digidesign
1360 Willow Road, Suite 101
Menlo Park, CA 94025
Contact: Eric Bonetti, Mktg Admin
415-688-0616 FAX: 415-327-0777

Digital Audio Tape Store
2624 Wilshire Blvd
Santa Monica, CA 90403
Contact: Brad Schneider

Digital Broadcast Associates
826 N. Victory Blvd
Burbank, CA 91502
Contact: Ron DeBry, President
818-567-2873

Digital Broadcast Systems Inc
184 Mechanic St
Southbridge, MA 01550
Contact: Richard LaVallee, President
508-764-4386 FAX: 508-764-4387

Digital Domain
309 East 90th Street, Suite B
New York, NY 10128
Contact: Bob Katz, President

Digital Management Systems
2714 Sapling Drive
Allison Park, PA 15101
Contact: Ed Deheart

Digital Recorders
P.O. Box 14068
Resrch Triangle Pk, NC 27709-4068
Contact: Joanne Alpiser, Senior Account Manager
800-222-9583 FAX: 919-361-2947

Digitech, div. of DOD Elect.
5639 South Riley Lane
Salt Lake City, UT 84107
Contact: Ferdinand Boyce, VP Marketing
801-268-8400 FAX: 801-262-4966

Di-Tech Inc
48 Jefryn Blvd
Deer Park, NY 11729
Contact: Anthony Bolletino, Dir of Mktg
516-667-6300 FAX: 516-595-1012

Diversified Communications
9139 PA Rte 18
Cranesville, PA 16410
Contact: Richard Pogson, Owner
814-756-3053

Diversified Interests
900 E Birch Drive
Gulfpart, MS 39503
Contact: Kim Campbell

Divisional Supply
124 Broadway, Suite #D
Costa Mesa, CA 92627
Contact: Dennis Barela

Dolby Laboratories Inc
100 Potrero Ave
San Francisco, CA 94103
Contact: Kevinn Tam, Bdcst Tech Mgr
415-558-0200 FAX: 415-863-1373

Domain Communications
289 Main Place
Carol Stream, IL 60188
Marketing Manager

Donald S. Smith Associates
PO Box 1545
Whittier, CA 90609
Contact: Donald S. Smith, President

Dorrough Electronics
5221 Collier Pl
Woodland Hills, CA 91364
Contact: Kay Dorrough, Partner
818-999-1132 FAX: 818-998-1507

Doug Vernier Broadcast Cslt
1600 Picturesque Dr
Cedar Falls, IA 50813
Contact: Doug Vernier, Pres
319-266-8402 FAX: 319-273-6402

Drake-Chenault, div Bdct Prog.
2211 Fifth Avenue
Seattle, WA 98121
Contact: John Carlile, VP/Sales & Marketing
800-426-9082 FAX: 206-441-6582

duTreil, Lundin & Rackley, Inc
1019 19th St, NW, Suite 300
Washington, DC 20036
Contact: L. Robert duTreil, President
202-223-6700 FAX: 202-466-2042

Dyma Engineering
152 La Mirada
El Paso, TX 79932
Marketing Manager

Dynacom
4100 Industrial Avenue
Lincoln, NE 68504-1105
Marketing Manager

Dynacord
200 Sea Lane
Farmingdale, NY 11735
Contact: Sam Spennacchio, Marketing Manager
516-249-3660 FAX: 516-420-1863

Dynair Electronics
5275 Market St
San Diego, CA 92114
Contact: Jesse Blount, Jr., VP, Sales & Marketing
619-263-7711 FAX: 619-264-4181

Dynatech Broadcast
6400 Enterprise Lane
Madison, WI 53719
Contact: Chuck Soholdt, Ad Mgr
FAX: 703-550-7560

E

ECS International Inc
PO Box 330607
Ft Worth, TX 76163
Contact: Dick Townsend, Mgr Bdct Div
817-483-8497 FAX: 817-572-2242

EEG Enterprises Inc
1 Rome St
Farmingdale, NY 11735
516-293-7472

EEV
4 Westchester Plaza
Elmsford, NY 10523
Contact: Perry Priestley, Sales Manager
914-923-1752 FAX: 914-682-8922

EG & G Inc
35 Congress St
Salem, MA 01970
Contact: George Mandeville

EIMAC Div of Varian
48 Campbell Lane
Menlo Park, CA 94025
Contact: W Orr, Adv Mgr

EMCEE Broadcast Products
PO Box 68
White Haven, PA 18661
717-443-9575

ERI Installations
108 Market Street
Newburgh, IN 47630
Contact: Max Brown, Director, Installations
818-853-3318 FAX: 818-858-5709

ESE
142 Sierra St
El Segundo, CA 90245
Contact: Brian Way, Mktg Mgr 310-322-2136 FAX: 310-322-8127

Eagle Hill Electronics Inc
Rt 2 Box 354
Chestertown, MD 21620
Contact: William H Johnson, President
301-778-3240

Eastern Acoustics
1 Main Street
Whittensville, MA 01588
Contact: Kenneth Berger

Econco
1318 Commerce Ave
Woodland, CA 95695
Contact: Debbie Storz, Sales
800-532-6626 FAX: 916-666-7760

Edge Technology Group Inc
1292 Acapulco Avenue
Simi Valley, CA 93065-4003
Contact: Lance Korthals, President

E Harold Munn, Jr & Associates
P.O. Box 220
Coldwater, MI 49036
Contact: E Harold Munn Jr., President
517-278-7339 FAX: 517-278-6973

Elcom Bauer
6199 Warehouse Way
Sacramento, CA 95826
Contact: Paul Gregg, Pres
916-381-3750 FAX: 916-381-4332

Electrex Co
18620 NE 2nd Ave
Miami, FL 33179
Contact: Ben Ostrovsky, Pres
305-651-5752 FAX: 305-654-1386

Electro Impulse Laboratory Inc
1805 Corlies Avenue, P.O. Box 278
Neptune, NJ 07754-0278
Contact: Mark Rubin, President
908-776-5800 FAX: 908-776-6793

Electro-Voice Bdct & Prod Pdct
600 Cecil St
Buchanan, MI 49107
Contact: Rick Sanchez, Bdct & Prod. Marketing Manager
800-877-1771 FAX: 818-444-1342

Electrodenics
PO Box 333
Comack, NY 11725
Contact: Matt Kruger

Electronic Equipment Bank
323 Mill St., NE
Vienna, VA 22180
800-368-3270 FAX: 703-938-6911

Electronic Industries
19 E. Irving Avenue
Oshkosh, WI 54902
Contact: Gordon Dailey, Bdct Sales
414-235-8930 FAX: 414-235-4233

Electronic Research
108 Market St
Newburgh, IN 47630
Contact: Bill Elmer, VP Sales
812-853-3318 FAX: 812-858-5706

Electronic Specialty
135 N Illinois St
Springfield, IL 62702
Contact: Ed Davison

Electronic Systems Labs
3911 SW 47th Avenue, Suite 906
Ft Lauderdale, FL 33314
Contact: Lutz Meyer, President

Electronics Diversified Inc
1675 Northwest 216th Ave
Hillsboro, OR 97124
503-645-5533

Electrotechnics
PO Box 953
Seattle, WA 98111
Contact: David Ziskin, Pres

Elenos, Inc
73 Oak St
Plymouth, MA 02360
Contact: Renato Carpeggiana
508-830-0448 FAX: 508-747-4696

Ellcon
417 S Associated Road, #A-313
Brea, CA 92621
714-870-6647

Ellason Weather Radar
747 Spirit of St. Louis Blvd
Chesterfield, MO 63005
Contact: Bill Ellason, President
314-532-3031 FAX: 314-532-3414

Emcor Products/Crenlo Inc
1600 4th Ave, NW
Rochester, MN 55901
Contact: Tom Regnier, Advertising Coordinator
507-289-3371 FAX: 507-287-3405

Emergency Alert Receiver Inc
PO Box 20629
New York, NY 10025
Contact: Jack Bergman, President
212-695-4767

Emphasys Software
9855 W 78th St, Suite 240
Prairie, MN 55344
Contact: Jeanneane R Swenson, Marketing Secretary

Enberg Electronics
PO Box 55087
Indianapolis, IN 46205
Contact: Mike Ringenberger, Pres
317-253-3866

Energy-Onix
752 Warren Street
Hudson, NY 12534
Contact: Ernest A. Belanger, VP Marketing
518-828-1690 FAX: 518-828-8476

Enterprise Systems Group Inc.
5475 Tech Center Drive
Colorado Springs, CO 80919
Contact: George T. Beattie, Senior Vice President
719-548-1800 FAX: 719-548-1818

Entrack Corp
80 1/2 Kinnaird Street
Cambridge, MA 02139-3153
Contact: Steve Krampf, President

Environmental Technology Inc
1302 High St
South Bend, IN 46618
Contact: John Petty, Marketing Manager
219-233-1202 FAX: 219-233-2152

Equipment Mint
39607 Embarcadero Terrace
Fremont, CA 94538
Contact: John Shell

Equipto Electronics Corp
351 Woodlawn Ave
Aurora, IL 60506-9988
312-897-4691

Eric Neil Angevine Consulting
910 Lakeridge Drive
Stillwater, OK 74075
Contact: Eric Neil Angevine, P.E.

Erico Products
34600 Solon Road
Cleveland, OH 44139
Contact: Barry Gregg, Marketing Services

Erko Technologies
7610 Burlington St
Omaha, NE 68127
Contact: Larry Martin, Owner
402-331-2632 FAX: 402-592-5320

Ethereal Concepts
210 Golden Gate Dr
Dayton, OH 45459
Contact: Lonnie Domnitz, Owner

Evans Antenna Service
P.O. Box 29
Kimbolton, OH 43749
Contact: Ron Evans, Owner

Evans Sales & Marketing
509 A Ligon Drive
Nashville, TN 37204
Contact: Sales Manager

Eventide Inc
One Alsan Way
Little Ferry, NJ 07643
Contact: Gil Griffith, Sales Manager
201-641-1200 FAX: 201-641-1640

Excalibur Electronics
4604 Sand Rock Ln
Chantilly, VA 22021-2468
Contact: Bill Ashley, VP

Excalibur Industries
PO Box 1029
Los Angeles, CA 90078
Contact: John Gresch

Exchange National Funding
2425 N Central Expressway, #241
Richardson, TX 75080
Contact: Charles Shore

The Express Group
3518 3rd Ave
San Diego, CA 92103
Contact: Byron Andrus, President
619-298-2834 FAX: 619-298-4143

Express Tower Co Inc
PO Box 143
Big Cabin, OK 74332
Contact: Dyke A Dean, Mktg Dir
918-783-5129 FAX: 918-783-5590

F

FM Construction Co
421 S Second St, Suite 500
Elkhart, IN 46516
Contact: Carl Tiedemann
219-522-1652

F M Systems Inc
3877 South Main St
Santa Ana, CA 92707
Contact: Frank McClatchie, President
800-235-6960 FAX: 714-979-0913

FM Technology Assoc Inc
30925 Vista View
Mount Dora, FL 32757
Contact: Howard Enstrom, President
904-383-3682 FAX: 904-383-4077

FMX Stereo/BTP
2017 Fox Glen Court
Bloomfield Hills, MI 48304-1007
Contact: Lou Raymo, Director

Fiberbilt Cases
601 West 26th St
New York, NY 10001
Contact: Paul Lownan, Sales Mgr
800-847-4176 FAX: 212-691-5935

Fidelipac Corp
97 Foster Road, PO Box 808
Moorestown, NJ 08057
Contact: Scott Martin, Dir of Sales
609-235-3900 FAX: 609-235-7779

Film House Inc
230 Cumberland Bend
Nashville, TN 37228
Contact: Wayne Campbell, VP of Marketing
615-255-4000 FAX: 615-256-3380

First Atlantic Group, Inc.
PO Box 941888
Maitland, FL 32794-1888
Contact: Don Scheib, President
407-578-2000 FAX: 407-290-1632

First Light Video Publishing
8536 Venice Boulevard
Los Angeles, CA 90034
Contact: Rosemary Guthrie, Vice President of Sales
213-558-7880 FAX: 213-558-7891

Fitz Sound Co
912 N Midkiff
Midland, TX 79701
Contact: Mike Fitz-Gerald, Owner
915-684-0861

Flash Technology Corp of Amer.
55 Lake St
Nashua, NH 03060
Contact: George J. Mandeville, Jr., VP Sales
603-883-6500 FAX: 603-883-0205

John Fluke Mfg Co Inc
PO Box C9090
Everett, WA 98206
206-356-5293

Focal Press Broadcasting Pubs.
80 Montvale Ave
Stoneham, MA 02180
Contact: Bill Lahey, National Sales Mgr
800-366-BOOK FAX: 617-279-4851

Formost Corporation
2025 Hamburg Turnpike
Wayne, NJ 07470
Contact: Bill Formosa, President

Fort Worth Tower Co Inc
PO Box 8597
Fort Worth, TX 76124
Contact: Roy Moore, Vice President
800-433-1816 FAX: 817-429-6010

Mel Foster Tech Sales, Inc
7611 Washington Ave So
Edina, MN 55434
Contact: Sales Mgr

Fostex Corp of America
15431 Blackburn Ave
Norwalk, CA 90650
Contact: Rick Cannata, Product Specialist
310-921-1112 FAX: 310-802-1964

Fran Dym Communications
211 E 43rd St, Suite 2303
New York, NY 10017
Contact: Fran Dym, President

Frankford Wayne Mastering
1697 Broadway, Suite 1404
New York, NY 10019
Contact: Carol Steele, Sales Manager
212-582-5473 FAX: 212-245-2309

Frederick L. Spaulding, P.E.
883 San Simeon Drive
Mountain View, CA 94043
Contact: Fred Spaulding, President

Freeland Products Inc
75412 Hwy 25
Covington, LA 70433
Contact: Joseph H. Freeland, President
504-893-1243 FAX: 504-892-7323

Frese Software
656 N Miller Avenue
Wenatchee, WA 98801-2044
Contact: Glen Frese

Full Compass Systems
5618 Odana Rd
Madison, WI 53719-1208
Contact: Jonathan Lipp, President
608-271-1100 FAX: 608-273-6336

Fuller Sound
1948 Riverside Dr
Los Angeles, CA 90039
Contact: Mike Fuller

Funke & Associates
908 Marilyn Dr
Campbell, CA 95008
Contact: Sonny Funke, Applications Engineer
800-748-6308 FAX: 408-866-1975

Furman Sound Inc
30 Rich St
Greenbrae, CA 94904
Contact: Joe Desmond, National Sales Manager
415-927-1225 FAX: 415-927-4548

Fusion Electronics Inc
15 Main St, PO Box 170
East Rockaway, NY 11518
Contact: Sid Sussman, Executive Vice President
800-645-2300 FAX: 516-599-6495

G

G & M Power Products Inc
943 N Orange Dr
Los Angeles, CA 90038
213-850-6800

GBC Electronics
125 Birch Street
Blountville, TN 37617
Contact: Bruce Cooke, Owner
615-323-2976 FAX: 615-323-2976

GBS-Giesler Broadcasting Sply
5914 Maple
Houston, TX 77074
Contact: Bernie Giesler, President
713-774-3314 FAX: 713-774-1306

GE American Communications
Four Research Way
Princeton, NJ 08540
Contact: Andreas Georghiou, Dir. Bdct & Business Services

GKM Mfg Corp
47 Bridgewater St
Brooklyn, NY 11222
Contact: John D'Augelli, General Manager
718-388-4114 FAX: 718-384-1325

GML, Inc.
7821 Burnet Avenue
Van Nuys, CA 91405
Contact: Mr. Cary Fischer, Vice President
818-781-1022 FAX: 818-781-3828

Gaines Audio
1237 E. Main Street
Rochester, NY 14609
Contact: Jon Gaines, Owner
800-442-0780

Gannon Associates
210 W Front St
Redbank, NJ 07701
Contact: Jim Corridon

Garner Industries
4200 N 48th St
Lincoln, NE 68504
Contact: Brad Osthus, Product Sales
402-464-5911 FAX: 402-464-6960

Gefen Systems
6261 Variel Avenue, #C
Woodland Hills, CA 91367
Contact: Hagai Gefen, President
800-545-6900 FAX: 818-884-3108

Gemini Electronic Marketing
111 Elm St
Edmonds, WA 98020
Contact: Sales Mgr

General Broadcast Supply Inc.
PO Box 372
Eureka Springs, AR 72632
Contact: T.S. Butler, President
501-253-8127 FAX: 501-253-6151

Generic Computer Systems
357 N Main St
Butler, PA 16001
412-283-1500

Gentner Communications Corp.
1825 Research Way
Salt Lake City, UT 84119
Contact: Elaine Jones, Business Unit Manager-Broadcast
801-975-7200 FAX: 801-977-0087

Gepco International Inc
2225 West Hubbard
Chicago, IL 60612-1613
Contact: Larry Smith, Senior Marketing Manager

Gerstmann Software, Wireready Div
PO Box 2356
Framingham, MA 01701
Contact: David Gerstmann, President
800-833-4459 FAX: 508-443-5812

Ghielmetti Inc
30961 Agoura Road, #309
Westlake Village, CA 91361-4618
Contact: Rick Ordorfer, Sales Engineer

Gibraltar Digital Systems
4125 S W Martin Highway
Palm City, FL 33490
Contact: D.S. Dayton, President

Gold Line Connector Inc.
Box 500
West Redding, CT 06896
Contact: Marj Miller, VP Sales
203-938-2588 FAX: 203-938-8740

Gorman-Redlich Mfg Co
257 W Union St
Athens, OH 45701
Contact: Jim Gorman, Owner
614-593-3150 FAX: 614-592-3898

Gotham Audio Corp
1790 Broadway 8th Fl
New York, NY 10019
Contact: Russ Hamm, President
212-765-3410 FAX: 212-265-8459

Graham-Patten Systems
13451 Colfax Hwy, PO Box 1960
Grass Valley, CA 95945
Contact: Tim Prouty
916-273-8412

Ronald J. Grandmaison, P.E.
11213 Split Rail Ln
Fairfax Station, VA 22039
Contact: Ronald J Grandmaison, President
703-764-0513

Grass Valley Group Inc
Box 1114
Grass Valley, CA 95945
Contact: Jay Cook, Advertising Manager
916-478-3000 FAX: 916-478-3187

Gray Audio
1451 E Farmington Avenue
Farmington, CT 06032
Contact: Bobby Gray

R Griffin & Assoc
133 W 19th
New York, NY 10111
Contact: Robert Griffin, Pres

Group One Ltd.
200 Sea Lane
Farmingdale, NY 11735
Contact: Jack Kelly, President
516-249-3660 FAX: 516-420-1863

James Grunder & Assoc Inc
5925 Beverly
Mission, KS 66202
Contact: Amy Flickinger, Advertising Manager
913-831-0188 FAX: 913-831-3427

Guarantee Radio Supply
1314 Iturbide St
Laredo, TX 78040
Contact: M Flores/A Robledo, Pres
512-723-6913 FAX: 512-727-8458

H

HM Electronics Inc
6675 Mesa Ridge Rd
San Diego, CA 92121
Sales Manager
619-535-6060 FAX: 619-452-7207

Halcom
10997 S W 113th Place
Miami, FL 33176
Contact: R Chauvet, President

Hal Communications
PO Box 365
Urbana, IL 61801
Contact: Ken Sartain, Mktg Mgr

Halland Broadcast Services Inc
1289 E. Alosta Avenue
Glendora, CA 91740
Contact: Steve Steinberg, General Manager
818-963-6300 FAX: 818-963-2070

Hall Electronics
1305-F Seminole Drive
Charlottesville, VA 22901
Contact: Jon Hall, President
804-974-6466 FAX: 804-974-6450

Mart Haller Inc
PO Box 140159
Coral Gables, FL 33114-0159
Contact: Edwin P Haller, President
305-444-4617 FAX: 305-445-7551

Hallikainen & Friends Inc
141 Suburban Rd
San Luis Obispo, CA 93401
Contact: Harold Hallikainen, Pres
805-541-0200 FAX: 805-544-6715

Hammett & Edison, Inc
PO Box 280068
San Francisco, CA 94128
Contact: William Hammett, Managing Director
415-342-5200 FAX: 415-342-8482

Hamtronics, Inc.
65 Moul Rd
Hilton, NY 14468-9535
Contact: Jerry Vogt, President
716-392-9430 FAX: 716-392-9420

C.B. Hannay & Son, Inc.
600 East Main Street
Westerlo, NY 12193
Contact: Edward A. Rash, Advertising Manager
518-797-3791 FAX: 800-REELING

Harman International
8500 Balboa Blvd
Northridge, CA 91329
Contact: Mike Budd, VP Manufacturing

Harmon's Tower Service
435B Broadway
Columbus, GA 31901
Contact: Al Harmon, Pres
404-327-1074

Harris Allied — Quincy, Illinois
(Manufacturing; Parts; RF Service; Training; Radio Studio and RF Systems)
3200 Wismann Lane, PO Box 4290
Quincy, Illinois 62305-4290

North American Field Sales
Contact: Gaylen Evans
217-222-8200, Ext. 3110
FAX: 217-224-1439

Radio RF Service
217-222-8200, Ext. 3528
FAX: 217-222-9443

Parts Department
217-222-8200, Ext. 3500
FAX: 217-224-2840

Training
217-222-8200, Ext. 3508
FAX: 217-222-9299

Systems: Studio and RF
Contact: Chuck Rockhill
217-222-8290 FAX: 217-224-2764

Harris Allied — Richmond, Indiana
(Radio Studio and Satellite Equipment Sales; Equipment Exchange; Distributed Products Technical Service)
3712 National Road West
PO Box 1487
Richmond, Indiana 47375

Broadcast Center (Radio Sales)
Contact: Tom Harle
1-800-622-0022 FAX: 317-966-0623

Satellite Sales
Contact: Jeff Nordstrom
317-962-8596 FAX: 317-962-8961

Distributed Products Service
317-962-8596 FAX 317-962-8961

Equipment Exchange
635 South E Street
Richmond, Indiana 47374
317-962-1471 FAX: 317-966-6321

Harris Allied Systems — Highland Heights, Kentucky
(Fixed and Mobile Production and Satellite Systems)
Four Tesseneer Drive
Highland Heights, Kentucky 41076
Contact: Jay C. Adrick
606-572-6880 FAX: 606-781-3987

Harrison by GLW
437 Atlas Drive
Nashville, TN 37211
Contact: Tom Irby, Vice President/General Manager
615-331-8800 FAX: 615-331-8883

Hartmann Associates
5 Nestlingwood Dr
Long Valley, NJ 07853
Contact: A David Hartmann, Pres
201-850-3750 FAX: 201-850-3751

Harvey Smith & Associates
1607 Palmer
Pueblo, CO 81004
Contact: Harvey Smith, President

Hatfield & Dawson Consult Engr
4226 Sixth Ave, NW
Seattle, WA 98107
Contact: Benjamin F. Dawson, Marketing Manager
206-783-9151 FAX: 206-789-9834

Hedco
825K Greenbrier Circle
Chesapeake, VA 23320
Contact: John Walter, President/General Manager
804-424-7920 FAX: 804-424-0639

Karl Heitz Inc
34-11 62nd Street
Woodside, NY 11377
Contact: Esther Conde, Marketing Manager
718-565-0004 FAX: 718-565-2582

Henry Engineering
503 Key Vista Dr
Sierra Madre, CA 91024
Contact: Hank Landsberg, Owner
818-355-3656 FAX: 818-355-0077

Hnat Hindes Inc
42 Elaine St, RR 1
Thompson, CT 06277
Contact: Bonnie Hnat
203-935-9066

Holaday Industries Inc
14825 Martin Dr
Eden Prairie, MN 55344
Contact: Michael Leighton, Sales
612-934-4920 FAX: 612-934-3604

Holzberg Inc
PO Box 323
Sea Bright, NJ 07760
Contact: Herb Holzberg, President
800-242-7298 FAX: 908-842-7552

Houston International Teleport
3003 Moffit Lane
Missouri City, TX 77489
Contact: Anna Sterling, Admin Assist

Hughey & Phillips Inc
PO Box 2167
Simi Valley, CA 93062
Contact: Peter H. Johnson, Vice President
805-581-5591 FAX: 805-581-5032

Huntington Corporate Center
35 Pinelawn Road
Melville, NY 11742
Contact: Richard Schops, Saxx Advertising

Huntsville Antenna Engineering
1301 Central Pkwy SW
Decatur, AL 35601
Contact: Ken Casey

Hybrid Arts
8522 National
Culver City, CA 90232
Contact: Dana Byrd, Ad & PR Manager
213-841-0340 FAX: 213-841-0348

Hy James Inc
24166 Haggerty Road
Farmington Hills, MI 48335
Contact: Henry J. Root, Pres
313-471-0027 FAX: 313-471-2611

I

IBSS Ltd.
Box 303
Binbrook Ontario, Canada
Contact: Rob Meuser, Technical Director
416-692-3330 FAX: 416-692-4033

ICB Audio
2036 Reading Road
Cincinnati, OH 45202
Contact: John Baylis, Manager
513-651-0800 FAX: 513-651-0828

IDB Communications Group, Inc
10525 W. Washington Blvd
Culver City, CA 90232
Contact: Julie Spira, President, Audio Sales
213-870-9000 FAX: 213-838-6374

IER (Industrial Equip Reps.)
1685 Precision Park Lane, #E
San Diego, CA 92173
Contact: Alex Rodriguez, VP of Operations
619-428-2261 FAX: 619-428-3483

IFR Systems Inc
10200 West York St
Wichita, KS 67215
Contact: Thomas G. Dideum, Marketing Manager
316-522-4981 FAX: 316-524-2623

IGM Communications
4041 Home Road
Bellingham, WA 98226
Contact: Carl Peterson, Dir Bdct Sales/Mktg
206-733-4567 FAX: 206-734-7939

ITC (International Tapetronics Corp)
2425 S Main St, P.O. Box 241
Bloomington, IL 61702-0241
Contact: Jim Woodworth, Sales Manager
800-447-0414 FAX: 309-828-1386

ITS Corporation
375 Valley Brook Rd
McMurray, PA 15317
Contact: Robert M. Unetich, President
412-941-1500 FAX: 412-941-4603

ITT Jennings
970 Mclaughlin Avenue
San Jose, CA 95122
Contact: E.V. Valehrach, Director of Marketing
408-292-4025 FAX: 408-286-1789

ITW Switches/II Toolworks Co
6615 W Irving Pk Rd
Chicago, IL 60634
Contact: Rick Magnuson, Mktg Mgr Swtrs/Sys

Ice Krackers
273 Circle Drive
Springfield, IL 62703
Contact: Jim Newbanks

Image Devices Inc
1825 NE 149th St
Miami, FL 33181
Contact: Bill Reiter, Mktg Mgr

Industrial Acoustics Co
1160 Commerce Ave
Bronx, NY 10462
212-931-8000

Industrial Components Corp
61 Birch Lane
Brewster, MA 02631-2114
Contact: Stephen Welch, Pres

Informotion
2715 Electronic Ln
Dallas, TX 75220
Contact: Woody Taylor, VP

Inmark Corp
38 Brushwood Rd
Stamford, CT 06903
Contact: Lars Giers

Innovative Automation
3316 19th Ave SE
Rio Rancho, NM 67124
Contact: Don Prentice, Pres
505-891-0501

Inovonics Inc
1305 Fair Ave
Santa Cruz, CA 95060
Contact: James B Wood, President
408-458-0552 FAX: 408-458-0554

Intergrated Media Systems
1370 Willow Road, Suite 201
Menlo Park, CA 94025
Contact: Theresa Smith

Interface Electronics
6710 Alder
Houston, TX 77081
Contact: Louis Stevenson

International Broadcast Supply
2450 N Powerline Rd K #12
Pompano Beach, FL 33069-1051
Contact: Jorge Bicocchi, President

International Cinema Eq Co
6750 NE 4th Ct
Miami, FL 33138
Contact: S Krams

International Crystal
PO Box 26330
Oklahoma City, OK 73126
Contact: Royden Freeland, President
405-236-3741 FAX: 405-235-1904

Intl Electro-Magnetics
350 North Eric Drive
Palatine, IL 60067
Contact: Tony Pretto, President
800-227-4323 FAX: 708-358-4623

International Magnetics
4411 Red Maple Ct
Concord, CA 94521
Contact: Bob Kearns

International Map Service
12211 W Alameda Pky, #101
Lakewood, CO 80228
Contact: Lynn Montoya, Director of Operations
303-987-2747 FAX: 303-967-2735

International Music Company
1316 E. Lancaster
Fort Worth, TX 76102
Contact: James Martin, Akai Product Specialist
817-336-5114 FAX: 817-670-1271

International Teletronics Inc
PO Box 738
Williamstown, NJ 08094
Contact: John F Hayes, VP

Intraplex Inc
PO Box 2427
Littleton, MA 01460
Contact: Roger L Shaw, Product Mgr
508-486-3722 FAX: 508-486-0709

Ivie
1366 W Center St
Orem, UT 84057
Contact: Glen Meyer, Mktg Mgr
801-224-1800 FAX: 801-224-7526

J

J & I Audio/Video
20899 Kelvin Palce
Woodland Hills, CA 91367
Contact: Gilbert F. Grieger, Jr., Owner
818-992-4288

JBL Professional
8500 Balboa Blvd
Northridge, CA 91329
Contact: Steve Armstrong, Director of Sales
818-893-8411 FAX: 818-893-3639

JM Technical Arts
30 Music SQ W #5
Nashville, TN 37203
Contact: Jack Clark, Owner

J.N.S. Electronics Inc
PO Box 32550
San Jose, CA 95152
Contact: John E. Leonard Jr., President
408-729-3838 FAX: 408-926-1003

JRF Magnetic Sciences
249 Kennedy Road
Greendell, NJ 07839
Contact: John R. French, Pres
201-579-5773 FAX: 201-579-6021

JVC Corp
41 Slater Drive
Elmwood Park, NJ 07407
Contact: Roberts, Spec Prod Mgr

J Squared Technical Services
2198 Hubbard Lane
Grants Pass, OR 97527
Contact: Jim Jones, Owner
503-471-2262

J Boyd Ingram & Associates
PO Box 73
Batesville, MS 38606
Marketing Manager

Jaffie Communications
122 E 42nd St
New York, NY 10168
Contact: D Harewood

Jampro Antennas Inc
6340 Sky Creek Drive
Sacramento, CA 95828
Contact: James E. Olver, President
916-383-1177 FAX: 916-383-1182

Jensen Tools Inc
7815 South 46th St
Phoenix, AZ 85044
602-968-6241

Jensen Transformers Inc
10735 Burbank Blvd
N Hollywood, CA 91601
Contact: Dave Hill, VP of Operations
213-876-0059 FAX: 818-763-4574

Jesse Neal Browder Company
202 Whistlewood Court
Woodstock, GA 30188
Contact: Neal Browder

Jim Walters Co
5017 Kalanianaole Hwy
Honolulu, HI 96821
Contact: Jim Walters, Owner
808-373-2701 FAX: 808-373-4435

John Furr & Associates
2700 NE Loop 410, Suite 325
San Antonio, TX 78217
Contact: John Furr, President
512-599-6511 FAX: 512-599-6635

John FX Browne & Associates
525 Woodward Avenue
Bloomfield Hills, MI 48013
Marketing Manager

John E. Hillman Associates
PO Box 530335
Miami, FL 33153
Contact: Timothy J. Hillman, Sales Manager
305-757-7661 FAX: 305-756-7749

John Nix
4215 Liberty Road South
Salem, OR 97302-5756
Contact: John Nix, President
800-321-4056

Johnson Electronics
1000 Legion Place #1515
Orlando, FL 32801-1044
Contact: Robert W Peters
407-677-4030 FAX: 407-679-1288

Jules Cohen & Associates P.C.
1725 Desales St NW, Ste 600
Washington, DC 20036
Contact: Jules Cohen, Partner
202-659-3707 FAX: 202-659-0360

K

Kandel Electronics
PO Box 204
Oreland, PA 19075
Contact: Robert Kandel, President

Kay Industries Inc
604 N Hill St
South Bend, IN 46617
Contact: Larry Katz, National Sales Manager
800-348-5257 FAX: 219-289-5932

Kayron
621 N Harvey Avenue
Oak Park, IL 60302
Contact: Hal Kaitchuck, President

Keating Technical Services
1220 Third Avenue, Suite B
Chula Vista, CA 91911
Contact: Steve Keating, Owner
619-426-0987

Kellner Electronics
Ferry Road
Charlotte, VT 05445
Contact: Charles Kellner

Kelper International Corp
25 W 43rd St
New York, NY 10036
Contact: Jacques Kellner, President

R.L. Kennedy & Associates
PO Box 141
Waynesville, NC 28786
Contact: Richard L. Kennedy
704-648-3283

Kenneth R. Meades
PO Box 1469
Los Angeles, CA 90053
Contact: Kenneth R. Meades, Owner
213-669-9670

Kingdom Technology
PO Box 1145
Ft Walton Beach, FL 32549-1145
Contact: David R. Benoit, Owner
904-664-6492

Kings Electronics Co Inc
40 Marbledale Rd
Tuckahoe, NY 10707
Contact: Robert A. Dock, VP Sales & Marketing
914-793-5000 FAX: 914-793-5092

Kintronic Laboratories Inc
PO Box 845
Bristol, TN 37621-0845
Contact: Tom King, President
615-878-3141 FAX: 615-878-4224

Klark-Teknik
200 Sea Lane
Farmingdale, NY 11735
Contact: Sam C Spennacchio, National Sales Manager
516-249-3660 FAX: 516-420-1863

Kline Towers
PO Box 1013
Columbia, SC 29202
Contact: Jerry Kline, President

Kosmik Audio Products, Inc
637 Florida Ave, Suite K
Longmont, CO 80501
Contact: Bob Koss, President
800-654-4806 FAX: 303-772-4034

Kronwall Communications
Rt 1 Box 1126
Lake Geneva, WI 53147
Contact: Dave Kronwall

L

L & R Communications Limited
3504 Robs Drive, P.O. Box 1387
Suffolk, VA 23434
Contact: Bob Nelson, Branch Manager
804-539-8365 FAX: 804-539-2047

LBA Technology Inc
PO Box 8026
Greenville, NC 27835
Contact: Phil Morse, General Manager
919-757-0279 FAX: 919-752-9155

LCR Systems
149 Ockley Drive
Shreveport, LA 71105-3022
Contact: Larry Clifton

LDL Communications Inc
14440 Cherry Lane Ct, No. 201
Laurel, MD 20707
Contact: G J Wilson, President
301-498-2200 FAX: 301-498-7952

LPB Inc
28 Bacton Hill Rd
Frazer, PA 19355
Contact: John E. Devecka, Applications Engineering Manager
215-644-1123 FAX: 215-644-8651

LSI Jennings
970 McLaughlin Ave
San Jose, CA 95122
Contact: E.V. Valehrach, Director of Marketing
408-292-4025 FAX: 408-286-1789

Lahm, Suffa & Cavell, Inc.
3975 University Dr, Suite 450
Fairfax, VA 22030
Contact: Gary Cavell

Lake Systems
805 Turnpike Street, #201
North Andover, MA 01845-6122
Contact: Les Arnold, Sales Mgr
617-244-6881 FAX: 617-527-3159

Lamp Technology Inc
1645 Sycamore Avenue
Bohemia, NY 11716
Contact: Janet Lang, Marketing Manager

Landy Associates Inc
412 Commerce Lane #A
Berlin, NJ 08009-9253
Contact: James E. Landy, President
609-767-0400 FAX: 609-767-4407

Landy Associates Inc.
330 Bear Hill Road
Waltham, MA 02154
Contact: Brad Reed, Manager
617-890-6325 FAX: 617-890-9128

Larcan Communications Equip
6520 Northam Dr
Mississauga, ON L4V 1H9 CANADA
Contact: P C Turner, President
416-678-9970 FAX: 416-678-9977

Lasalle Music & Pro Audio
993 Main Street
East Hartford, CT 06100-2233
Contact: Marek Stycos, Pro Audio Mgr
617-536-2030 FAX: 617-536-4878

D N Latus & Co Inc
PO Box 1720
Helena, MT 59624
406-442-3940

Lauderdale Electronic Labs
16 Southwest 13th St
Ft Lauderdale, FL 33315
Contact: Mark Tibbetts, Sales
305-764-7755

Lawrence Behr Associates Inc
PO Box 8026
Greenville, NC 27835
Contact: George Grills, P.E., VP of Consulting Services
919-757-0279 FAX: 919-752-9155

Lawrence L Morton Associates
1231 Mesa Oaks Lane
Mesa Oaks, CA 93436-2309
Contact: Lawrence Morton, President
805-733-4275 FAX: 805-733-4793

Leader Instruments Corporation
380 Oser Ave
Hauppauge, NY 11788
Contact: Joe Fisher, Product Marketing Manager
516-231-6900 FAX: 516-231-5295

Leaming Industries
15339 Barranca Pkwy
Irvine, CA 92718
Contact: Kim Litchfield, Technical Sales
714-727-4144 FAX: 714-727-3650

Leitch Incorporated
825K Greenbrier Circle
Chesapeake, VA 23320
Contact: John Walter, President/General Manager
804-424-7920 FAX: 804-424-0639

Lenco
PO Box 348
Jackson, MO 63755
Contact: Jim Rhodes, Audio Prod Mgr

Leonine Technology
PO Box 32550
San Jose, CA 95152
Contact: John Leonard, Pres

Lexicon Inc
100 Beaver St
Waltham, MA 02154
Contact: Larry Rich, Bdct Sales Mgr
617-891-6790 FAX: 617-891-0340

Lightning Deterrent Corp
5321 South Kedzie Ave
Chicago, IL 60632
Contact: Don Hudalla, Mktg Mgr

Lightning Elimination
12516 Lakeland Rd
Santa Fe Springs, CA 90670
Contact: Hal Proppe, VP Mktg
213-946-6886

Lightning Eliminators & Cnslt.
6687 Arapahoe Rd
Boulder, CO 80303
Contact: Ralph L. Auer, VP Marketing
303-447-2828 FAX: 303-447-8122

Lindahl Sales Corp
10680 SW Wedgewood Street
Portland, OR 97225
Contact: Bob Lindahl, President
503-644-9643

Lindco Commercial Audio
57 Glencoe Rd
Columbus, OH 43214
Contact: Christopher E Lind

Lineau Assoc Inc
5501 Twin Knolls Road #103
Columbia, MD 21045-3260
Contact: Sales Mgr

Lines Video Systems
219 S Jefferson
Springfield, MO 65806
Contact: Bud Lines, Vice President
417-862-5533 FAX: 417-862-1829

Charles J Lipow Inc
PO Box 2899
Canoga Park, CA 91306
Contact: Charles Lipow

Lipsner-Smith Company
4700 West Chase
Lincolnwood, IL 60646
Contact: Thomas A. Tisch, Director of Marketing
708-677-3000 FAX: 708-677-1311

Lita Broadcasting Dist
6912 NW 72nd Ave
Miami, FL 33166
Contact: Luis C. Endara, Pres
305-887-1223 FAX: 305-887-0405

Litronix Corp
6912 NW 72nd Ave
Miami, FL 33166
Contact: Luis C. Endara, Pres
305-887-1223 FAX: 305-887-0405

Logitek
3320 Bering Dr
Houston, TX 77057
Contact: Tag Borland, President
800-231-5870 FAX: 713-782-7597

Lone Star Tower Co
PO Box 1009
San Angelo, TX 76902
Contact: Kenny Speciale, Owner

Lowrey Tower Service
PO Box 573
Lorena, TX 76655
Contact: Skip Lowrey, President

Lyle Cartridges
115 S Corona Ave
Valley Stream, NY 11582
Contact: Eric Lewinter, VP
800-221-0906 FAX: 516-561-7793

M

M A Benington Inc
2459 Cuchura Drive
Birmingham, AL 35244
Contact: Mike Benington, President

M/A-Com Mac Inc
347 Rogers Street
Lowel, MA 01852-4345
Contact: Yong Lee, Pres
617-272-3100 FAX: 617-272-8861

MC Communications
13140 Coit Road, Suite 515
Dallas, TX 75240
Contact: Catherine Minster, Account Executive

MCG Electronics
12 Burt Dr
Deer Park, NY 11729
Contact: James P Lane, Ad Coordinator
800-851-1508 FAX: 516-586-5120

MCL Inc
501 S Woodcreek Road
Bolingbrook, IL 60440-4999
Contact: Frank Morgan, Ad Manager
708-759-9500 FAX: 708-759-5018

MDL/Microwave Devlp Lab Inc
10 Michigan Dr
Natick, MA 01760

MIT Inc
14130 NW Science Park Dr
Portland, OR 97229
Contact: Mo Wagner, Pres

MXR Innovations
215 Tremont St C/O App Resch
Rochester, NY 14608
Contact: Mitch Milton

Mackenzie Laboratories Inc
PO Box 3029
Arcadia, CA 91006
Contact: A R Taylor

Macromedia
1320 Liberty Court
Northfield, MN 55057
Contact: Tim Valley, President
507-645-5970 FAX: 507-663-3549

Mag-Head Engineering Co.
686 Mendelssohn Avenue
Minneapolis, MN 55427
Contact: Gary Hoonsbeen, Sales
800-433-8522 FAX: 612-545-1321

Magnefax Int
Rt 1
Rogers, AR 72756
Contact: Dennis W. Tallakson, Pres
501-925-1818 FAX: 501-925-1841

Magnetic Reference Laboratory
229 Polaris Ave Ste 4
Mountain View, CA 94041
415-965-8187 FAX: 415-965-8548

Magni Systems Inc
9500 SW Gemini Drive
Beaverton, OR 97005
Contact: Ed Kiyoi, Domestic Sales/Marketing Manager
503-626-8400 FAX: 503-626-6225

Magnum Towers Inc
9370 Elder Creek Road
Sacramento, CA 95829
Contact: Lawrence Smith, President
916-381-5053 FAX: 916-381-2144

Magrill Engineering
PO Box 1010
Fairfield, FL 32634
Contact: Barry Magrill, Owner
904-591-3005

Major Custom Cable Inc
HCR 61 Box 82
Altenburg, MO 63732
Contact: Jody Overbey, General Manager
314-824-5212 FAX: 314-824-5215

Manger Eng-Beau Motors Div.
Bethmour Road
Bethany, CT 06524
Contact: Paul Manger, President
203-288-9351 FAX: 203-735-4543

Manion Outdoors
PO Box 4024
Appleton, WI 54915
Contact: Ms Derse Smith Todd, Sales Promo Dir

Marantz
945 Lakeview Parkway, Suite 110
Vernon Hills, IL 60061
Contact: Dave Schwartz, Product Specialist
708-820-4800

Marathon Products
69 Sandersdale Road, Box 623
Charlton, MA 01507
Contact: Richard Myers Sr., Pres/Owner
508-248-3157

Marcom
PO Box 66507
Scotts Valley, CA 95066
Contact: Martin Jackson, President
408-438-4273 FAX: 408-438-6617

Mark IV Audio
9900 Baldwin Place
El Monte, CA 91731
Contact: Rick Sanchez, Bdct & Prod. Marketing Manager
800-877-1771 FAX: 818-444-1342

Marketing Technics
6666 N Oliphant
Chicago, IL 60631
Contact: George Vadik, Ad Mgr

Mart Haller, Inc
PO Box 140159
Coral Gables, FL 33114-0159
Contact: Edwin P. Haller
305-444-4617 FAX: 305-445-7551

Marti Electronics
PO Box 661
Cleburne, TX 76031
Contact: Dan Rau, Director of Sales & Marketing
817-645-9163 FAX: 817-641-3869

Martin Audio Video Corp
423 West 55 St
New York, NY 10019
Contact: Joseph Helguera, Advertising & Marketing
212-541-5900 FAX: 212-541-9129

Master Software Systems
3565 Green Street
Muskegon, MI 49444
Contact: Kenneth Norton, Division Manager
616-726-2837 FAX: 616-733-1107

McClanathan & Associates, Inc.
PO Box 939
Portland, OR 97207-0939
Contact: Robert A. McClanathan, President
503-246-8080 FAX: 503-246-6309

McCurdy Radio Industries
108 Carnforth Rd
Toronto ON M4A 2L4 Canada
Contact: Omar Fattah
416-751-6262 FAX: 416-751-6455

McKenney Broadcast Engineering
Route 3 Box 205
Russellville, AR 72801
Contact: Bill McKenney, President

McMartin Incorporated
201 35th Avenue
Council Bluffs, IA 51501
Contact: John Miller, President
712-366-1300 FAX: 712-366-3915

Media Computing Inc
3506 East Meadow Dr
Phoenix, AZ 85032
Contact: Larry L Baum, Manager Technical Operations
602-482-9131 FAX: 602-992-6572

Media Concepts Inc
8210 E 71st St, Suite 310
Tulsa, OK 74133-2908
Contact: Marvin Lane

Media Graphics
821 Virginia Ave.
Langhorne, PA 19047
Contact: Bob Jeffreys, Owner

Media Touch Systems
50 Northwestern Drive #11
Salem, NH 03079
Contact: Jim Waterman, Director of Sales
603-893-5104 FAX: 603-893-6390

Merlin Engineering Works
1880 Embarcadero
Palo Alto, CA 94303
Contact: John Streets, Pres

Metropolis Audio Marketing Inc
1199 Amboy Ave
Edison, NJ 08837
Contact: Tom Bensen

Meyer Marketing
258 S Military Trail
Deerfield Beach, FL 33442
Sales Manager

Meyer Sound
2832 San Pablo Ave.
Berkeley, CA 94702
Contact: Ralph Jones, Sales & Marketing
510-486-1166 FAX: 510-486-8356

Micro Communications Inc
PO Box 4365
Manchester, NH 03108-4365
Contact: Jennie E. Allen, Inside Sales & Advertising
603-624-4351 FAX: 603-624-4822

Micro Controls Inc
228 NE Wilshire, Suite E
Burleson, TX 76028
Contact: Jeff Freeman, President
817-295-0965

Micro Phase Communications Inc
999 C Edgewater Blvd, #138
Foster City, CA 94404
Contact: Roger K. Parr, President
415-368-8379 FAX: 415-368-3869

Microdyne Corporation
491 Oak Road
Ocala, FL 32672
Contact: Thomas H. Kidd, International Sales Manager
904-687-4633 FAX: 904-687-3392

Micron Audio Products Ltd
210 Westlake Dr
Valhalla, NY 10595
914-761-6520

Microtime Inc
1280 Blue Hills Ave
Bloomfield, CT 06002
Contact: Chris Smith, G. Mathias

Microtran Co
145 East Mineola Ave PO Box 236
Valley Stream, NY 11582-0236
Contact: Lou Anne O'Connor
516-561-6050 FAX: 516-561-1117

Microwave Filter Co
6743 Kinne St
E Syracuse, NY 13057
Contact: Elizabeth Buck, Marketing Research/Publicity
800-448-1666 FAX: 315-463-1467

Mid-America Automation Corp
1822 Laramie
Manhattan, KS 66502
Contact: Dave McFarland, Pres
913-537-3289

MidAmerica Electronics Service
410 Mt Tabor Road
New Albany, IN 47150
Contact: Peter C.L. Boyce, President
812-945-1209 FAX: 812-945-1859

Mid-Continent Tech Services
331 Pineview Drive A Suite B18
Kernersville, NC 27284
Contact: F Lee Thompson, Consult Engineer

Midlen & Guillot
3238 Prospect St, N.W.
Washington DC 20007
Contact: Greg Guillot, Partner
202-333-1500 FAX: 202-333-6852

Mid-Maine Remodeling
809 Unity Road
Benton, ME 04927
Contact: Joe McSwain

Mid-State Comm & Electronics
One Clear Road
Oriskany, NY 13424
Contact: David Stevenson, Tower Division

Midwest Communications Corporation, Systems Division
Highland Heights, KY
Please see Harris Allied Systems

Milam Audio Co
1470 Valle Vista
Pekin, IL 61554
Contact: Ken Musselman, Sales Mgr
309-346-3161 FAX: 309-346-6431

Miller Tower Company
60 West 57th street, Suite 5E
New York, NY 10019
Contact: Keith Miller, Vice President
212-582-2063 FAX: 212-262-2416

Mirkwood Engineering
50 Park Avenue
Claremont, NH 03743
Contact: Gary Savoie

Jay Mitchell Assoc
PO Box 1285, Route 2
Fairfield, IA 52556
Contact: Jay Mitchell, President
515-472-4087 FAX: 515-472-6457

Mitsubishi International Corp
1597 McCandless Drive
Milpitas, CA 95035
415-651-9931

Mitsubishi Pro Audio Group
27771 Ave Hopkins
Valencia, CA 91355
Contact: William E Windsor, Sr Mktg Exec
818-898-2341

Modular Audio Products
Brookhaven R&D Park 1 Roned Rd
Shirley, NY 11967
Contact: Peter Visconti, Mktg Mgr

Modulation Sciences Inc
12A World's Fair Drive
Somerset, NJ 08873
Contact: Eric Small, VP Engineering
201-302-3090 FAX: 201-302-0206

Moffet, Larson & Johnson Inc
5203 Leesburg Pike, Suite 800
Falls Church, VA 22041
Contact: Wallace E. Johnson, President
703-824-5660 FAX: 703-824-5672

Monfort Electronics Mkt
8788 Robbins Rd
Indianapolis, IN 46268
Contact: Sales Mgr
FAX: 317-876-2384

Monroe Electronics Inc
100 Housel Ave
Lyndonville, NY 14098
Contact: Roland Phillips, Applications Engineer
716-765-2254 FAX: 716-765-9330

Moody Broadcasting Network
820 N. Lasalle Drive
Chicago, IL 60610
Contact: Bob West, Director of Network Development
800-621-7031

Morcom International
5130 Duke Street, Suite 6
Alexandria, VA 22304
Contact: Manuel Ojeda
703-750-3414

Morgan Capitol/A Wayne
1202 Nueces Street
Austin, TX 78701
Contact: Barbara Morgan, President

Moseley Associates Inc
111 Castilian Dr
Santa Barbara, CA 93117
Contact: J. Hamdani/D. Chancey, Exec. VP & COO/Natl Sales Mgr
805-968-9621 FAX: 805-685-9638

Motorola AM Stereo
1216 Remington Rd
Schaumburg, IL 60173
Contact: Don Wilson
312-576-0554 FAX: 312-576-3258

Mullaney Engineering Inc
9049 Shady Grove Court
Gaithersburg, MD 20877
Contact: John J Mullaney, President
301-921-0115 FAX: 301-590-9757

Multicomm Telecommunications
2004 South 800 East
Salt Lake City, UT 84105-3107
Contact: Bev Schronce

Multilink
23801 Calabasas Rd
Calabasas, CA 91302
Contact: John Ulrick, Pres

Multiphase Consulting
5827 Columbia Pike Ste 310a
Falls Church, VA 22041
Contact: Henry Stewart
703-379-1665

Multi-Technical Services
150 Clayton Commerce Center
Clayton, NC 27520
Contact: Lyn Williams, Tech Director

Murphy Studio Furniture
4153 N Bonita St
Spring Valley, CA 92077
Contact: Dennis Murphy, Pres
619-698-4658 FAX: 619-698-1268

Music Director Programming
PO Box 51978
Indian Orchard, MA 01151
Contact: Budd Clain, General Manager
413-783-4626 FAX: 413-783-3168

The Musicworks Inc
PO Box 111390
Nashville, TN 37211
615-790-1200

Myat Inc
380 Chestnut Street, PO Box 425
Norwood, NJ 07648-0425
Contact: Philip Cindrich, President
201-767-5380 FAX: 201-767-4147

N

NEA Tower Services
2206 Mary Jane
Jonesboro, AR 72401
Contact: David Primm, Owner

NKT Elektronik
Brondbyvestervej 95
Golstrup, DK-2600 Denmark

NZ Marketing
602 W Fir Street
San Diego, CA 92101
Contact: John Peterson, General Mgr

Nady Systems Inc
6701 Bay Street
Emeryville, CA 94608
Contact: Tono Rondone, Ad Director
510-652-2411 FAX: 510-652-5075

Nagra Magnetic Recorders Inc
19 West 44th St Ste 715
New York, NY 10036
Contact: Don Notto, Sales Mgr
212-840-0999

Nakamichi America Corp
19701 S Vermont Ave
Torrance, CA 90502
Contact: Kim Wilson, Natl Sales Coordinator, Pro Audio
213-538-8150 FAX: 213-324-7614

Nalpak Video Sales Inc
1937-C Friendship Dr
El Cajon, CA 92020
Contact: Cheryl L. Kaplan, Account Executive
619-258-1200 FAX: 619-258-0925

Narac Bdcst
RR 2 Box 7845
Jay, ME 04239-9413
Contact: P Palagonia

Narda Microwave Corp
435 Moreland Rd
Hauppauge, NY 11788
Contact: Robert Johnson, Instrument Sales Manager
516-231-1700 FAX: 516-231-1711

Nards Inc.
1446 Emerson Avenue
McLean, VA 22101
Contact: Mike Nardella, President

National Audio Co Inc
Box 3657, G.S.
Springfield, MO 65808
Contact: Steve Stepp, President
417-863-1925 FAX: 417-863-7825

National Cassette
613 N Commerce Street
Front Royal, VA 22630
Contact: Paul Brown, General Mgr

National Supervisory Network
PO Box 578
Avon, CO 81620
Contact: Bill Sepmeier, Pres
800-345-8728

Nautel Electronic Laboratories
Hacketts Cove, RR 1
Tantallon, NS BOJ 3JO CANADA
Contact: Jorgen Jensen, Manager Sales & Marketing
902-823-2233 FAX: 902-823-3183

Nautel Maine Inc.
201 Target Industrial Circle
Bangor, ME 04401
Contact: Jorgen B. Jensen, Manager Sales & Marketing
207-947-8200 FAX: 207-947-3693

Nemal Electronics International, Inc
12240 NE 14th Ave
N Miami, FL 33161
Contact: Benjamin L. Nemser, President
800-327-5999 FAX: 305-895-8178

Neotek Corp
1154 W Belmont
Chicago, IL 60657
Contact: Tom Lay, Marketing Director
312-929-6699 FAX: 312-975-1700

Netcom
1465 Palisade Avenue
Teaneck, NJ 07666
Contact: James Tronolone, President
201-837-8424 FAX: 201-837-8384

Network Production Music Inc
16935 W Barnardo Drive, #100
San Diego, CA 92127
619-451-6400

The Network
5423 Rambiewood Lane, SE
Olympia, WA 98503
Contact: Katherine Arnold

Neumade Products Corp
200 Connecticut Ave
Norwalk, CT 06584
203-866-7600

Neutrik USA Inc
195-53 Lehigh Avenue
Lakewood, NJ 08701-4527
Contact: James Cowan, General Manager

Rupert Neve Inc
Berkshire Industrial Pk
Bethel, CT 06801
Contact: Barry Roche, Pres
203-744-6230

New England Digital
Rivermill Commercial Center
Lebanon, NH 03766
Contact: Franklin B Sullivan, VP/Mktg & Sales
802-295-5800 FAX: 802-296-2075

New Resource
28 Mount Blue St
Norwell, MA 02061
Contact: Sales Mgr

New World Music & Sound
4792 Clairemont Mesa Blvd
San Diego, CA 92117
Contact: Jim Scott, Owner
800-854-2005 FAX: 619-569-2040

Nitty Gritty Record Care
4650 Arrow Hwy, Suite F4
Montclair, CA 91763
Contact: Michael Baskind, National Sales Mgr
714-625-5525

Norac Industrial Services, Inc
PO Box 771
Gray, ME 04039
Contact: Paul Caron, President
207-657-3579

Nordic Software
917 Carlos Drive
Lincoln, NE 68505-2059
Contact: James Wrenholt, President
402-488-5086 FAX: 402-488-2914

Normex Electronic Co. Ltd.
55 Montpellier Blvd
St Laurent, PQ, H4N 2G3 CANADA
Contact: Jerome Masson, Vice President/General Manager
514-746-7811 FAX: 514-744-2797

North Coast Marketing
707 West 10th St
Erie, PA 16502
Contact: Sales Mgr

Northeast Broadcast Lab Inc
PO Box 1179
S Glen Falls, NY 12803
Contact: Criss Onan, Sales Mgr
800-227-1093 FAX: 518-793-7423

Northern Technologies, Inc
15602 E. Marietta
Spokane, WA 99216
509-927-0401 FAX: 509-927-0435

Northern Transdata Networks
2 Fleets Point Drive
West Babylon, NY 11704-8304
Contact: Angela De Pascale, Industry Sales Manager

Northwestern Inc
15938 SW 72nd Avenue
Portland, OR 97224-7936
Contact: Robert Lindahl, Pres
800-547-2252

Nortronics Co Inc
6750 Shady Oak Road
Eden Prairie, MN 55344
Contact: Jim Tusing, Director of Sales
612-545-0401 FAX: 612-540-8678

Nott, Ltd
4001 La Plata Highway
Farmington, NM 87401
Contact: Ron Nott, President
505-327-5646 FAX: 505-326-1261

Fred A. Nudd Corporation
1743 Route 104, PO Box 577
Ontario, NY 14519
Contact: Tom D. Nudd, Director of Sales/Engineering
315-524-2531 FAX: 315-524-4249

Rick Nudd Ltd
4897 Arbor Rd
Walwort, NY 14568
Contact: Rick Nudd, Owner
315-524-5495

Numark Electronics
503 Newfield Avenue
Edison, NJ 08837
Contact: Todd M. Jensen, Sales/Service Manager
908-225-3822 FAX: 908-287-2155

Nytone Electronics
2424 South 900 West
Salt Lake City, UT 84119

O

Oakwood Audio Labs, Ltd
652 King Edward St
Winnipeg, MB R3H 0P2 CANADA
Contact: Ron Paley, Bdct Sales Mgr
204-786-6715 FAX: 204-783-5805

Ocean Audio Inc
366 Las Cases Avenue
Pacific Palisades, CA 90272
Contact: David Hadler, President
213-459-2743 FAX: 213-454-6043

Old Dominion Bdct Engr Service
9505 Lakewater Ct
Richmond, VA 23229
Contact: Sam Straus, President
804-740-4717 FAX: 804-740-4717

Omega Communications Company
109 Moore Street
Moorestown, NJ 08057-1218
Contact: Robert L. Eboch, Jr, Owner
609-234-2118

Omega International
6 Hutton Center Drive, #800
Santa Ana, CA 92707
Contact: Mark Hutchins
714-553-0564 FAX: 714-553-0533

Omni-Lambda
PO Box 39
Burk, NY 12917
Contact: Peter Holt

Omnimusic
52 Main Street
Port Washington, NY 11050
Contact: Sam White

Omnitronix
1374 Cinnamon Drive
Ft Washington, PA 19034
Contact: David Solt, President
215-542-9580 FAX: 215-542-9582

One Stop Broadcast Supply
2210 S M Street
Oxnard, CA 93033-7147

Opamp Labs Inc
1033 N Sycamore Ave
Los Angeles, CA 90038
Contact: B Losmandy, Manager
213-934-3566 FAX: 213-462-6490

Orban Associates, Div of AKG
1525 Alvarado Street
San Leandro, CA 94577
Contact: David Roudebush, Corporate Marketing Manager
510-351-3500 FAX: 510-351-0500

Orcad Systems Corp
1049 SW Base Line St Ste 500
Hillsboro, OR 97123
503-640-5007

Douglas Ordon & Company Inc
4646 West McLean Avenue
Chicago, IL 60639-3428
Contact: Greg Groeper, Sales Manager
312-889-5532 FAX: 312-889-2308

Ortofon Inc
122 Dupont St
Plainview, NY 11758
Contact: Michele Port
516-349-9180

Otari Corporation
378 Vintage Park Dr
Foster City, CA 94404
Contact: John Carey, VP Sales and

Marketing
415-341-5900 FAX: 415-341-7200

Oval Window
251 W Central St, Suite 111
Natick, MA 01760
Contact: Bob Gilmore, Marketing Director

Owl Engineering
1306 West City Rd F, Suite 105
St. Paul, MN 55112
Contact: Garrett G. Lysiak, P.E., President
612-631-1338 FAX: 612-631-3502

P

PC Boards
2110 14th Ave, South
Birmingham, AL 35205
Contact: Tricia Burns, Ad Manager

PHOTOCOMM (Solar Signage)
9806 Mula Road
Stafford, TX 77477
Contact: Kevin Conlin, General Manager
713-933-1578 FAX: 713-933-1599

PME
111 Stanford Court
Grass Valley, CA 95945
Contact: Ross Shelton, Consultant

Pacific Rcdrs & Engineering
2070 Las Palmas Dr
Carlsbad, CA 92009
Contact: Jack Williams, President
619-438-3911 FAX: 619-438-9722

Pala Electronic Inc
3200 Teakwood
Edmond, OK 73013
Contact: Linda Kaye, Exec VP

Paladin Corp
3543 Old Conejo Rd, No. 102
Newbury Park, CA 91320
Contact: Harriet Diss, Sales & Marketing Administrator
800-272-8665 FAX: 800-272-5257

Palex Co
6330 Ashdale Rd
Cleveland, OH 44124
Contact: H Heller, CE

Panasonic Industrial Co
One Panasonic Way
Secaucus, NJ 07094
Contact: Sales Mgr
201-348-7620

Panasonic/Prof Audio Systems
6550 Katella (Ramsa Division)
Cypress, CA 90630
Contact: Steve Woolley, Sales & Marketing Manager
714-373-7277 FAX: 714-373-7903

Paramount Communications Syst
304 Elm Terrace
Atco, NJ 08004-1024
Contact: Michael Moskowitz, President
609-869-0222 FAX: 609-753-8785

Park Leasing Co
PO Box 1719
Des Moines, IA 50306
Contact: Bob Arnold, Pres

Parsons Audio
192 Worcester St
Welesley Hills, MA 02181
Contact: Mark Parsons, Owner
617-431-8708 FAX: 617-431-8710

Patch Bay Designation
4742 San Fernando Rd
Glendale, CA 91204
Contact: Scott Lookholder, Ad Mgr
818-241-5585

Paul Dean Ford, P.E.
3775 West Dugger Avenue
West Terre Haute, IN 47885-9794
Contact: Paul Dean Ford, Owner
812-535-3831 FAX: 812-535-3341

Payne Engineering
Route 5, Box 20
Chickasha, OK 73018
Contact: Chris Payne, Owner
405-224-3470 FAX: 405-224-7521

Peak Audio
3107 Bedlington Pl
Holland, PA 18966
Contact: M Sirkis

Peavey Electronics Corp
711a St Box 2898
Meridian, MS 39301
Contact: Lance Schmidt, Sales & Mktg Dir
601-483-5365 FAX: 601-484-4278

Peirce-Phelps Inc - AVSD
2000 North 59th St
Philadelphia, PA 19131
Contact: Frank Brady, General Manager
800-862-6800 FAX: 215-878-5252

Penny & Giles Inc.
2716 Ocean Park Blvd Ste 1005
Santa Monica, CA 90405-5209
Contact: Neal Handler, Sales Office Supervisor
310-393-0014 FAX: 310-450-9860

Penta Labs
10820 Guilford Road, Suite 211
Annapolis Junction, MD 20701
Advertising/Marketing Manager

Pep, Inc
25 W 54th Street
New York, NY 10019
Contact: James Tharp, President
212-246-2490 FAX: 212-765-5988

Periphex
115-1B Hurley Road
Oxford, CT 06478
Contact: Burton Piaser, Sales Manager
203-264-3985 FAX: 203-262-6943

Perry Enterprises
3062 Robb Circle
Lakewood, CO 80215
Contact: Al Perry, President

Peter's Technical Service
RR #2 Box 7845
Jay, ME 04239
Contact: Peter Palagonia, Owner

Peter W. Dahl Co.
5869 Waycross Avenue
El Paso, TX 79924
Contact: Gary Komassa, Corporate Secretary
915-751-2300 FAX: 915-751-0768

Phase Linear
4134 N United Parkway
Schiller Park, IL 60176
Contact: Peter Horsman, Natl Sales Mgr Pro Div

Philips Components
100 Providence Pike
Slatersville, RI 02876
Contact: Greg J Murphy, Marketing Manager

Philips Corp
2001 Blue Heron Blvd.
Riviera Beach, FL 33404
Contact: Mariann Cook, Marketing Director

Phoenix Systems
PO Box 297
Hickory, MS 39332
Contact: John H Roberts, Pres

PIRod Inc
1200 N Oak Road
Plymouth, IN 46563
Contact: L. Brown Sanders, V.P. Marketing-Sales
219-936-4221 FAX: 219-936-6796

Pittsburgh Int'l Teleport
PO Box 14070
Pittsburg, PA 15239
Contact: George Sperry, Jr., General Manager
800-634-6530 FAX: 412-337-1754

Plastic Capacitors Inc
2623 N Pulaski Rd
Chicago, IL 60639
Contact: Tom Brown, Mktg Mgr
312-489-2229 FAX: 312-489-0496

Plastic Reel Corp of America
Brisbin Ave
Lyndhurst, NJ 07071
Contact: Pat Baccarella, VP
201-933-5100 FAX: 201-933-9464

Plastics Technology Inc
2137 Woodlea Dr West
Mobile, AL 36609
Contact: Larry Cable

PMA Marketing, Inc.
4359 S Howell Avenue, #106
Milwaukee, WI 53207-5056
Contact: Pat Martin, President
414-482-2638 FAX: 414-483-1980

Polar Research
PO Box 1
Thief River Fall, MN 56701
Contact: Kim Ballou

Polyline Corp - PolyQuick Div.
1243 Rand Rd
Des Plaines, IL 60016
Contact: Ed Kaiser, President
708-390-7744 FAX: 708-390-9886

Pomar Electronics
1615 Santa Maria
Laredo, TX 78040
Contact: Oscar Pomar, President
512-722-9437 FAX: 512-722-1795

Portland Instruments/ROH
6120 San Fernando Road
Glendale, CA 91201
Contact: Richard F. Herbert, Director of Manufacturing
818-500-0137 FAX: 818-240-1828

Posthorn Recordings
142 West 26th St
New York, NY 10001
Contact: Jerry Bruck, Owner/Pres
212-242-3737 FAX: 212-924-1243

Potomac Instruments
932 Philadelphia Ave
Silver Spring, MD 20910
Contact: David G Harry, Sales Mgr
301-589-2662

Power Film Systems Inc
PO Box 485
Yellville, AR 72687
Contact: Alice Milligan, Sales Dir
501-449-4091 FAX: 501-449-6000

Precision Design
27106 South 46th Ave
Kent, WA 98032
206-852-5070

Precision Electromagnetics
12001 Lanham-Severn Road
Bowie, MD 20720
Contact: Bob Loyd

Presmagraphics
PO Box 703
Milwaukee, WI 53201
Contact: R Schmaclzle

Pristine Systems
8489 West Third St, Suite 1017
Los Angeles, CA 90048
Contact: Boyce Williams, President
213-852-0737 FAX: 213-655-6207

Pro-Bel
220 Duncan Mill Road, Ste 301
Don Mills, Ont, M3B 3J5 CANADA
Contact: Geoff Snell, Systems Engineering Manager
800-387-0233 FAX: 416-445-0595

Procart
7012 27th St West
Tacoma, WA 98466
206-565-4546

Pro Media
3563 San Pablo Dam Rd
El Sobrante, CA 94803
Contact: Ellen Goldstein, Sales Manager
415-222-0307 FAX: 415-223-9147

Professional Audio Marketing
PO Box 765
Melville, NY 11747
Contact: Stan Somers, President
516-367-8620 FAX: 516-367-4325

Professional Audio Supply
5700 E Loop 820 S
Ft Worth, TX 76119-7099
Contact: Lee Edwards, VP/Marketing
817-483-7474 FAX: 817-483-9952

Professional Sound Systems
2527 Treelane Avenue
Monrovia, CA 91016
Contact: William Wysock, Owner

Programming Plus
PO Box 90486
Pacific Beach, CA 92109-0860
619-272-7587

Promusic, Inc.
6555 NW 9th Ave, Suite 303
Ft Lauderdale, FL 33309

Contact: Cheryl Mathauer, Manager
305-776-2070 FAX: 305-776-2074

Prophet Systems Inc
113 West 4th Street
Ogallala, NE 69153
Contact: Kevin Lockhart, Project Director
800-658-4403 FAX: 308-254-3517

Puopolo Consulting
37 Martin St
Rehoboth, MA 02769
Contact: Dana Puopolo, President

Pyramid Audio Inc
450 W Taft Dr
S Holland, IL 60473
Contact: Robert Vukelich, President
708-339-8014 FAX: 708-339-8024

Q

QEI Corporation
One Airport Dr, PO Box 805
Williamstown, NJ 08094
Contact: Jeff R Detweiler, Domestic Sales Manager
800-334-9154 FAX: 609-629-1751

QSC Audio Products, Inc.
1926 Placentia Ave
Costa Mesa, CA 92627
Contact: Claudia Smith, Marketing Assistant
714-645-2540 FAX: 714-645-7927

Quick Set Inc
3650 Woodhead Dr
Northbrook, IL 60062
Contact: Mark Stolman

Quintessence Audio
PO Box 4900
Tulsa, OK 74159
Contact: Douglas Brown, Director
918-582-1200

R

R & A Broadcast Services
8684 Route 21
Naples, NY 14512
Contact: Mike Hotchkiss, Owner
716-374-5280

R-Columbia Products Co Inc
2008 St Johns Ave
Highland Park, IL 60035
Contact: Irving Rozak
312-432-7915

R Morgan Burrow Jr, P.E.
17221 Beauvoir Blvd
Rockville, MD 20855
Contact: R Morgan Burrow Jr

RAKS
201 Rt 17 Ste 300
Rutherford, NJ 07070
201-438-0119

RANE Corporation
10802 47th Ave W
Mukilteo, WA 98275-5098
Contact: Larry Winter, VP Mktg
206-355-6000 FAX: 206-347-7757

RE America
31029 Center Ridge Road
Westlake, OH 44145
Contact: Terence M. Ruane, Marketing & Sales Manager
216-871-7617 FAX: 216-871-4303

RE Electronics
31029 Center Ridge
Cleveland, OH 44145
Contact: Bruce Graven, Sales Dept

RE Instruments Corp
31029 Center Ridge Rd
Westlake, OH 44145
Contact: Terrence M. Ruane, Sales & Marketing Manager
216-871-7617 FAX: 216-871-4303

RF Industries, Ltd
10040 Mesa Rim Road
San Diego, CA 92121
Contact: Woody O'Keefe, President
800-233-1728 FAX: 619-587-0049

RF Scientific Inc
5644 Commerce Drive #C
Orlando, FL 32809-2978
Contact: Angelo Miceli, VP

RF Specialties of California
3463 State St Ste 229
Santa Barbara, CA 93105
Contact: Sam Lane, GM
805-682-9429 FAX: 805-682-5170

RF Specialties of Florida
PO Box 397
Niceville, FL 32578
Contact: Bill Hoisington
904-678-8943 FAX: 904-729-2744

RF Specialties of Missouri
22406 NE 159th St
Kearney, MO 64060
Contact: Chris Kreger, President
816-635-5959 FAX: 816-635-4508

RF Specialties of Pennsylvania
121 Conneaut Dr
Pittsburgh, PA 15239
Contact: Thomas Monahan, President
412-733-1994 FAX: 412-327-9336

RF Specialties of Texas
PO Box 7630
Amarillo, TX 79114-7630
Contact: Don S. Jones, President/Owner
806-372-4518 FAX: 806-373-8036

RF Specialties of Washington
19237 Aurora Ave N
Seattle, WA 98133
Contact: John Schneider, President
206-546-6546 FAX: 206-546-2633

RF Systems (Div of Audiolab)
5831 Rosebud Ln Bldg C
Sacramento, CA 95841
Contact: Robert E. Stofan, President
916-348-0200 FAX: 916-348-1512

RF Technologies Corp.
238 Goddard Road
Lewiston, ME 04240
Contact: George Harris, Pres
207-777-7778 FAX: 207-777-7784

RF Technologies Corp
238 Goddard Road
Lewiston, ME 04240
Contact: George Harris, President
207-777-7778 FAX: 207-777-7784

RF Technology Inc
16 Testa Pl
So Norwalk, CT 06854
Contact: John Brandt, Engr

RMS Electronics Inc
41 Hartz Way
Secaucus, NJ 07604
212-892-1000

ROHN Inc
PO Box 2000
Peoria, IL 61656
Contact: R.A. Kleine, Vice President
309-697-4400 FAX: 309-697-5612

RP Communications
25 West Street
Bristol, VT 05443
Contact: Bob Cham, President
802-453-4369 FAX: 802-453-4369

RPG Diffusor Systems Inc
651-C Commerce Drive
Upper Marlboro, MD 20772
Contact: Dr Peter D'Antonio, President/CEO
301-249-5647 FAX: 301-249-3912

RTI Research Technology Intl
4700 West Chase
Lincolnwood, IL 60646
Contact: Tom Tisch, Vice President Marketing
708-677-3000 FAX: 708-677-1311

RTS Systems Inc
1350 Hollywood Way
Burbank, CA 91505
818-566-6700 FAX: 818-843-7953

Radiation Systems/Mark Antennas Div
PO Box 1548
Des Plaines, IL 60017
Contact: Sharon Krause, Ad Coordinator
708-298-9420 FAX: 708-635-7946

Radio Computing Service, Inc.
Two Overhill Road, #100
Scarsdale, NY 10583
Contact: Lee Facto, Vice President/General Manager
914-723-8567 FAX: 914-723-6651

Radio Design Labs
PO Box 1286
Carpinteria, CA 93013
Contact: Joel Bump, Director of Engineering
714-245-6055 FAX: 714-245-6058

Radio Resources & Services
1201 South Sharp St
Baltimore, MD 21230
800-547-2346 FAX: 301-783-4635

Radio Systems Engineering
4289 Roan Ridge
Las Vegas, NV 89120
Contact: Gale Gilbreath, Owner/President
702-454-2085 FAX: 702-898-8731

Radio Systems Inc
110 High Hill Rd
Bridgeport, NJ 08014-0458
Contact: Daniel Braverman, President
609-467-8000 FAX: 609-467-3044

Radio Television Technique
544 Redfield Avenue
Los Angeles, CA 90042-4931
Contact: Jonathan Sugay, General Manager

Radiosoft
1111 Fawn Road
Saugerties, NY 12477
Contact: Peter Moncure, President
914-246-4912 FAX: 914-246-0261

Radiotechniques
PO Box 367
Haddon Heights, NJ 08035
Contact: Edward Schober, President
609-546-8008 FAX: 609-546-1841

Raines Electromagnetics
13420 Cleveland Dr
Potomac, MD 20850
Contact: Jeremy K Raines, President
301-279-2972

Raks Corp of America Inc
201 Rt 17 Ste 300
Rutherford, NJ 07070
Contact: Sinan Turkomer, Exec VP
201-438-0119 FAX: 201-438-3185

Steve Raleigh Bdct Service
PO Box 3403
Princeton, NJ 08540
Contact: Steve Raleigh, Pres

Ram Broadcast Systems Inc
PO Box 3100
Barrington, IL 60011-3100
Contact: Ron Mitchell, Pres
708-382-7575 FAX: 708-382-8818

Ramko Research
3501 Sunrise Blvd, No. 4
Rancho Cordova, CA 95742
Contact: Mike Pardee, Nat'l Sales Coor.
916-635-3600 FAX: 916-635-0907

Ray D Eisbrenner & Co
2950 W Square Lake Road, #100
Troy, MI 48098-5724
Contact: Eric Hood, Vice President

Reach Inc
301 South 68th St
Lincoln, NE 68510
Contact: Jon Canaday, Pres

Real Time Designs Inc
20944 Sherman Way, Suite 205
Canoga Park, CA 91304
Contact: Robert Copriviza, CEO
818-888-3434

Redco Audio Products
917 Post Road, Suite 318
Fairfield, CT 06430
Contact: Bob Berliner, Owner
203-256-0532 FAX: 203-254-1509

Register Data Systems
PO Box 1246
Perry, GA 31069
Contact: Thomas R. Mead
912-987-2501 FAX: 912-987-7595

Renkus-Heinz, Inc.
17191 Armstrong Avenue
Irving, CA 92714
Contact: Frank Ostrander, Chief Engineer
714-250-0166 FAX: 714-250-1035

Research Associates Inc
230 S Sierra Madre
Colorado Springs, CO 80903
Contact: Bill Cook, Pres & GM
719-594-9464 FAX: 719-578-5688

ReVox
1425 Elm Hill Pike
Nashville, TN 37210

Contact: Tom Spain, National Sales Manager
615-254-5651 FAX: 615-256-7619

Richard Hirschmann of America
Industrial Row/Box 229
Riverdale, NJ 07457
Contact: Andrew Swenson, Sales Manager
201-835-5002 FAX: 201-835-8354

Richardson Electronics
40W267 Keslinger Rd
LaFox, IL 60147
Contact: Larry Broome, Division Manager - Broadcast
708-208-2200 FAX: 708-208-2550

Richardson Electronics/RF Gain
116 S Long Beach Rd
Rockville Centre, NY 11570
Contact: Stuart Ochs, Sales Manager
800-348-5580 FAX: 516-872-4450

Riggins Electronic Sales
3272 E Willow St
Long Beach, CA 90806
Contact: George Riggins, Pres
310-598-7007

Ritz Audio Visual Associates
6620 Virginia Manor Road
Beltsville, MD 30105
Contact: Robert Duvorak, Executive Vice President
301-206-3101 FAX: 301-206-3105

River City Sound Productions
P.O. Box 750786
Memphis, TN 38175
Contact: Bob Pierce, Operations Manager
800-755-8729 FAX: 901-365-6910

Riviera Broadcast Leasing
9200 Sunset Blvd, No. 601
Los Angeles, CA 90069
Contact: Henri Ballinger

Rockwell International
1220 N. Alma Road (406-110)
Richardson, TX 75081
Contact: David Orr, VP/GM
214-996-5999 FAX: 214-996-5409

Roland Corp U.S.—Pro Audio/Video Group
7200 Dominion Circle
Los Angeles, CA 90040-3696
Contact: Albert Dugas, Advertising Manager
213-685-5141 FAX: 213-722-0911

Rosati Acoustics
3 Hanson Street
Boston, MA 92118-2120
Contact: Robert Rosati, President
617-423-5546 FAX: 617-423-5884

Rosco Labs Inc
36 Bush Ave
Port Chester, NY 10573
914-937-1300

Roscom General
P.O. Box 1208
Roswell, GA 30077
Contact: Bob Stewart
404-992-2230 FAX: 404-992-6538

Roscom General
P.O. Box 372
Eureka Springs, AR 72632
Contact: Tom Butler
501-253-8127 FAX: 501-253-8567

Roscom General
6301 Jackpine Drive
Bellvue, CO 80512
Contact: John Shideler
303-482-9254 FAX: 303-482-6123

Ray H. Rosenblum
PO Box 38296
Pittsburg, PA 15238
Contact: Ray H. Rosenblum, Media Broker/Station Appraiser
412-963-6311

RRadco Group
805 Wildrose Springs Drive
St Charles, IL 60174
Contact: Steve Kravitz, President
708-513-1386

Ruslang Corp
320 Dewey St
Bridgeport, CT 06605
Contact: Frank Ruskay, Jr., President
203-384-1266

Russco Electronics Mfg Inc
5690 E Shields Ave
Fresno, CA 93727
Contact: Vickey Turley, Sales Manager
209-291-5591 FAX: 209-291-9601

S

SCA Data Systems Inc
225 Arizona Avenue, Suite 350
Santa Monica, CA 90401-1203
Contact: Corinne Weber, Operations Manager
310-576-0566 FAX: 310-576-0566

S C M S Inc
10201 Rodney Blvd
Pineville, NC 28134
Contact: Bob Cauthen, President
800-438-6040 FAX: 704-889-4540

SG Communications
3444 N Dodge, Suite A
Tucson, AZ 85716
Contact: Ron Blackbern, Marketing/Sales Director
800-824-7865 FAX: 602-323-6980

SMARTS Broadcast Systems
PO Box 293
Emmetsburg, IA 50536
Contact: John Schad, President
800-747-6278 FAX: 712-852-3061

SMC International, Inc
2505 North 24th Street, Suite 501
Omaha, NE 68110
Contact: Jay B. McMartin, President
800-456-9107 FAX:402-451-2876

SPECTRA SONICS
3750 Airport Rd
Ogden, UT 84405
Contact: Jean Dilley, Controller
801-392-7531 FAX: 801-392-7531

SSAC Co
Box 1000
Baldwinsville, NY 13027
Contact: Gary Weeks, Director of Marketing
315-638-1300 FAX: 315-638-0333

STC Broadcast Consultants
3720 Greenwich Drive
El Paso, TX 79912
Marketing Manager

SW Casualty Inc
9311 San Padro Suite 600
San Antonio, TX 78216
Contact: Charles Amato

S.W.R. Inc.
P.O. Box 856, R.D. #3, Box 182
Ebensburg, PA 15931
Contact: Ed Edmiston, President
800-762-7743 FAX: 814-472-5552

Sage Alerting
700 Canal Street
Stamford, CT 06902
Contact: Jerry Lebow, President
203-357-1464 FAX: 203-357-1531

Sahe
P.O. Box 3047
Bayamon, PR 00621
Contact: Jose Fernandez, Consultant

Sailors Audio
125 E. 5th Street, P.O. Box 249
Imperial, NE 69033
Contact: Sherrill Sailors, President
308-882-4696 FAX: 308-882-5081

Saki Magnetics, Inc.
26600 Agoura Rd
Calabasas, CA 91302
Contact: Trevor Boyer, Director of Marketing & Sales
818-880-4054 FAX: 818-880-6242

Satellite Consultants Intl
PO Box 1509
Idaho Springs, CO 80452
Contact: Ms Terri Johnson, VP Sales Mktg

Satellite Music Network
12655 N Central Exprwy, Suite 600
Dallas, TX 75243
Contact: Martin Raab, Jr

Satellite Systems Corp.
897 Independence Ave, 1B
Mountain View, CA 94043
Contact: Larry Hayes, Vice President Engineering
415-962-8000 FAX: 415-962-8180

Satellite Transmission
3003 Moffett Ln
Houston, TX 77489
Contact: Barry Frishman, Mgr Audio Sales
713-438-3600 FAX: 713-438-9407

Sax Freeman Assoc
1401 McCormick Dr
Landover, MD 20785
Contact: Ted Dietz

S/B Valley International
P.O. Box 40306
Nashville, TN 37204
Contact: Liz Clark, Ad Manager

Scala Electronic Corp
PO Box 4580
Medford, OR 97501
Contact: Dan Fowler, Mktg Mgr
503-779-6500 FAX: 503-779-3991

Schafer Digital
231 Lathrop Way, Suite H
Sacramento, CA 95815
Contact: Dean Cull, General Services Manager
916-646-3444 FAX: 916-646-3493

Schafer International
17804 Cabela Drive
San Diego, CA 92127
Contact: Paul Schafer, President
619-673-8080 FAX: 619-673-8210

Schafer World Communications
PO Box 31
Marion, VA 24354
Contact: Bob Dix, President
703-783-2000 FAX: 703-783-2064

Schmid Telecomm. America Inc
15 West 26th Street
New York, NY 10010
Contact: Sergio Moreno, President
212-213-2099 FAX: 212-779-7305

Peter E Schmitt Co, Inc
240 Grand Ave
Leonia. NJ 07605
Contact: Sales Mgr

Schoeps/Posthorn Recordings
142 West 26th St 10th Floor
New York, NY 10001
Contact: Jerry Bruck, Owner-President
212-242-3737 FAX: 212-924-1243

Scientific Atlanta Inc
420 North Wickham Rd
Melbourne, FL 32935
Contact: Kent Malinowski, Dir Broadcast Radio & Data Systems
407-255-3000 FAX: 407-255-3016

L J Scully Mfg Corp
138 Hurd Ave
Bridgeport, CT 06604
Contact: L J Scully Jr, Pres
203-368-2332

Seck
8500 Balboa Ave
Northridge, CA 91329
818-893-4351 FAX: 818-893-3639

Secoa
2731 Nevada Ave N
Minneapolis, MN 55427
612-546-6313

Selco Products
7580 Stage Rd
Buena Park, CA 90638
Contact: Celeste Martinez, Mktg Mgr
800-25-SELCO FAX: 714-739-1507

Selectronics
2204 Del Paso Blvd
Sacramento, CA 95815
Contact: Robert Phillips, Owner

Sellmeyer Engineering
P.O. Box 356
McKinney, TX 75069
Contact: J.S. Sellmeyer, Consulting Engineer
214-542-2056 FAX: 214-542-2056

Sencore Inc
3200 Sencore Dr
Sioux Falls, SD 57117
Contact: John Perry, Natl Sales Mgr
605-339-0100

Sennheiser Electronic Corp
6 Vista Dr, PO Box 987
Old Lyme, CT 06371
Contact: Albert C. Zang, Mgr Pro Products
203-434-9190 FAX: 203-434-1759

Sentry Systems
2211 Fifth Ave
Seattle, WA 98121
Contact: Lee Hurley, General Mgr
800-426-9082 FAX: 206-441-6582

Sequoia Electronics
1131 Virginia Ave
Campbell, CA 95008
Contact: Mel Crosby, Sales Mgr
406-866-8434

Sescom Inc
2100 Ward Dr
Henderson, NV 89015
Contact: Franklin Miller, Pres
702-565-3400 FAX: 702-565-4828

Shaffer Communications Group
3050 Post Oak Blvd, Suite 1700
Houston, TX 77056-6526

Shallco Inc
PO Box 1089
Smithfield, NC 27577
Contact: Michael Sutton
919-934-3135

Sheer & Chaskelson Research
274 Madison Ave, Suite 1406
New York, NY 10016
Contact: Douglas Sheer, Co-Director

Shenandoah Tower Service
PO Box 956
Staunton, VA 24401
Contact: David Anthony, Owner

Shepler Electronics
5653 Weymouth Dr
Rockford, IL 61111
Contact: J Shepler, Sr Design Engr

Shively Labs
19 Harrison Rd
Bridgton, ME 04009
Contact: Jonathan R Clark, Marketing Manager
207-647-3327 FAX: 207-647-8273

Shook Electronic Enterprises
6630 Topper Pky
San Antonio, TX 78233
Contact: J Hollenbeck Shook, Dir
512-653-6761

Shure Brothers Inc
222 Hartrey Ave
Evanston, IL 60202
Contact: Nancy Calvert, Advertising
708-866-2200 FAX: 708-866-2279

Sierra Automated Systems
2112 N Glenoaks Blvd
Burbank, CA 91504
Contact: Al Salci, Vice President
818-840-6749 FAX: 818-840-6751

Signal Communications
5161 River Road Bldg 2A
Bethesda, MD 20816
Contact: Carol Ryder, Account Executive

Silliman and Silliman
8601 Georgia Avenue, Suite 910
Silver Spring, MD 20910
Contact: Robert Silliman, Partners
301-589-8288

Silver Lake Audio
2590 Hillside Court
Baldwin, NY 11510
Contact: Steve Kirsch, President

Sine Systems
3704 Inglewood Circle S
Nashville, TN 37216-3310
Contact: John Pate, President
615-228-3500 FAX: 615-227-2367

Si-Tex
PO Box 6700
Clearwater, FL 34618
Contact: William F Burgin, Mktg Mgr

W Lee Simmons & Associates Inc
1036 William Hilton Pky, No. 200f
Hilton Head Isle, SC 29928
Contact: W. Lee Simmons, President
800-277-5417 FAX: 803-842-3371

Sky Tower Service
PO Box 11493
Lynchburg, VA 24506
Contact: Greg Harrington, Owner
804-845-9479

Skyhawk Communications
PO Box 2078
Seminole, OK 74868
Contact: Rick Bales, President
405-382-0042 FAX: 405-382-0029

Skyline Antenna Management Inc
93 Delphi Road
Stafford, CT 06076
Contact: Peter Kovaleski, President
203-684-4444 FAX: 203-684-9459

Software Link
197 East Post Road
White Plains, NY 10601
Contact: Robert Signer, President

Software Technologies Inc
6 Shetland Cl
Salem, NH 03079
Contact: Mark Richards, GM

Solid State Logic
Begbroke
Oxford, OX5 1RU England
Contact: Noel Bell
44-08675-435

Solway Inc
PO Box 7647
Hollywood, FL 33081
Contact: Martin Munger
305-962-8650

Somich Engineering
1208 Stoney Run Trail
Broadview Heights, OH 44147
Contact: Jim Somich, President
216-526-4561 FAX: 216-991-1932

Sonocraft Corp
575 Eighth Avenue
New York, NY 10018
Contact: Ed Sternbach, A/V Sales Manager
800-274-7666 FAX: 212-564-9488

Sonex Division of Illbruck Inc
3800 Washington Avenue North
Minneapolis, MN 55412
Contact: Eric Johnson, National Sales Manager
800-662-0032 FAX: 612-521-5639

Sono-Mag Corp
1833 W Hovey Ave
Normal, IL 61761
Contact: Jon A. Housour, VP Sales
309-452-5313 FAX: 309-452-2521

Sontec Electronics
Audio Drive
Goldbond, VA 24094
Contact: Burgess MacNeal, General Manager
703-626-7256 FAX: 703-626-7257

Sony Business & Prof Group
3 Paragon Drive
Montvale, NJ 07645
Contact: Ron Remschel, Marketing Manager-Audio Products
201-358-4196 FAX: 201-358-4907

Soper Sound Music Library
PO Box 498
Palo Alto, CA 94301
Contact: Bruce Hemingway, Sales Manager
800-227-9980 FAX: 415-321-9261

Sound America Corp
5669 Highway 17 South
Savannah, GA 31405
Contact: Fred Hines, President
912-238-1771 FAX: 912-238-1750

Sound Com Corp
227 Depot St
Berea, OH 44017
Contact: Roy Stuewe
216-234-2604 FAX: 216-234-2614

Sound Concepts
Box 135
Brookline, MA 02146
Contact: John Bubbers

Sound Creations
21 Royal Oak Road
Lawrenceville, NJ 08648
Contact: Cliff White, Program Director

Sound Ideas
105 W Beaver Creek Rd Suite 4
Rich. Hill, ONT,L4B 1C6 CANADA
Contact: Brian Nimens, Pres
416-886-5000 FAX: 416-886-6800

Sound Merchandising
926 Sheridan Rd
Glencoe, IL 60022
Contact: Sales Mgr

Sound Technology
1400 Dell Avenue #A
Campbell, CA 95008
Contact: Robert Anderson, VP
408-378-6540 FAX: 408-378-6847

Soundcraft
8500 Balboa Blvd
Northridge, CA 91329
Contact: David Kimm, Director of Market Development
818-893-4351 FAX: 818-893-3639

South Central Sound
2201 South Main
Hope, AR 71801
Contact: Dan Wasmouth, Owner

Southeast Electronics Inc
3719 Richmond Street
Jacksonville, FL 32205-9425
904-356-3007

Southern Tower Service Co
PO Box 1387
Suffolk, VA 23434
Contact: James L Corlew
804-539-8365 FAX: 804-539-2047

Spacecom Systems
3801 S Sheridan Road
Tulsa, OK 74145
Contact: Pat Crocker, Dir of Marketing
918-665-8886 FAX: 918-621-5601

Spectrum Engineering Company
11211 Katy Freeway, Suite 390
Houston, TX 77079
Contact: W. (Bill) E. Cordell, PE, President
713-438-3838 FAX: 713-984-0066

Spencer Broadcast Inc
7003 W Union Hills Dr
Glendale, AZ 85308
Contact: Charles Spencer, President
602-242-2211 FAX: 602-843-2860

A W Sperry Instruments
245 Marcus Blvd
Hauppauge, NY 11788
Contact: Dennis Carroll, VP Sales & Marketing
516-231-7050 FAX: 516-434-3128

Sphere Electronics
13855 S Carus Road
Oregon City, OR 97045-9509
Contact: David Holmes

Sprague Magnetics Inc
15720 Stagg St
Van Nuys, CA 91406
Contact: Bob Reiss, Director, Audio Sales
800-553-8712 FAX: 818-994-2153

Stainless Inc
Third & Montgomery Sts
North Wales, PA 19454
Contact: H William Guzewicz
215-699-4871

Standard Tape Laboratory Inc
26120 Eden Landing Rd, No. 5
Hayward, CA 94545
Contact: Frank G Lennert, Pres
510-786-3546 FAX: 510-786-1180

Stanford Research Systems
1290 Reanwood Avenue
Sunnyvale, CA 94089
Contact: Dave Ames
408-744-9040

Stanton Magnetics Inc
101 Sunnyside Blvd
Plainview, NY 11803
Contact: Pete Bidwell, Vice President
516-349-0235 FAX: 516-349-0230

Star Case Manufacturing Co Inc
648 Superior Avenue
Munster, IN 46321
Contact: Ralph G. Hoopes, Vice President Sales & Marketing
800-822-STAR FAX: 219-922-4442

Star Systems
326 South Broadway #D
Salem, NH 03079
Contact: Ed Burns

Steinkamp Engineering
PO Box 3101
Quincy, IL 62305
Contact: Jeff Steinkamp, Registered Engineer
217-224-6284

Stellar Communications, Inc.
PO Box 1120
Vinita, OK 74301
Contact: Tom Snow, President
916-256-7883 FAX: 918-256-2558

Stellar Distributing, Inc.
PO Box 35661
Tulsa, OK 74153
Contact: John Pumphrey, Vice President Sales & Marketing
918-627-8887 FAX: 918-256-2558

Stephen Aaron Enterprise
PO Box 515764
Dallas, TX 75251
Contact: Steve Bergenholtz, Ad Manager

Steven L Delay Co
PO Box 1125
Pawnee, IL 62558-1125

Contact: Steven Delay, Owner
217-498-4339 FAX: 217-498-8147

Stevens, Kirkland, Kreer
35 E Wacker Dr, Suite 1780
Chicago, IL 60601
Contact: H.B. Kreer

Steve Vanni Assoc Inc.
PO Box 422
Auburn, NH 03032
Contact: Steve Vanni, Owner
603-483-5365 FAX: 603-483-2352

Storeel Corp
PO Box 80523
Atlanta, GA 30366
Contact: Carolyn Galvin, President
404-458-3280 FAX: 404-457-5585

Stram Electronics Corp
4800 S Westshore Blvd, #714
Tampa, FL 33611
Contact: Michael Stram, Owner
813-831-8551

Structural Systems Tech, Inc
6867 Elm St
McLean, VA 22101
Contact: J Cabot Goudy, President

Studer Editech
1370 Willow Road, Suite 201
Menlo Park, CA 94025
Contact: Andraes Koch, VP & General Manager
415-326-7030 FAX: 415-326-7039

Studer
1425 Elm Hill Pike
Nashville, TN 37210
Contact: Joe Bean, Sales Representative
615-254-5651 FAX: 615-256-7619

Studio Technologies
5520 West Touhy Ave
Skokie, IL 60077
Contact: B. Govednik/G. Kapes, Comm. Mgr/President
708-676-9177 FAX: 708-982-0747

Studio Technology
#4 Pennsylvania Avenue
Malvern, PA 19355
Contact: Vince Fiola, Director
215-640-1227

Studio-Sonics Corp
2246 N. Palmer Drive, Suite 100
Schaumburg, IL 60173
Contact: James R Stemke, Pres
312-843-7400

Suministros Gonzalez
3250 SW 21st Street
Miami, FL 33145
Contact: Manuel J Gonzalez, Owner
305-448-5066 FAX: 305-448-5127

Summit Audio
644 N Santa Cruz Avenue, Suite 7
Los Gatos, CA 95030
Contact: Mike Papp
408-395-2448

Summit Software Systems Inc
1966 13th Street
Boulder, CO 80302
Contact: Chris Morris, Sales Manager
303-443-9866 FAX: 303-443-9934

Sunbelt Mfg Co
Vienna Industrial Park
Vienna, GA 31092
Contact: Ben Johnston, Mktg Mgr

Sunkyong Magnetic/America
4041 Via Oro Avenue
Long Beach, CA 90810
Contact: Joseph Kempler, Technical Director

Sunspot
7925 Serendipity Lane
Charlotte, NC 28226-8609
Advertising Manager

Surcom Associates
2215 Faraday Ave, No. A
Carlsbad, CA 92008
Contact: A J Link, President
619-438-4420 FAX: 619-438-4759

Swaine Studio Inc
2515 Harriman Ln
Redondo Beach, CA 90278
Contact: Gay D Swaine, Pres

Swiderski Electronics Inc
1200 Greenleaf Avenue
Elk Grove Village, IL 60007
Marketing Manager

Swintek Enterprises Inc
965 Shulman Ave
Santa Clara, CA 95121
Contact: John Hernandez, Mktg Mgr
408-727-4889 FAX: 408-727-3025

Switchcraft Inc
5555 N Elston Ave
Chicago, IL 60630
Contact: Herbert C. Klapp, Manager Marketing Communications
312-792-2700 FAX: 312-792-2129

Symetrix Inc
4211 24th Ave West
Seattle, WA 98199
Contact: Jon Bosaw, National Sales Manager
800-288-8855 FAX: 206-283-5504

Systemation
337 N Water Street
Decatur, IL 62523
Contact: Maureen Bellinger, Executive Assistant
217-428-7101 FAX: 217-423-9764

Systems Wireless Ltd
465 Herndon Parkway
Herndon, VA 22091
Contact: William Sien, Vice President
703-471-7887 FAX: 703-437-1107

T

360 Systems
18740 Oxnard St, #302
Tarzana, CA 91356
Contact: Robert Easton, President
818-342-3127 FAX: 818-342-4372

3M Magnetic Media Division
Bldg 223-55-01, 3M Center
St Paul, MN 55144-1000
Contact: Richard J Collins
612-733-1082

TAI
7733 Telegraph Road
Montebello, CA 90640
Contact: David Oren, Product Mgr

T & W Tower/Antenna
PO Box 898
Hurlock, MD 21643
Contact: Patrick Todd

TCI
6050 Backlick Road, Suite 215
Springfield, VA 22150
Contact: J B Straud Sr, Director

TDK Electronics Corp
12 Harbor Park Dr
Port Washington, NY 11050

TEI Electronics
19850 Pheasant Drive
New Berlin, WI 53146
Contact: Tom Winnicki, President

TFT Inc
3090 Oakmead Village Dr
Santa Clara, CA 95051
Contact: Darryl E. Parker, Dir of Mktg
408-727-7272 FAX: 408-727-5942

THC Associates
15 Plum Grove Way
Gaithersburg, MD 20878
Contact: Tom Creighton, Consultant
301-926-1388

T.H.E.A.T.A. Digital Co
5330 Darry Avenue
Agoura Hills, CA 91301
Contact: Neal Sinclair

TK Video
12300 Coppola Drive
Potomac, MD 20854
Contact: Eric Hillman

TM Century, Inc.
14444 East Beltwood Parkway
Dallas, TX 75244
800-937-2100 FAX: 800-749-2121

TM Communications
14444 E. Beltwood Parkway
Dallas, TX 75244-3201
Contact: David Tyler

TOA Electronics Inc
601 Gateway Blvd, Suite 300
S San Francisco, CA 94080
Contact: Christine Foran, Marketing Communications Mgr
415-588-2538 FAX: 415-588-3349

TV Answer
1941 Roland Circle Place
Reston, VA 22091
Contact: Sally Olmstead, Public Relations
703-715-8600 FAX: 703-715-8853

TV Systems
3625 Clare Drive
San Angelo, TX 76904-5284
Contact: Cary Fitch

TWR Lighting Inc
1630 Elmview
Houston, TX 77080
Contact: Patrick Feller, General Manager
713-973-6904 FAX: 713-973-0205

T.Z. Sawyer Tech Consultants
6204 Highland Drive
Chevy Chase, MD 20815-6610
Contact: Timothy Z. Sawyer, President
800-255-2632 FAX: 301-913-5799

T-Tech (Talbot Technology Corp)
1 Dean St, PO Box 151
Hudson, MA 01749
Contact: Daniel B. Talbot
508-562-5820 FAX: 508-568-1219

Taber Manufacturing & Engrg Co
1880 Embarcadero Way
Palo Alto, CA 94303
Contact: Veldon Leverich
415-493-3811 FAX: 415-855-2302

Tandberg Educational, Inc.
Orch Rdg Crp Pk, Bldg 2, Fields Ln
Brewster, NY 10509
Contact: Morten Moseby, Operations Manager
914-277-3320 FAX: 914-277-3995

Tannoy-Tgi North America Inc
300 Gage Ave Unit, No. 1
Kitchener, Ont, N2M 2C8 Canada
Contact: Mark Kinzie, Technical Support
519-745-1158 FAX: 519-745-2364

Tape Video Services
3374 Given
Memphis, TN 38122
Contact: Ed Chapman

Tapecaster
7174A Industrial Drive
South Haven, MS 38671
Contact: Robert E Jones, Owner/Manager
601-349-2881 FAX: 601-349-2882

Tapex Corp
3608 Davisson Road
Des Moines, IA 50310
Contact: Vic Blacketer, Sales Mgr
515-255-3232 FAX: 515-274-3087

Tapscan
3000 Riverside Galleria K #830
Birmingham, AL 35244-2335
Contact: J Christian, President

Target Head Enterprise
5360 East Raymond St
Indianapolis, IN 46203
Contact: Geo Cecil Frye

Target Tuning
6 Caesar Place
Moonachie, NJ 07074
Contact: Dan Flohr, Pres
201-935-8880 FAX: 201-935-6548

Tascam/TEAC
7733 Telegraph Road
Montebello CA 90640
Contact: Ken Hirata, Marketing Communications Manager
213-726-0303 FAX: 213-727-7656

Taube Violante Advert
PO Box 504
Norwalk, CT 06856
Contact: Jean Crawford

Tech Laboratories Inc
500 Tenth Street
Palisades Park, NJ 07650
Contact: Nino M. Vlacich, Vice President
201-944-2221 FAX: 201-944-1653

Technical Services
PO Box 57
Rupert, VT 05768
Contact: Peter Morton

Techni-Tool
5 Apollo Rd Box 368
Plymouth Meeting, PA 19462
Contact: Bonnie Burgemeister, Adv Mgr

Technology Plus
6502 Robin Forrest
San Antonio, TX 78239
Contact: Bill Smith, Proj Mgr

Techron
PO Box 1000
Elkhart, IN 46515
Contact: Larry Shank, TEF Sales Manager

Tech/Write Communications
209 Sleepy Hollow Street
Ashland, OR 97520-1206
Contact: Bruce Borgerson, Owner

Tectan Inc
PO Box 271872
Concord, CA 94572
Contact: William D. Leasy, Vice President, Sales
510-798-2222 FAX: 510-798-2224

Tek Media Supply Company
4700 West Chase
Lincolnwood, IL 60646
Contact: Sherwin Berger, General Manager
708-677-3000 FAX: 708-677-1311

Tektronix Inc
PO Box 500
Beaverton, OR 97077
503-627-7111

Telcom Group Intl
2921 Carlisle Blvd NE, #200
Albuquerque, NM 87110
Contact: David Morgan, President

Tele-Wire Supply Co
1620 W Crosby Rd
Carrollton, TX 76006

Telectro Systems Corp
96-18 43rd Ave
Corona, NY 11368
Contact: Harry Sussman, President
718-651-8900 FAX: 718-651-4103

Teletech Inc
PO Box 924
Dearborn, MI 48121
Contact: Kenneth Hoehn, Vice President & General Manager
313-562-6873 FAX: 313-562-8612

Television Engineering
6400 Hollis, Suite #12
Emeryville, CA 94608
Contact: David Dunaway, West Dist Sales Mgr

Television Technology Corp
650 South Taylor Avenue
Louisville, CO 80027
Contact: Alex Delay, Sales Administrator
303-665-8000 FAX: 303-673-9900

Television Equip. Assoc., Inc.
Box 393
South Salem, NY 10590
Contact: Bill Pegler, President
914-763-8893 FAX: 914-763-9158

Telex Communications Inc
9600 Aldrich Ave South
Minneapolis, MN 55420
Contact: John Schofield, Sr VP Marketing
612-884-4051 FAX: 612-884-0043

Telfax Communications
2501 N. Loop Drive, Suite 900
Ames, IA 50010
Contact: Craig Pringle, Owner
515-296-9911 FAX: 515-296-9910

Telos Systems
1729 Superior Avenue
Cleveland, OH 44114
Contact: Trisha Ristagno, General Manager
216-241-7225 FAX: 216-241-4103

Telo Technology
1305 Upland Drive
Stanwood, WA 98292
Contact: Dan Rupe, Owner
206-387-3558

Telular
1215 Washington Ave
Wilmette, IL 60091
Contact: Richard Wasserman, Technical Sales Supervisor
708-256-8000 FAX: 708-256-3555

Temtron Electronics Ltd
15 Main St
E Rockaway, NY 11518
Contact: Sid Sussman
516-599-6400

Tenco Tower
9723 Folsom Blvd
Sacramento, CA 95827-1326
Contact: Donald J. Tenns, Owner
916-638-8833 FAX: 916-638-8858

Tennaplex Systems Ltd
21 Concourse Gate
Nepean, ON, K2E 7S4 Canada
Contact: Marvin Crouch, President
613-226-5870 FAX: 613-727-1247

Tentel Corp
4475 Golden Foothill Pkwy
El Dorado Hills, CA 95630
Contact: Wayne Graham, Sales Mgr
916-939-4005 FAX: 916-939-4114

Tepco Corp
PO Box 680
Rapid City, SD 57709-0680
Contact: Jerry Johnson, Sales Mgr
605-343-7200

Texas Electronics Inc
PO Box 7225
Dallas, TX 75209
Contact: Sam F. Eason, Marketing Manager
800-424-5651 FAX: 214-631-4218

Text Technologies Inc
PO Box 24268
Denver, CO 80224-0268
Contact: John Clark, Pres
303-751-7619

That Corporation
15 Strathmore Road
Natick, MA 01760
Contact: Gary Hebert, VP Eng
508-653-6335 FAX: 508-653-5334

The Management
PO Box 1-36457
Ft Worth, TX 76136
Contact: Peter Charlton, Pres
800-334-7823 FAX: 817-624-9741

The Media Groupe
657 East Thach Avenue
Auburn, AL 36830
Contact: Michael Shelley, President

The Miley Collection
PO Box 5103
Evansville, NY 47716-5103
Contact: John Miley, President

The Nissen Group, Inc.
32 Ridge Drive
Port Washington, NY 11050
Contact: Robert J Nissen, President/Consultant

The Summit
1227 W McNolia, #500
Fort Worth, TX 76104
Contact: Denise Graham

Thermodyne International Ltd.
20850 South Alameda Street
Long Beach, CA 90810
Contact: Gary S. Ackerman, Senior Vice President
310-603-1976 FAX: 310-603-1929

Thompson Consulting
1031 San Antonio Avenue
Alameda, CA 94501
Contact: Sam Thompson

Thor Electronics Corp
321 Pennsylvania Ave
Linden, NJ 07036
Contact: Angelo Crudele, President
800-666-8467 FAX: 908-486-0923

Time & Temperature Co of SD
PO Box 3605
Rapid City, SD 57709-3605
Contact: Don Grant, VP Sales & Mktg
605-787-4805

Tinet Inc
2611 Temple Heights Dr, Ste F
Oceanside, CA 92056
Contact: Paul Scott

Titus Technologies Labs
77 Kreiger Lane, Ste 914
Glastonbury, CT 06033
Contact: Lawrence Titus, President
203-633-5472 FAX: 203-633-8244

Tobias & Co Ltd
4246 Gate Crest
San Antonio, TX 78217
Contact: Gordon Tobias, President
512-599-0789 FAX: 512-599-0799

Tody Arnold & Assoc Inc
3234 Commander Drive
Carrollton, TX 75006
Contact: Lawrence Mangiameli, Vice President

Tower Network Services
PO Box 4065
Miami, FL 33269-4065
Contact: Jim Tiner

Tower Structures Inc
1869 Nirvana Avenue
Chula Vista, CA 92011
Contact: Fred Wells, Director, Marketing/Sales
619-421-1181 FAX: 619-421-0533

Townsend Broadcasting Systems
PO Box 2439
Springfield, MA 01101-2439

Transcom Corporation
201 Old York Road, Suite 207
Jenkintown, PA 19046
Contact: Martin Cooper, President
215-884-0888 FAX: 215-884-0738

Transcom Corporation
PO Box 26744
Elkins Park, PA 19117

Transmission Structures Ltd
PO Box 907, 227 South Vann Street
Vinita, OK 74301
Contact: Tom Snow, Vice President
918-256-7883 FAX: 918-256-2558

Transtector Systems Inc
10701 Airport Dr
Hayden Lake, ID 83835
Contact: Tom Wobker, VP Corp Mktg
208-772-8515 FAX: 208-772-6619

Trimm Inc
400 West Lake Street
Libertyville, IL 60048
Contact: Jacalyn Jaremba, Sales & Mktg
708-362-3700 FAX: 708-680-3888

Tri-Tech Inc/Cellcast
2415 East Skelly Dr
Tulsa, OK 74105
918-425-5588

Trompeter Electronics Inc
31186 La Baya Drive
Westlake Village, CA 91362-4047
Contact: Ray Calvin, VP Sales & Mktg
818-707-2020 FAX: 818-706-1040

Turtle Beach Systems
PO Box 5074
York, PA 17405
Contact: Jeff Klinedinst, Mktg Director
717-843-6916 FAX: 717-854-8319

U

UAR Professional Systems
8535 Fairhaven
San Antonio, TX 78229
Contact: Robert Bruce, Mgr
512-614-5678 FAX: 512-616-0299

UREI
8500 Balboa Blvd
Northridge, CA 91329
Contact: Steve Armstrong, Dir of Sales
818-893-8411 FAX: 818-893-3639

US Tape & Label
1561 Fairview Ave
St Louis, MO 63132
Contact: Byron Crecelius, VP Mktg

U.S. Tower Services
5263 Agro Drive
Frederick, MD 21701
Contact: Norman Jeweler, President
301-874-5885 FAX: 301-874-5887

Uher of America
7067 Vineland Ave
N Hollywood, CA 91605
Contact: Patricia Belgiorno, VP
818-764-1120 FAX: 818-764-1129

United Communications
1090 Chateau Drive
Helena, AL 35080-9604
Contact: Dave Robinson

United Recording
681 Fifth Ave
New York, NY 10022
Contact: Anita Adams

United Rope Works
151 Commerce Drive
Montgomeryville, PA 18936
Contact: Rosely Stronski, Administration Manager
215-368-6611 FAX: 215-362-7956

Univenture Inc.
6145 Scherers Place, Suite A
Dublin, OH 43017
Contact: Sandy Stein, Ad Mgr
614-761-2669 FAX: 614-793-0202

Utility Tower Company
PO Box 12369
Oklahoma City, OK 73157
Contact: Ron Nelson, Jr., Vice President & Sales
405-946-5551 FAX: 405-947-8466

V

VIF International
PO Box 1555
Mountain View, CA 94042
Contact: Gordon Mackechnie, Advisor, International Operations
408-739-9740 FAX: 408-739-0809

VIR James Consulting Engrs
3137 W Kentucky Avenue
Denver, CO 80219
Contact: VIR James

Vacuum Tube Industries Inc.
506 N Warren Ave, PO Box 2009
Brockton, MA 02405
Contact: Gene Tosti, General Mgr
508-584-4500 FAX: 508-584-0096

Thomas J. Valentino, Inc.
151 West 46th St
New York, NY 10036
Contact: Thomas Valentino, President
212-869-5210 FAX: 212-869-6259

Valley International Inc
616 Bradley Court
Franklin, TN 37064
Contact: Norman Baker, President
615-370-5901 FAX: 615-370-5907

Valmont Industries
Valley, NE 68064
Contact: Larry Hibler, Manager of Communication Products

Vanner Inc
4282 Reynolds Drive
Hilliard, OH 43028-1297
Contact: Jay Bowling, National Sales Manager
614-771-2718 FAX: 614-771-4904

Vantage Associates
1305 Mesilla NE
Albuquerque, NM 87110
Contact: Rick Harris, President

Vaughn Communications
7951 Computer Ave So
Minneapolis, MN 55435
Contact: Beth Evans
612-831-2248 FAX: 612-831-0791

Vega Wireless/A Mark IV Co
9900 Baldwin Place
El Monte, CA 91731
Contact: James Stoffo, Mktg Mgr
800-877-1771 FAX: 818-444-1342

Verda Corp
5321 South Kedzie Avenue
Chicago, IL 60632
Contact: Mr. Don Hudalla, President
414-961-2185

Versa Count
553 Lively Blvd
Elk Grove Village, IL 60007
Contact: Charles Piper

Versatech Industries Inc
14750 South Grant St
Bixby, OK 74008
Contact: Gene B. Randall Jr, Pres
918-366-7400 FAX: 918-366-7400

Vertigo Recording
12115 Magnolia Ste 116
N Hollywood, CA 91607
Contact: Charles Bolis
818-907-5161

Videoquip Research Limited
418 Calverton Court
Harleysville, PA 10438
Contact: Fred Majewski, National Marketing Manager
215-361-2757 FAX: 215-361-3281

Vinylweld Inc
2011 W Hastings St
Chicago, IL 60608
Marketing Manager

Voyageurs Communications
PO Box 282
International Falls, MN 56649
Contact: Leroy Hervey, President

W

Walter Wulff & Associates
PO Box 77028
Atlanta, GA 30357
Contact: Walter Wulff, President
404-881-6786 FAX: 404-881-6786

Walters-Storyk Design Group
134 Main Street
New Paltz, NY 12561
Contact: John Storyk, Vice President
914-255-2255 FAX: 914-255-2519

Ward-Beck Systems Ltd
841 Progress Ave
Scarborough, ON M1H 2X4 Canada
Contact: Eugene L. Johnson, Sales Engineer
416-438-6550 FAX: 416-438-3865

Warren Electronic Systems Inc
250 Thunderbird, Suite 5
El Paso, TX 79912
Contact: Pete Warren, III, President
915-581-0306 FAX: 915-584-8005

Washington Professional System
11157 Veirs Mill Road
Wheaton, MD 20902
Contact: Robert Forman, Sales Manager

Waters Manufacturing
Longfellow Ctr
Wayland, MA 01778
Contact: Peggy Angel, Ad Mgr

WaveFrame Corporation
4730 Woodman Avenue, Suite 405
Sherman Oaks, CA 91423
Contact: Chuck Grindstaff, President
818-981-9235 FAX: 818-981-9239

Wayne Audio
RR 2 Box 232
Moncks Corner, SC 29461
Contact: Joseph Kelley

Weather Central
5725 Tokay Blvd
Madison, WI 53719
Contact: Charles B. Sholdt, Vice President
608-274-5789 FAX: 608-273-5854

Weather Services Corporation
131A Great Rd
Bedford, MA 01730
Contact: George Stamos, Vice President
617-275-8860 FAX: 617-271-0178

Wegener Communications
11350 Technology Cir
Duluth, GA 30136
Contact: Kenneth D Leffingwell
404-623-0096 FAX: 404-623-0698

Weisel Communications
147 Brookfield Avenue
Youngstown, OH 44512
Contact: Charles Weisel

Western Intl Communications
505 Burrard St Ste 1960
Vancouver, Bc, V7X 1M6 Canada
604-526-3214

Westlake Audio Prof Prod Mfg G
2696 Lavery Ct Unit 18
Newbury Park, CA 91320
805-499-3686

West Starr International
W. 7106 W.D. Alton Drive, Ste 106
Spokane, WA 99204
Contact: Dick Jones, Vice President of Marketing
509-838-0110 FAX: 509-624-2941

Wheatstone Corporation
6720 V.I.P. Parkway
Syracuse, NY 13211
Contact: Ray Esparolini, Director of Sales
315-455-7740 FAX: 315-454-8104

Whirlwind
100 Boxart Street
Rochester, NY 14612
Contact: Michael Laiacona, President
716-663-8820

White Instruments, Div. CVANR
1514 Ed Bluestein Blvd.
Austin, TX 78721
Contact: Jeff Van Ryswyk, Sales Manager
512-389-3800 FAX: 512-389-1515

Brian R White Co, Inc
313 Henry Station Rd
Ukiah, CA 95482
Contact: Larry J Richmond, Sales Manager
707-462-9795 FAX: 707-462-4800

Wide Range Electronics Corp
174 Chesterfield Industrial Blvd.
Chesterfield, MO 63005
Contact: Gail Stecker, Manager
800-728-4017 FAX: 314-532-5492

Wilkinson Electronics
PO Box 1385
Broomfield, CO 80020
Contact: Mkt Mgr

Will-Burt Company
PO Box 900; 169 South Main Street
Orrville, OH 44667
Contact: Steven Pinkley, Accounts Manager
216-682-7015 FAX: 216-684-1190

Martin Williams
10 So 5th St
Minneapolis, MN 55402
Contact: Marlene Ordof

Wiltronix Inc
16850 Oakmont Ave
Washington Grove, MD 20880
301-258-7676

Winchell Marketing Comm
1315 Cherry St
Philadelphia, PA 19107
Contact: Joan Meagher

Winsted Corp
10901 Hampshire Ave South
Minneapolis, MN 55438
Contact: G R Hoska, Vice President
800-447-2257 FAX: 612-944-1546

Wireready Newswire Systems Inc
31-H Union Avenue
Sudbury, MA 01776
Contact: David M. Gerstmann, President
800-833-4459 FAX: 508-443-5988

Wireworks Corp
380 Hillside Ave
Hillside, NJ 07205
Contact: Angela Kelly, Customer Service Manager
908-686-7400 FAX: 908-886-0483

Wohler Technologies
1349 Kansas St
San Francisco, CA 94107
Contact: Will C. Wohler, President
415-285-5462 FAX: 415-821-6414

Wood & Douglas
PO Box 1631
Melbourne, FL 32902-1631
Contact: Alan Papworth, Mktg Dir

Worldwide Technologies
8 Patrician Drive
E Northport, NY 11731
Contact: Harvey Lunfenfeld, President

World Tower Co
PO Box 405
Mayfield, KY 42066
Contact: Nate Sholar

Worrell Assoc
300 College St
Ft Worth, TX 76104
Contact: Chuck Worrell

X

Xedit Corp
218-31 9th Avenue
Queens Village, NY 11429
Contact: Claude M Karczmer, President

Y

Yamaha International Corp
PO Box 6600
Buena Park, CA 90622
Contact: Bob Shomaker
714-522-9011 FAX: 714-739-2680

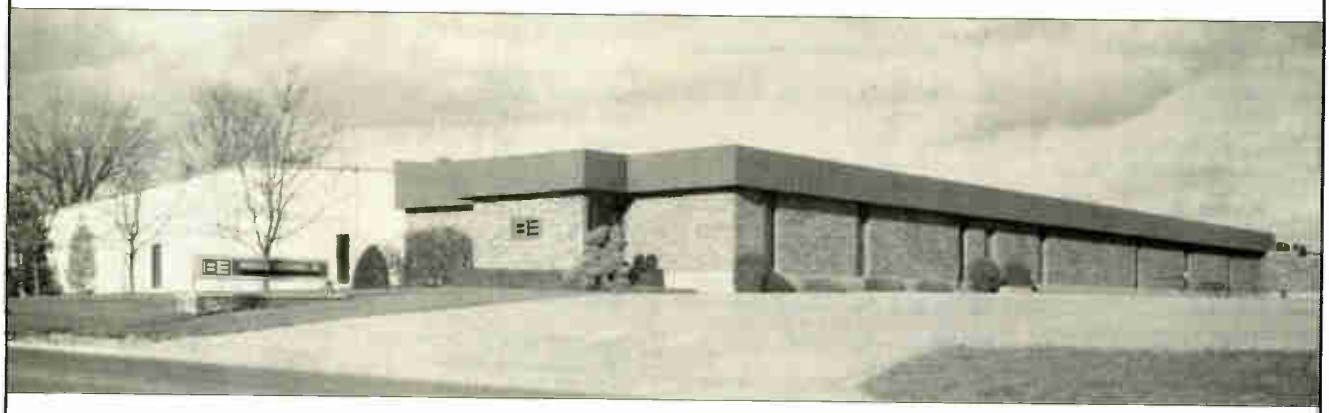
Z

Zephyr Weather Information Ser
40 Washington St
Westborough, MA 01581
Contact: Kevin A. Porreco, Manager, Zephyr Sales
508-898-3511 FAX: 508-836-3711

Zercom
Box 84, Zercom Drive
Merrifield, MN 56465
Contact: Denny Schmidt, Sales Engineer
218-765-3151 FAX: 218-765-3900

Zero Stantron
777 Front Street
Burbank, CA 91502
Contact: M. Pistone, Advertising Coordinator
818-841-1825 FAX: 818-841-8892

Zimmer Broadcast Co
PO Box 1810
Cape Girardeau, MO 63701
Contact: John Zimmer



BROADCAST ELECTRONICS

PRESIDENT'S BIO

John J. Nevin has been president and CEO of Broadcast Electronics since March 1, 1991. His experience in the electronics and telecommunications industries spans 30 years. Prior to taking the reins at B/E, Nevin served as senior vice president/general manager of Glenayre Electronics Ltd. (formerly Quintron Corporation) and president/ CEO of Plexsys Corporation, both located in Quincy, IL.

COMPANY HISTORY

Broadcast Electronics has been setting the standards in radio broadcast equipment since its inception in 1959, when the company designed and built the first magnetic tape cartridge machine. That leadership has continued over the years through aggressive research and development, and a dedicated, highly trained workforce.

The many design innovations in our more than 30-year history include the Control 16 Automation System, fully microprocessor-based for flexibility and power; the first single tube, 30 kW FM transmitter, incorporating the patented folded half-wave cavity; the PHASE TRAK 90 Cart Machine, which introduced the technology of non-encoded, automatic phase correction; the AudioVAULT for the ultimate in record, storage and playback capability; the CORE 2000 for unparalleled automated program control; and the AIR TRAK 90 linear console for the utmost in performance and reliability.

FACILITIES

Broadcast Electronics' offices and manufacturing facilities are located in Quincy, IL.

DISTRIBUTORS/REPS

B/E sells through both distributors and sales rep organizations.

MAJOR PRODUCTS

At Broadcast Electronics, we're committed to providing the industry the finest radio broadcast products available anywhere. Our major products include both AM and FM transmitters from 100 watts to 35 kw, tape cartridge machines, splice finder/erasers, rotary and linear studio consoles, digital audio storage, digital program control, AM stereo exciters and monitors.

Broadcast Electronics is dedicated to manufacturing a broad spectrum of products required for radio station operation, from power to tower.

1992 TRADE SHOWS

- National Religious Broadcasters
- European AES
- National Association of Broadcasters
- Broadcast Asia
- NAB Europe
- NAB Radio '92
- SBE '92

B/E CONTACTS

- President – Jack Nevin
- Sales Director-International: Chuck Kelly
- Sales Director-Domestic: Bill Harland
- Sales Director-Government: Tim Bealor
- Customer Service manager: Gil Housewright

BROADCAST ELECTRONICS INC.
4100 N. 24th St., P.O. BOX 3606
Quincy, IL 62305-3606 U.S.A.
Phone (217) 224-9600, FAX (217) 224-9607
TELEX: 250142

Circle (92) on Reader Service Card

What Are They Up To Now?

ComStream is a manufacturer of advanced satellite based digital audio communications systems, including the new Integrated Digital Audio Network, featuring the ABR200 Digital Audio Receiver.

The ABR200 sets a new worldwide standard for digital audio distribution. Significant satellite savings (35-65%) are achieved through a combination of ComStream custom IC technology and the latest in MUSICAM digital audio compression.

System capacity grows as requirements grow, from 1 channel to over 50, thereby minimizing satellite transmission costs. Each channel can include an async bitstream for network control, relay sensor lines or user data.

FEATURES:

- CD-quality stereo at 128 Kbps.
- Ku- or C-band operation.
- World's first multirate, multimode integrated receiver/decoder IRD) for digital audio.
- Quick Channel Access provides instantaneous switching between audio channels. Full addressability and receiver control from uplink.

The ComStream Audio Network Management System controls the audio distribution network at the uplink and the downlink, and collects and displays network configuration and status information.

APPLICATIONS:

- Private network audio distribution with direct uplinking alleviates expensive backhauls to large major network uplinks.
- Distribution of large-market radio programming to outlying, small market stations.
  Timely transfers of news and actualities by network news organizations.
- High quality, low cost links for direct uplinking of remote broadcasts from concerts and "on-location"radio shows.

For more information on ComStream's digital audio technology, call **619-458-1800** or fax **619-552-0488.**

The New Integrated Digital Audio Network Featuring The ABR200 Digital Audio Receiver

Circle (141) on Reader Service Card

Headquarters: *10180 Barnes Canyon Rd., San Diego, CA 92121 Tel: 619 458-1800 Fax: 619 552-0488*
Washington: *P.O. Box 4010 Annapolis, MD 21403 Tel: 301 267-8040 Fax: 301 267-8039*
Hong Kong: *CD19, 21 Conduit Rd., Hong Kong Tel: 852 559-6907 Fax: 852 858-6234*
London: *Balmoral House, 57B Station Approach, West Byfleet, Surrey KT14 6NE, UK Tel: (44) 932 340 989 Fax: (44) 932 341 266*

COMSTREAM
Satellite Technology Brought Down To Earth

TAPECASTER®

7174A Industrial Drive, Southhaven, MS 38671
601-349-2881 ■ FAX: 601-349-2882 ■ 1-800-638-0977
Owner/Manager: Robert E. Jones

Robert Jones worked for Harris-Gates in the Audio Engineering Department as well as being involved in the design of Magnacord products at Telex. He also worked as a Field Engineer for Scully Metrotech in Nashville, TN and in October, 1976 joined Auditronics. He was born in 1936, is married and graduated from Indiana Tech in 1961 with a BSELE degree.

Tapecaster was started in 1962 by Paul Shore in Maryland. In 1986, the company was bought by Auditronics and moved to Memphis, TN. At that time, Robert Jones became manager. Tapecaster was purchased by Robert from Auditronics in July, 1991, and moved to Southaven, Mississippi, just across the state line from Memphis. Our 1400 square foot facility is located near I-55. We currently employ one part-time and four full-time employees.

Tapecaster machines have been "workhorses" in the field of broadcasting equipment. With this reputation of reliability and dependability, we are embarking upon a new line of stackable and rack mountable cart machines with our stereo and mono playbacks available in the market December, 1991.

Some features of our new machine will be:

- Three Cue Tone Standard with Defeat
- Playback Amp Muting
- CMOS Logic
- 600 OHM Active Balanced Output
- Fast Forward-Manual or Automatic (Determined by Cue Tone)
- Rackmountable
- High Quality at Low Cost

Our complete line will be introduced at the NAB Show in April which will include stereo and mono record machines.

The 900 Series machines will be an addition to our line of products which include our Series 700 machines and our cartridge loader. Tapecaster also offers repair services for our machines

Our dealers include Harris Allied, Broadcast Supply West, Continental Electronics, Suministros Gonzalez, Boynton Studios, Professional Audio Broadcast Supply as well as others. International dealers include Empire Communications, Prodinel and Radio Magic. We also sell direct.

Tapecaster will be at the Spring NAB Show as well as Radio 1992.

Circle (63) on Reader Service Card

multiphase consulting

Contract Engineering Service

Test Equipment Rental

founded in 1978 by Henry Stewart and John Bisset

Now beginning its 14th year of service to broadcasters, Multiphase Consulting provides affordable contract engineering, emergency, and special project services. Our involvement in projects is customized to the specific need. Whether it's a turnkey system or simply an "extra pair of hands" to complete a project deadline, broadcasters are turning to Multiphase. Our experienced engineers are former Major Market CE's who offer responsible, affordable technical service. With experience in both audio and RF, Multiphase is a logical choice for station assessments and evaluations. For a free FCC Compliance Checklist, **circle 45 on reader service card.**

5827 Columbia Pike
Suite 310A
Falls Church, VA 22041

(703) 379-1664
answered 24 hours
FAX: (703) 998-2966

An example of a studio project involving Multiphase

Multiphase is recognized as an authorized installer for C-QUAM® AM Stereo systems, and also provides system tuneups for existing stereo installations. Multiphase maintains a stock of rental test equipment which includes:

- **Delta's "HEART MONITOR"** PRH-1—tests the condition of all types of transmission lines
- **The AM SPLATTER MONITOR** Verify NRSC and transmitter performance. Also minimize IPM
- **OIB Operating Impedance Bridges** and RG-3/RG-4 Receiver/Generators

"try before you buy"

For test equipment rental application notes, **circle 109 on reader service card.**

® C-Quam is a registered trademark of Motorola, Inc.

• FULLY FCC LICENSED AND SBE CERTIFIED •

Sailors Audio Studios

Two locations:
2327 North Jefferson, Hobbs, New Mexico 88240
505-392-1220

137 West O Street, McCook, Nebraska 69001
308-345-4762

President: Sherrill LeRoy Sailors
Vice President: D.G. Sailors II
Sales Director: Howard D. Smith, Jr.
Customer Service Representative: D.L. Sailors
Production Manager: Jack D. Bauer
Bookkeeper: Diane Bauer
Personal Secretary to the President: Anna S. Sailors

At the age of 12, company president Sherrill LeRoy Sailors started experimenting with the various brands of sound gear, only to find that they just did not have what he calls "top quality music reproduction."

After many years of intense research and experimentation, he has developed a professional line of products, including a speaker line that he says will turn the music industry upside down.

All sound cabinets are handcrafted with pride, using the finest materials available. Enclosed inside is the one big secret, something to enlighten the ears—the company's own speaker line developed and built to Sailors Audio's specifications and configured to complement every sound.

Whether it's subwoofers, mid-range cabinets, mid-lows, mid-highs or horns, Sailors Audio Studios' sound reproduction is sure to please.

New in 1992 will be a professional line of microphones, EQs, power amps, mixing consoles and guitars.

Sailors Audio Studios' products are backed by its no-questions-asked Seven-Year or Lifetime Guarantees on cabinet enclosures and components.

Sailors Audio Studios is seeking a few good dealers to represent its lines. Most geographic areas are available at this time, but are subject to fill on a first-come, first-serve basis. For additional information, please call.

Once you see and hear our line, you will be as enthusiastic as we are!

SAILORS AUDIO STUDIOS—OVER 100 YEARS OF SALES STAFF EXPERIENCE

Circle (71) On Reader Service Card

KINTRONIC LABS

144 Pleasant Grove Road
Bluff City, TN 37618
Phone: 615-878-3141
FAX: 615-878-4224

President: Thomas F. King
VP/Sales: Gwen B. King
Customer Service Rep: Donald Hastings
Production Manager: Boyd Wright

Founded in 1962 by Louis A. King P.E., Kintronic Laboratories got its start in the fabrication of isolation transformers and custom RF components. The company has since grown in size to encompass a facility of 17,500 square feet and a staff including four eletrical engineers and twenty-six clerical and manufacturing personnel.

Kintronic has also grown in reputation to be the leading independent manufacturer of custom AM antenna systems and components in the US. The firm also has established a reputation for high quality products and service worldwide.

Kintronic Laboratories' President Thomas King holds a Bachelors and a Masters Degree in Electrical Engineering; he also has completed two years of graduate study toward his Doctorate in the field. King has 10 years of experience in defense electronics, and an additional eight years in broadcast engineering. He is also a member of NAB, SBE and the IEEE Broadcast Technology Subgroup and an Associate Member of AFCCE.

Major products from Kintronic include directional broadband antenna phasing systems, antenna tuning units, AM non-directional and directional multiplexed antenna systems, dummy loads, equipment racks, rigid transmission line and accessories, and RF contactors. Other products from the company include RF fixed and variable inductors, isocouplers, lighting chokes and custom RF components. In addition Kintronic Labs now manufactures a full line of shortwave/HF equipment including dipole curtain, log periodic, rhombic or half-wave dipole antennas, open wire transmission line, wall feedthrough panels, and open wire transmission line manual or motorized switches.

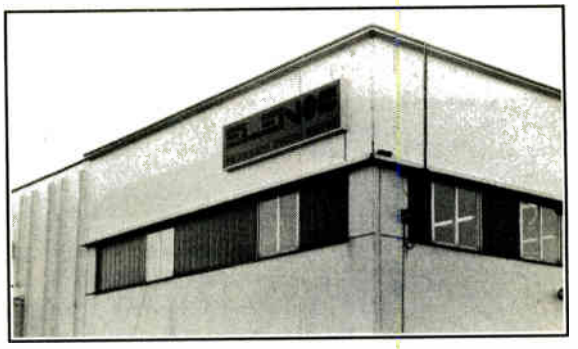
Kintronic is also the stocking distributor for Sangamo/Cornell Dublier Mica Capacitors as well as for Jennings vacuum capacitors and contactors, and maintains Cablewave transmission line and accessory products in stock.

Direct marketing and distributors are employed by Kintronic Laboratories for sales, and the company has distribution agreements with RF Specialties, Harris Allied, NE Broadcast Lab, and Southern Coastal Marketing Services.

Kintronic plans to exhibit in 1992 NAB convention.

Circle (26) on Reader Service Card

ELENOS



PLYMOUTH, Mass. Today, Elenos Co. is a leader in the field of high-quality FM power amplifiers. The relevant success gained is the result of great emphasis on research and development, as well as high standards in business philosophy.

With the assistance of sophisticated equipment, which is partly designed and manufactured by Elenos Co., a highly qualified team of engineers are constantly engaged in developing innovative ideas as well as improving the existing products.

Elenos is capable of providing exclusive products, services and a series of accessories that improves the quality of the transmitting systems as well as enhancing the performance of existing equipment manufactured by our competitors. Our testers, which are standard equipment in all of Elenos service centers, are particularly useful for monitoring the quality and the working condition of the amplifiers.

Obviously, our team of qualified engineers and trained consultants are also available and willing to cooperate with our clients' particular and specialized needs.

National/International marketing

During the last few years, Elenos has strived to achieve its national notoriety, and at present it occupies a notable quote among our competitors. Elenos is also well established in the international market; Elenos has demonstrated and will continue to demonstrate its products in the following international broadcasting exhibitions: NAB in the U.S., IBC in Great Britain, Broadcast Madrid in Spain, Africa Telecom, Communication Turkey and FM Expo in France.

Through agreement with a relevant importer, Elenos has a new office in the U.S. The new office has been established to better serve the North, Central and South American markets.

Total guarantee

The "one-year guarantee" for the amplifier tube is a sure sign of confidence with which Elenos offers its products. This philosophy is Elenos' assurance that our clients receive reliable products, good consultation, good services and guarantees that allow Elenos staff to consider the future with optimistic prospects of continued success.

At present, Elenos' design department is upgrading all existing plans concerning radio links, modulators and high-power amplifiers, which are particularly innovative within this professional field. This is a commitment to the already acquired value of the Elenos mark, which is recognized as synonymous to high quality throughout the industry.

Other interesting plans are constantly being worked on by our Research & Development department. Only after careful and practical evaluation, selective and stringent testing will they be released to the existing market, with the aim to create new standards for quality and technology that Elenos has introduced in the past.

Prospect for the future

In a specialized field like broadcasting, it is very important to consolidate one's position and to give greater importance to quality and to the high reliability on the manufacturer's products, characteristically which have always marked Elenos amplifiers, allowing us gain prestigious targets.

Elenos prides itself in utilizing qualified representatives to guarantee good consultation, quality and speedy services, and (importantly) cater to our client's needs. As a major guarantee, Elenos ensures that their representatives, engineers, and service personnel are upgraded and trained to the latest technology.

To be in the market and confirm oneself as a leader in the broadcasting field means to work in order to improve the existing products and to assure a business-like atmosphere able to maintain and demonstrate the value of Elenos diversified products.

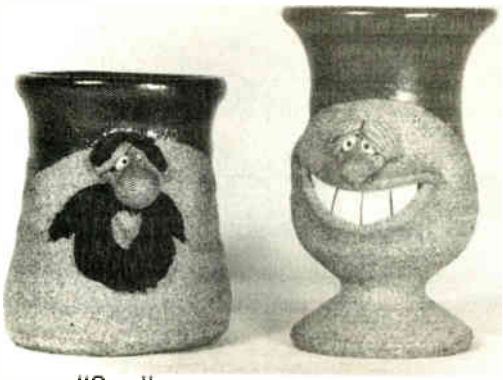
Due to our bold moves and established confidence in our equipment and company status, Elenos has reached the stage of guaranteeing the rapid time of consignment, providing direct assistance in the installation and sound testing of the equipment or systems located anywhere in the world.

Consulting services are available at all time.

For information, contact Renato Carpeggiani at Elenos, 508-830-0448; or fax: 508-747-4696.

Circle (98) On Reader Service Card

THE ATI GUYS



"Sam" "Ed"

Audio Technologies, Inc.
328 W. Maple Avenue
Horsham, PA 19044
Phone: (215) 443-0330
Fax: (215) 443-0394

Co-owners:

SAMUEL B. WENZEL, President, born 1934, married. 1951-55 served U.S. Armed Forces. BSEE 1959 City College of New York. MSEE 1963 Drexel University. 1959 - 1961 - AIL Design Engineer. 1961-1976- Philco Ford, Senior Engineering Specialist Terrestrial and Satellite Communications. 1976 - 1979 - Ampro Scully Co., as Vice-President and General Manager. 1979 - Co-founded ATI.

EDWARD M. MULLIN, Vice-President, born 1938, married. BSEE 1961 Drexel University. 1961 - 1964 - ITA Corp. Audio Design Engineer. 1964 - 1967 - Omnidata Corp - Digital & Electromechanical Design engineer. 1967 - 1979 Ampro Scully Co. successively as Design Engineer, Chief Engineer and President. 1979 Co-founded ATI.

ATI - Audio Technologies Incorporated was incorporated in the state of Pennsylvania in August 1979. We are now in our 12th year. The company was organized and is co-owned equally by Samuel B. Wenzel and Edward M. Mullin. The initial ATI designs which are still manufactured, are the Micro Amp Series of Mike, Line, Distribution and Turntable Amplifiers. These products have been augmented by a full line of Consoles and "Problem Solver" products directed toward the broadcast and pro-sound industries. ATI's market is worldwide. 70% of world sales are domestic, 30% are international.

ATI supports the National SBE and local SBE chapter 18 and is an associate member of NAB and NSCA.

ATI's manufacturing facility and headquarters occupy 15,000 sq. ft. in beautiful downtown Horsham, Pennsylvania, a suburb of Philadelphia. The principal activity at the plant is the manufacturing of ATI's extensive proprietary product line of audio equipment, along with marketing/sales and engineering offices.

- The "Micro-Amp Series" - Premium Mike Amplifiers, Turntable Amplifiers, Line Amplifiers, Audio Distribution Amplifiers, Meter and Monitoring systems. New products include Press box and a family of headphone amplifiers.
- The "Vanguard Series" - 6 (new), 8 and 12 mixer, dual channel stereo broadcast consoles.
- The "Encore Series", of Ulti-mike, Line, Turntable Amplifiers, Audio Distribution Amplifiers and Multi-Amplifier arrays.
- The "Match-Maker" and "Disc-Patcher" line of bi-directional and uni-directional interface systems for level matching IHF leads to 600 ohms.
- The "Emph-a sizer" - A Mike and Line Audio Processor.

Principal Dealers:

Harris/Allied, Audio Broadcast Group, Bradley Broadcast Sales, Broadcast Supply West, Broadcasters General Store, Northeast Broadcast Labs, RF Specialties Group and other domestic and international dealers.

1992 trade shows where ATI will exhibit:

NAB '92, Radio '92, SBE National '92, Regional SBE Shows, Univ. of Wisconsin Broadcasters Clinic

DEDICATED TO SOUND ENGINEERING

Circle (115) On Reader Service Card

The founders of J.N.S. share over half a century of station and broadcast equipment manufacturing experience. This hands-on exposure has led to the development of products that do jobs essential to the broadcaster, but in an intelligent way. Founders include John E. Leonard, Jr., President and John N. Stannard, Vice-President.

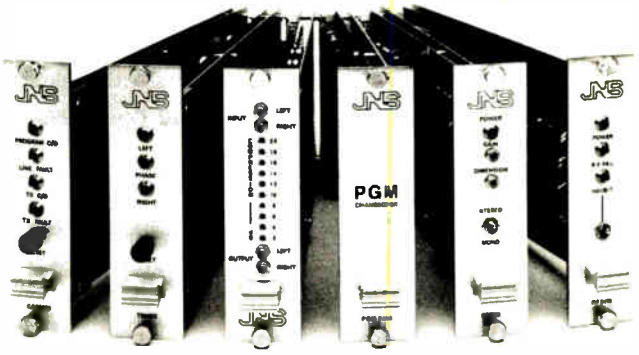
The firm spans two continents. J.N.S. Electronics, Inc. corporate, sales and service offices are in San Jose, CA. Manufacturing occurs in both California and Australia.

Products currently include two families of audio routing switchers and a modular rack frame system.

'the FRAME'

The 8000 series modular system can be configured to amplify, switch, match, equalize, demodulate, display or generate. Two sizes are available to house and power from 2 or up to 10 modules. Over 20 modules are currently available for **'the FRAME'**, with new modules in development for release in 1992. Jobs being done by these modules include -

- ❑ **Mono or Stereo Audio Distribution**
- ❑ **Audio Monitor Amplifiers**
- ❑ **Audio Switching**
- ❑ **Video Distribution**
- ❑ **Audio Failure Sensing**
- ❑ **Stereo Presence/Validity**
- ❑ **Program Changeover, auto or manual**
- ❑ **RF Demodulation**
- ❑ **Off-air Monitoring**
- ❑ **Peak/VU Audio Metering**



Modules from 'the FRAME'

SWITCHERS

J.N.S. audio switchers are noted for **ALL** having, as a minimum, ***CD quality*** performance. Frequency responses of 20 Hz to 20kHz, distortions under 0.01% and noise at or toward 100dB are standard.

8310

8310 - Affordable 10 in×1 out, stereo

8310B - Stereo, 10 in×1 out, expandable to 100in, local and remote controllable, computer controllable.

9000 - Full matrix switch, from 1×15 to 100×100 (mono, stereo, and machine control), Control surfaces of all types, including computer control. Memory of last selection through hours of power outage standard.

See the current and new J.N.S. products at NAB in Las Vegas or from our distributors. Products are available through select distributors and by direct sales.

J.N.S. Electronics, Inc.
P.O. Box 32550
San Jose, CA 95152
408 729-3838/FAX 408 926-1003

Circle (83) on Reader Service Card

INDICES & REPRINTS

Each index uses a numerical system to denote issue date and page number– the month and day are separated by a slash, while the day and page are separated by a colon. Thus, an entry of 2/20:6, for example, refers to a story in the 20 February 1991 issue, on page 6.

SUBJECT INDEX

D

E

F

M

N

O

P

T

U

V

W

X

Z

BUYERS GUIDE INDEX

AUTHOR INDEX

BUYERS GUIDE

DigiCart Makes the Job Easier

by Robert Easton
President
360 Systems

TARZANA, Calif. Although the DigiCart from 360 Systems closely resembles analog tape carts, inside it's a 16-bit stereo digital recorder with performance specs equal to the best CD player.

TECHNOLOGY UPDATE

We think DigiCart is the first serious challenge to NAB cart machines in several decades—and best of all, it costs the same as a mid-line NAB cart.

The DigiCart stores more than 20 minutes of stereo on a removable Bernoulli disk. It acts a lot like a recordable CD, but accomplishes the feat with a reuseable magnetic disk cartridge, good for five years.

Unlike CDs, there is no limit to the number of selections that can be recorded, and each can be edited, erased and re-recorded indefinitely without degradation to the disk.

Track record

If there is one reason broadcasters want to get rid of their tape carts, it's because they aren't reliable; so finding a technology with a proven 10-year track record became our R&D department's number-one job.

Unlike many new digital recorders with emerging technologies, the DigiCart uses a Bernoulli disk drive built for 360 Systems by Iomega Corp., one of the largest makers of computer data-backup systems. One of the advantages the DigiCart offers over other technologies is that the Bernoulli disks are readily available.

Where DigiCart really outperforms analog carts is its ability to instantly access any spot on the disk. A Cue Select knob lets the user rapidly jump to any one of dozens of spots, while an easy-to-read display shows the name of the spot, time remaining, and other useful information.

Unlike tape carts, the DigiCart can cue up a second selection (or many more) while the first one is playing; each cue does a smooth follow-on play from the last one.

Digital editing facilities

Digital editing facilities are a standard feature of the DigiCart. Edits can be done in the usual time-code format of Hours, Minutes, Seconds, Frames and SMPTE Bits.

After a cue is recorded, head trims, tail trims or even fade-ins and fade-outs are done in a few moments. And if a cue's loudness doesn't match other material, the DigiCart's digital signal processing can recalculate the audio data to make it match. Loudness adjustments from +6 dB to −90 dB can be done on the fly.

DigiCarts come with a full-featured serial port using the ES-Bus communications standard. They can be fully controlled from a computer, so that the serial port gives all the capability that the front panel has.

Third-party suppliers, such as TM/Century (Dallas, Texas) provide complete live-assist systems for stations, using the DigiCart as the central store for all spots, station IDs and jingles.

Workstations are the big topic of conversation, because they seem to do so much. But in an on-air situation, many people don't want a computer. They want an audio recorder that's friendly and easy to use.

The DigiCart offers much of the workstation's feature set, including an optional internal hard disk and a maximum of 44 hours of full bandwidth storage. It's priced at $3,995, which makes it the most cost-effective disk recorder on the broadcast market.

For information on 360 Systems' DigiCart, call 818-342-3127; fax: 818-342-4372; or circle **Reader Service 30.**

Reprinted from **Radio World** *December 25, 1991.*

Alphaton Controls Feedback

by John Schauer
Audio Engineer

BUENA PARK, California How many times have you attended a meeting and had to strain to hear the presenter, while the sound system in the room rings from impending feedback?

That happened to me on several occasions when I attempted to reinforce a soft-spoken speaker or one who wanted to place a lapel mic in the tie clip position.

USER REPORT

I was introduced to the Alphaton FC-100 feedback controller by Allen Groh of Acoustic Technology as a means to help remedy these problems. He gave me a quick and convincing demonstration by placing a microphone in front of a speaker and raising the fader on the console to the point of feedback. I marked this position while Groh put the FC-100 in line between the microphone and the console.

The FC-100 cuts the feedback while bringing out quiet voices.

Raising the fader

I raised the fader again up to and past the mark I had made until feedback occurred again. I noted about 10 dB more gain on the fader this time. Also, it seemed that when feedback did occur, it was more difficult to get the system to stay "feeding back," as if it was somehow adjusting itself to keep this from happening. ►

Groh explained that the unit selectively inverts the phase of the frequency where feedback is about to occur. I ran a sweep frequency generator through the unit, hoping to gain some understanding of how all of this occurs. I looked at both input and output signals fed into a dual trace scope, but found the same waveform in either trace. It had passed the signal through with no effect whatsoever.

I then called Groh and told him about my tests and their outcome. He explained that the FC-100 was looking for the characteristic of feedback that is a very slow attack time, triggering the circuit to do something about the problem. In the absence of that characteristic, the signal passes through the unit with no change.

Further testing showed the only change I could "force" the unit to make was some high frequency roll-off, occurring only when the "step up level" control on the FC-100 was set at 70 percent and above.

I finally got to really "road test" the unit several days later when I needed to reinforce a speaker using a wireless lapel microphone system. Connecting the unit in-line between the wireless receiver and console, I powered the unit with 48 V phantom power off the board and adjusted the "set up level" control on the FC-100 to minimum.

I then EQ'd the system for the sound I wanted and began raising the "set up level" control, listening for any coloration or effect it might have been having on the sound. It seemed to begin to roll off high frequencies at about 60 percent of "set up level," so I backed the control off to 50 percent and was quite impressed. I was able to gain approximately 6 dB of additional headroom, and the speaker sounded quite natural.

Used many times

Since then, I have used the FC-100 on many occasions. I still believe you should try to overcome as much of the feedback problem as you can with EQ, speaker and microphone placement, etc., then insert the unit in-line only on the microphones that are the most prone to howling. This is when the beauty of the FC-100 really shows.

The unit is housed in a sturdy aluminum chassis with no protruding parts. The only control on the FC-100 is the "set up level" control. Connecting the unit is easy—simply plug the cable from the microphone into the "in" of the controller, and a cable from the "out" jack to the input of your console.

Power can be obtained from either phantom power via your console or by a DC power pack.

All in all, the Alphaton FC-100 is a useful tool for getting a bit more gain from your PA system. My only suggestion: I would like to see a multichannel unit, perhaps in a rackmount package, for easier access and to reduce the chance of theft (the unit is only 2.5″×4.5″×1.25″).

For information on Acoustic Technology's FC-100 feedback controller, contact Allen Groh in Roanoke, Texas, at telephone: +1-817-430-3351; FAX: +1-817-430-3351 (the FAX is not on a dedicated line); or circle **Reader Service 18.**

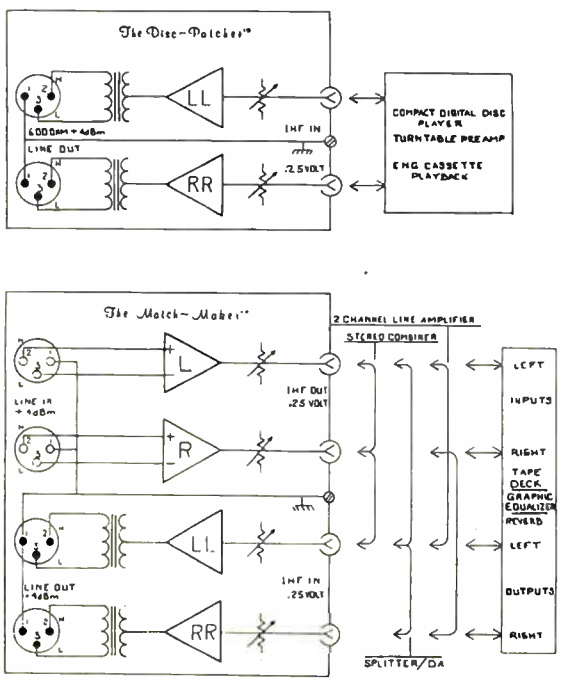
Reprinted from **Radio World** *June 26, 1991.*

ATI's Professional Interfaces

by Don and Carolyn Davis
Syn-Aud-Con

NORMAN, Ind. Audio Technologies Inc. manufactures a pair of boxes that belong in the tool kit of any engineer trying to interface semi-pro and consumer audio equipment with professional devices. We have been using these in our farm classes as part of our exercises on interfacing incompatible devices.

Figure 1.



The clarity of their product labeling, the straight-forwardness of their warranty and the thoroughness of their specifications, along with a performance that meets them, demands respect for their offering.

In our opinion, these are the boxes you will need in an emergency situation.

As the excerpts from their instruction manual make clear, ATI has enough engineering skill to have regained its sense of humor after facing the "real world".

If you call Syn-Aud-Con with an interface problem between incompatible equipment ►

Simple Limited Warranty
ATI warrants that:
Your Interface will work when you get it.
Your Interface will do what our published specs say it will do.
Your Interface will continue to do the above for at least one year.

As Long As:
You don't use it as an anvil.
You don't rip out the audio connectors.
Your power company treats it right.
You don't adjust the pots with a crowbar.
You don't take it swimming.

If it doesn't work, call us first.
We will immediately:
Tell you with a straight face that you are the first person who ever had a problem with one of our interfaces.
Send you a replacement part or
Send you a replacement unit.
Ask you to return the defective unit prepaid.
Help you put a damage claim to the shipper.
Recommend you to a competitor.

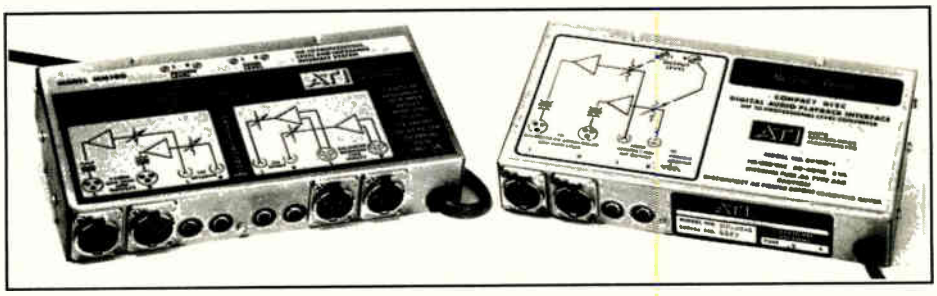
We are not responsible for:
Acts of God.
Murphy's Law.
The wrath of your boss and other consequential damage.

we will refer you to this article for the solution.

Excerpts from "Applications":

"The Disc-Patcher™ and the Match-Maker™ are level and impedance-matching interfaces for semi-pro, industrial and consumer audio equipment operating into professional balanced 600Ω systems.

"The Disc-Patcher is a uni-directional stereo interface for Playback Only applications. . . .The Match-Maker is a bi-directional interface which bridges a stereo pair of 600Ω balanced or unbalanced, +4dBm lines and converts those signals to a nominal .25 Volt (-10dBu) level to fee, for example, the record inputs of a consumer cassette or reel-to-reel tape recorder.....The Match-Maker IHF connectors may also be jumpered for use as a two channel 600Ω Line Amplifier, a two output Distribution Amplifier or a Mono Summing Amplifier."



ATI's Match-Maker (left) and Disc-Patcher

For information, call 215-443-0330; fax: 215-443-0394; or circle **Reader Service 86.**

This article was reprinted by permission of Syn-Aud-Con newsletter, from Vol. 19, No. 1, Fall 1991.

Developing a New Broadcast Console

by Sam Wenzel

HORSHAM, Pa. Developing any new product can be both exciting and difficult. This is how we developed the eight channel mixer board for our ATI Vanguard Series stereo consoles. (See Figure 1.)

We first tried to find a market niche that had not been addressed. We found that consoles that sold in 1980 in the $2,000 to $4,000 range were selling in the $4,000 to $7,500 range in 1986. A high quality, low cost, on-air radio console was not being marketed and we had found our marketing niche.

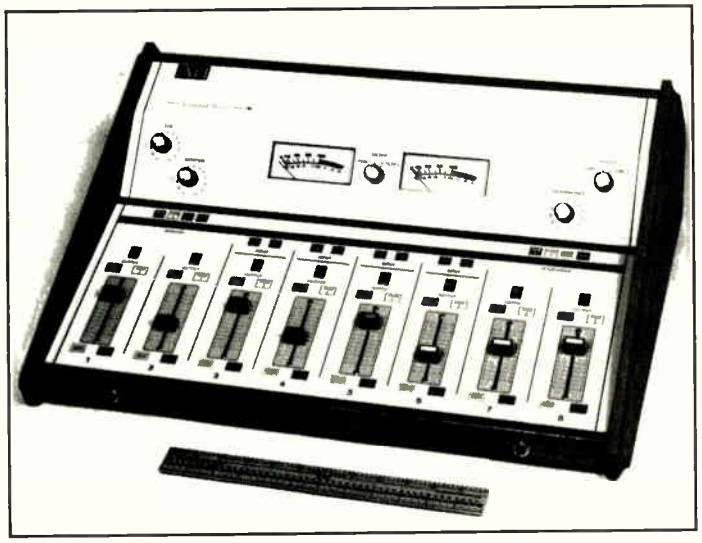


Figure 1: The ATI Vanguard Series, BC8DS, 8 mixer dual stereo Broadcast Console with linear faders. This model is also available with rotary faders. The Vanguard 12 mixer console is available with linear faders.

We decided that the new basic console configuration should be targeted to sell at around $3,000 with good audio performance, foolproof operation and installation, modularity, ease of maintenance, and a long, trouble-free life in the most demanding control room or production applications. It may sound like motherhood and apple pie, but we though it was an achievable goal.

We knew that all good broadcast consoles:

1. Had labor intensive harness wiring for console interconnections.
2. Used expensive, conventional push-button and lever key switches for input selection and bus assignment.
3. Used expensive faders for gain channel control. In many, the audio signal actually passed through the fader.

We wanted to find cost effective alternatives to these standards.

We developed a motherboard printed circuit with three additional layers of daughter boards. All input and output studio wiring is made directly to the motherboard using solderless punch-down connectors. A major advantage in the use of the mother-daughterboard package is its absolute consistency in performance in touchy areas such as crosstalk noise, hum, and RF pick-up. This modularity allows ease of repair by simply substituting boards.

For pushbuttons and lever switches, we substituted digital scanned matrix long-life membrane switches. These switches have a good snap-action tactile feel. The actual audio switching and selection is done by logic controlled current mode field effect transistor (FET) switches. These switches exhibit no wear-out, excellent isolation, and no noise or distortion. Activation of the membrane switch generates a momentary pulse which is stored in digital memory, and the stored logic signal activates the appropriate FET switch or switches to control audio channel inputs and outputs.

These membrane switches could replace the more expensive mechanical switches with superior performance and reliability. Our first design incorporated 46 snap action membrane switches, hermetically sealed in the console's front panel. This panel had a typical lifetime of three to five years.

The biggest problem we had at the time we introduced the console was with the acceptance of the membrane switches by the broadcast industry. The user's concern was with membrane switch reliability and the fact that if a single switch failed, the whole console front panel had to be replaced. The new design was a tough sell. We explained that membrane switches had been used extensively in consumer, military, industrial, and medical equipment. Besides their reliability, they are sealed and can operate in dusty and demanding environments such as the cash registers in fast food restaurants. ►

This concern was addressed by offering a one year free panel replacement and a limited warranty to three years. The problem was addressed by a change in design. The front panel now consists of three separate pieces with the membrane switches in just one of these sections. Replacement is much simpler with lower costs. Now, for less than $200, all 48 membrane switches can be replaced, which essentially produces a new console. Compare this with the labor and material costs in the replacement of 48 conventional mechanical switches whose cost can be as high as $12 each and whose typical lifetime is only 50,000 activations compared to several million for a membrane switch.

Our objectives were reached by using innovative technology.

We selected an inexpensive fader to provide a DC controlled signal to a pair of matched Voltage Controlled Amplifiers for stereo operation. The VCAs provide the actual audio signal level control. The lifetime of the faders has exceeded our expectations. Since no audio signal travels through them, they can last for years even though they may get noisy or scratchy or drenched in coffee. All eight faders can be replaced for the cost of only one expensive fader.

Having reached our design goals, the Vanguard Series of ATI consoles was introduced in 1986 at a cost of $2,995.

Our objectives were reached by using innovative technology. The danger in innovation, as in the case of the membrane switches, can be reluctance by the public to accept the product which has elements with which they have no experience.

Our consoles are used both in the United States and abroad. The principal users are small commercial radio stations, news rooms, and college and high school stations where they take much abuse but keep on operating.

For more information contact: Sam Wenzel, Pres., ATI - Audio Technologies, Inc., 328 West Maple Avenue, Horsham, PA 19044, phone: 215 443-0330; fax: 215 443-0394; or circle **Reader Service 58.** (Since publication of this article, ATI has augmented the Vanguard series of consoles to include a six-channel mixer and an enhanced 12-channel mixer. See Figure 2.)

This article was reprinted by permission of the Journal of College Radio No. 4 1990-91.

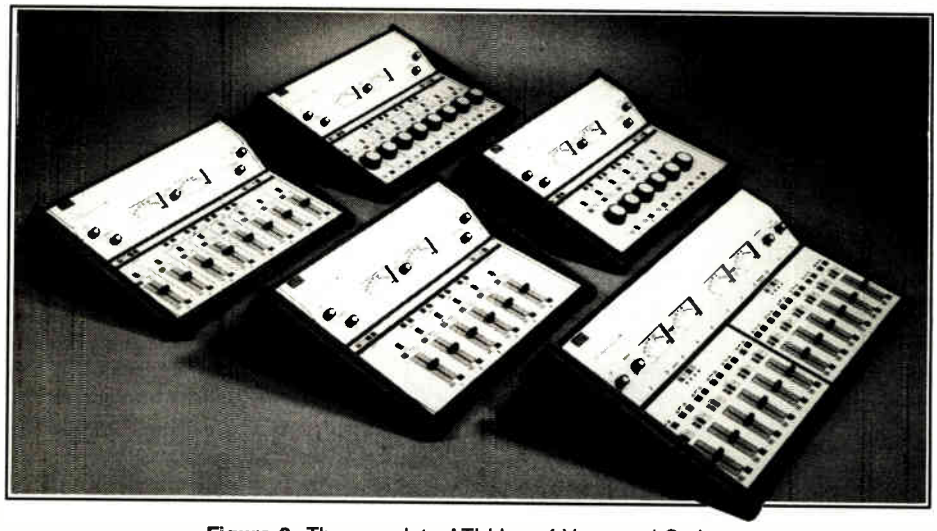


Figure 2: The complete ATI Line of Vanguard Series of Broadcast Audio Stereo Consoles; 6, 8 and 12 channels.

DL Series Aims to be Best Buy

by Andy Rector
President
Audi-Cord Corp.

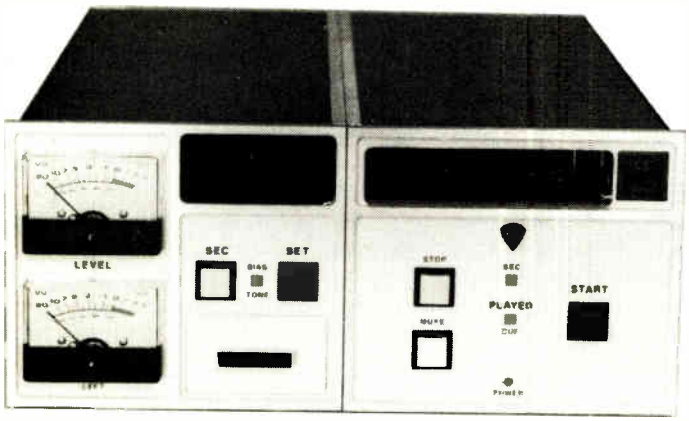
NORMAL, Ill. Audi-Cord's DL Series is the product of more than 30 years of Carl Martin's experience in designing broadcast cartridge machines, and reflects a reversal in design philosophy trends.

Martin saw several things happening in broadcasting in the mid-1980s that led him to see the need for change. He felt it was time to reverse the trend of more features for higher cost and design instead for cost reduction.

TECHNOLOGY UPDATE

Audi-Cord launched an 18-month program to design a basic cart machine that would qualify as the industry's "Best Buy." The cart machine, we think, succeeded in identifying the features that a majority of broadcasters needed on a regular basis, while discarding or offering on a limited list of options all other features. From then on it was a continuous cost/value analysis in which each concept and design was challenged.

The result was Audi-Cord's DL series, a reliable, durable cartridge machine with what we think is the industry's lowest price tag. Another result was a change in Audi-Cord's manufacturing philosophy. Today, Audi-Cord buys few parts from outside vendors, instead preferring to manufacture mechanical parts in our in-house machine shop. PC cards are manufactured in-house as well.



Audi-Cord's DL Series is the result of 18 months of R&D.

►

The price of electronic parts has been going down for years—if you carefully select parts that are being manufactured in high volume. We shop the world market for the best electronic values. Sometimes we take delivery on large quantities to assure the lowest possible price.

Search for quality

Our biggest challenge remains to find less expensive ways to build the mechanical and electro-mechanical parts without cheapening the end product.

For example, environmental concerns about chemicals have resulted in major increases in the cost of plating and anodizing. So, we went to brushed aluminum, vinyl clad aluminum and aluminum extrusions for our chassis and cases.

Today, Audi-Cord buys few parts from outside vendors, instead preferring to manufacture mechanical parts in our in-house machine shop.

We also looked for ways to reduce the size of the metal parts in ways that would reduce scrap. Our machine's infrastructure is a series of sub-assemblies, which reduced our assembly costs.

Recorder or reproducer

The DL series from Audi-Cord is available as mono or stereo in either reproducer only or recorder/reproducer configurations. A dual recorder/reproducer makes it possible to record two cartridges simultaneously, "dub" a recording from one cartridge to another or have two independent playback machines.

Certainly, you can pay more, you can get more features and you may be able to find a machine you consider more attractive, but in these days, we like to think most broadcasters are looking for the best value.

In this department, we will proudly match the Audi-Cord DL series against any other cartridge machine.

For information from Audi-Cord, contact Carole Pedigo at 309-452-9461; fax: 309-452-0893; or circle **Reader Service 14.**

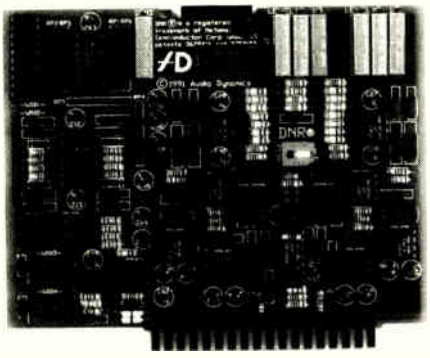
Reprinted from **Radio World** *December 25, 1991.*

AD-302 Updates ITC Delta

by Steven W. Yates
President
Audio Dynamics Inc.

CHARLOTTESVILLE, Va. With the growing popularity of on-air digital audio playback systems, analog cartridge machines have become the weakest link of the audio chain for many broadcasters.

When integrated into an otherwise all-digital format, analog cartridges can demonstrate inferior audio performance, especially in the form of tape noise. To help bridge this performance gap, Audio Dynamics Inc., has introduced the AD-302 retrofit board for ITC Delta series cartridge machines.



Audio Dynamics
AD-302 retrofit board is made to accompany ITC Delta Series Cart Machines.

Analog cartridge systems have a longstanding record of reliability in even the most demanding broadcast applications. Both the carts themselves and the tape machines have earned an unsurpassed record of ruggedness, reliability and convenience that make them the format of choice for most broadcasters, despite newer digital audio technologies. By building on the platform provided by the ITC Delta series of reproducers, the AD-302 retains these advantages while providing significant sonic improvements to analog cartridge performance.

The AD-302's most obvious application is music playback for stations with all-cart formats. However, the AD-302 also can significantly improve the quality of commercials, liners, news actualities and other local productions to allow more effective integration of analog cartridges into otherwise all-digital formats.

The AD-302 incorporates a professional implementation of the DNR® Dynamic Noise Reduction System. DNR is a highly effective yet transparent non-encoded noise reduction technique that exploits the psychoacoustic noise masking properties of high frequency audio material.

TECHNOLOGY UPDATE

Continuously analyzing audio spectral content, DNR employs carefully controlled bandwidth reduction during periods of reduced high frequency content to prevent noise unmasking. Bandwidth is increased virtually instantaneously as high frequency signal content increases, so the audio is accurately passed with no high frequency loss and no audible side effects.

Since DNR is fully compatible with existing cartridge libraries, there is no need to re-record the entire library to enjoy the benefits of noise reduction. DNR also requires no alignment, is totally operator transparent and can be disabled if desired. The DNR system on board the AD-302 provides 10 dB of CCIR/ARM weighted noise reduction for a signal-to-noise ratio of 82 dB referenced to a level of 250 nano-Webers per meter (nWb/m) at 1 kHz.

The audio path of the AD-302 is designed for optimum cartridge audio performance. Traditional tape preamplifier design practices have been critically re-examined and improved upon in many cases.

The NAB equalization and tape head frequency response correction functions have been separated in the AD-302. Traditionally, these are combined in the preamplifier stage by moving the equalization curve break frequencies to accomplish head response correction.

The AD-302 preamplifier stage employs a fixed NAB 1975 equalization characteristic, which can be field-converted to either the NAB 1964 or ►

IEC standards. The preamplifier is based on the OP-37 opamp, which offers extraordinary distortion, noise and transient response characteristics.

Both the high and low frequency equalization adjustments are accomplished by separate stages whose characteristics accurately complement playback head losses. This design enables the AD-302 to deliver a playback frequency response of 32 Hz to 16 kHz (±0.7 dB), and a total independence between the equalization control settings and the 1 kHz reference level.

The large overall amplifier gain is divided among a number of lower gain stages. By so doing, overall distortion is significantly reduced and closed loop bandwidth is increased for improved high-frequency performance.

The entire audio path is direct coupled, except for the DNR circuit, to improve group delay characteristics. All capacitors in the audio circuitry are either polypropylene or polyester film, selected for their low dielectric absorption and excellent stability.

Power supply decoupling is achieved with liberal use of low-impedance tantalum capacitors, and electrolytic capacitors have been avoided altogether to increase reliability. Exclusive use of one-percent metal film resistors, gold-plated machined-pin IC sockets and fully-sealed potentiometers address other common reliability problems.

The AD-302's three-tone cue detector is based on an asynchronous programmable logic device (PAL), which performs both cue tone detection and EOM logic functions.

This PAL-based design produces no high-level digital clock or data signals that can couple into the critical low-level audio chain. The cue detection PAL contains the equivalent of eight TTL logic packages.

Full jumper compatibility with the original cue detector is maintained and a cue detector sensitivity control has been added for increased operational flexibility.

In summary, with its on-board DNR Dynamic Noise Reduction, proprietary equalization network and asynchronous PAL-based cue detector, the AD-302 can significantly improve the performance of existing analog cartridge machines.

For information, contact Steven Yates at Audio Dynamics: 804-296-4111; fax: 804-296-4111, ext. 511; or circle **Reader Service 133.**

Reprinted from **Radio World** *December 25, 1991.*

WOVV Is A-OK with audiopak AA-4 Carts

by Don Cook
CE, WOVV-FM

WEST PALM BEACH, Fla. WOVV-FM serves Florida's Palm Beaches with a CHR format. Most of the music comes into the station on CD, and we have only one CD player—in the control room.

USER REPORT

All of our music programming comes off of ITC cart machines. I've yet to see a CD player that can offer the speed and ruggedness of a good cart machine.

Why don't we play CDs on the air? In the car or in a single-family home, we hold our own with the other stations in town, but like many broadcasters, we have problems reaching inside some of the big buildings.

Which is which?

When WOVV's owner asked me about airing CDs, I just took him into the production room, dubbed a CD off onto an audiopak AA-4, then put the original CD through one channel of the board and the audiopak cart through another. I switched back and forth and asked him to tell me which source he was listening to.

Eventually he gave up trying to tell which was which. Of course, I was pleased that the station owner understood and approved of my choice of audiopak carts for on-air use, but I wasn't surprised by the results of the test.

The people at audiopak tell me that AA-4s get their superior audio performance from 614 tape's special oxide formulation that supports elevated record levels (250 nano-Webers per meter (nWb/m)) with increased high frequency saturation headroom.

On the scene

Four years ago when I came to WOVV, we switched from "red" carts to "true blue" audiopak AA-4s. We have about 4,000 in the station now. Some of the music carts are still totally original from four years ago, but I'd say on average we send them out about once a year for reloading.

The Broadcast Cart Clinic in Ocala, Fla., puts in fresh audiopak 614 tape and replaces the foam pressure pads if they seem to have lost their sponginess. It seems the tape will last for about 600 passes over the head, so if you're playing the cart twice a day, you should get a year out of the tape. Of course, commercial carts that get played 10 times a day will require reloading after a shorter time period.

With 4,000 carts in the station and tape stock that ranges from four years to a month or two old, you might expect some performance variations from batch to batch. But we haven't had that problem at all. Except for tape that's worn out, we get the same dynamic range and frequency response from all our carts.

The audiopak AA-4 cart

With CD-equivalent sound and consistent quality like this, I'm more than satisfied with audiopak carts. More important, so is the owner and so are WOVV's listeners.

For information on audiopak AA-4, AA-3 or A-2 broadcast tape cartridges, contact Gordon Stafford at 805-481-8278; fax: 805-481-8279; or circle **Reader Service 53.**

Reprinted from **Radio World** *December 25, 1991.*

Autogram Sets Pace with PM-1644

by Jim Laird, CE
Autogram Corp.

PLANO, Texas Once again Autogram has found itself in the position of responding to requests from members of the broadcast community to add a new product to its line.

The response to the Pacemaker series has been fantastic, however, some desire a larger version. The Pacemaker PM-1644 is designed to fill that need by supplying 16 faders and a total of 44 stereo inputs. The new console is basically an en-

TECHNOLOGY UPDATE

larged version of the Pacemaker PM-1032 with five VU meters and the standard Autogram features, including front panel engraving, all aluminum "bullet-proof" construction and easy access for maintenance.

The Pacemaker consoles all make extensive use of electronic switching and voltage-controlled amplifiers (VCA) for audio control with no audio signals on the front panel. Installation of the Pacemaker console is easy due to the miniature plug-in screw connectors used.

All input and output electronics are on individual plug-in circuit boards rather than a large mother board. Service usually is a matter of a board exchange rather than part replacement; although, all the integrated circuits are socketed for quick replacement.

Inputs to the Pacemaker may be either consumer-unbalanced or professional-balanced equipment. Selections for level-range, termination and level-trim are provided on each console input. Open-collector control outputs are provided for each associated input for interfacing with most source equipment. An optional relay panel is available for situations where the ground sinking open-collector might not work.

The Pacemaker PM-1644 has 14 channels each with two stereo inputs, while channels 15 and 16 each have eight inputs. In keeping with the design criterion for all Pacemakers, the PM-1644 has an internal power supply, a metered Mono output, which is selectable between the Program and Audition output buses, a front panel assignable Mix Minus bus (for telephone interface systems) and a fully selectable monitor systems.

The stereo headphone amplifier (2 W into 8 ohms) is independent of the monitor driver and either may be selected between Program, Audition or two external inputs. Additionally, the headphone system contains a Cue-To-Phones (CTP) feature, which allows the operator to hear the cue audio in the left phone while continuing to monitor normally with the right. DIP switches allow programming of CTP, timer reset, two mute buses and cue defeat for each console input.

The Pacemakers allow new flexibility in installation as Autogram is now offering a kit to submount the console in the table top complete with wooden end pieces to blend with modern studio furniture.

Of course, submounting is not required and the units can just set on top of the desk. Either way the Pacemaker is at home in any broadcast environment. Electrical installation is greatly simplified with the plug-in connectors and the wide input range allowed.

Patch points have been provided for connecting to external processing systems. The four independent microphone preamplifiers have electrically balanced outputs, which can be easily connected to external microphone processing equipment. Two relays operate from the muting buses, which allow quick connection to on-air warning lights, skimmers, etc.

An optional Autoclock or Autocount may be installed in the Pacemaker PM-1644 either at the factory or by later simple field installation since the connector is pre-wired for the clocks. The Autoclock provides time-of-day, a count-up timer, a simple count-down timer, outside temperature and day-date on its mutifunction display. The Autoclock even keeps up with the high and low temperatures of the day and stores the time of occurrence.

Many Autoclocks can be wired together via the communications ports so all units share the same time and temperature. The Autoclock can be synchronized to network time or to WWV with a contact closure at the top of the hour.

By adding the Pacemaker PM-1644, Autogram has expanded the line to a total of 11 consoles in three major types ranging from the ever-popular IC-10 10-channel rotary pot console to the 20-channel RTV/20 with an optional computer interface.

For more than 21 years, the name Autogram has been synonymous with manufacturing quality, excellent engineering, professional service and reasonably priced replacement parts. Visit any station in your area and chances are you'll find an Autogram console.

For information, contact Jim Laird, CE of Autogram Corp., at 800-327-6901; or circle **Reader Service 20.**

Wizard Digital Analyzer Answers Test Wish List

by Arno Meyer, President
Belar Electronics Laboratory

DEVON, Pa. With loudness wars raging fiercely in many of the nation's radio markets, a lot of factors play into measuring and maintaining the various levels that keep a station in check with FCC rules while sounding good enough to remain competitive.

First, a station CE must accurately measure the peaks of frequent recurrence in order to stay in compliance with FCC rule 73.1570. As important, he or she must analyze the modulation data to provide a comparison of modulation density that enables an FM station to determine why a competitor sounds louder than others.

TECHNOLOGY UPDATE

In addition, the station may want to quantify the "garbage" around the stereo pilot that is produced by excessive ►

composite clipping while measuring the amount of clipping. The CE (or PD) may want to "touch up" the clipping level or even the modulation level from his home.

Then again, there's always the possibility that, from the home office, he may want to spot check what the stations in his chain are doing—to check peaks according to FCC rule 73.1570.

He might want to . . .

He might want to check modulation density, changing the time constants of the peak weighting function from 100 microseconds to 2 milliseconds (1 to 20 cycles of a 10 kHz tone burst).

He could want to choose between a sliding window histogram or an infinite window histogram to display the history of a sound bite. Or he may prefer to look at the peaks per unit time display to check the distribution of the peaks of frequent recurrence. He might want to check pilot injection and pilot modulation.

He may want to make sure the SCA injection is not too high or to scan the alarms to ensure that everything is in order. Best yet, he may want to do these things from his microcomputer—at any time.

These were some of the functions that inspired Belar to develop The Wizard, an all-inclusive FM digital modulation analyzer.

Its front-panel 16-character alphanumeric display allows the user to scan and set parameters for more than 25 menus. Eight different time constants of a peak weighting function may be selected from the front panel. Display accuracy may be set to 1 percent or 0.1 percent deviation.

Real-time mode or past-time mode also may be selected. Display peak hold time may be set in 0.5 second increments. Pre-set peak mod indicator is adjustable in 0.5 percent increments. A preset PPM (peaks of frequent recurrence) alarm is adjustable from 0 to 100 PPM, while self calibration to an external calibrating signal may be made.

Eight different time constants of a peak weighting function may be selected from the front panel.

Internal precision demodulator

With the optional internal precision demodulator, The Wizard will self-calibrate, including remotely, to a 0.1 percent accuracy. Peak weighting time constants may be menu-selected at 1, 2, 3, 5, 7, 10, 15 or 20 cycles of a 10 kHz tone burst corresponding to 100 microseconds to 2 milliseconds.

Provision for pilot injection, pilot modulation, and SCA injection measurements are provided, as well as a "loss of program" alarm adjustable in percent modulation and time out. The Wizard will accept external alarms such as "off frequency" alarms from the FMM-4A.

Two wideband level adjusting loop-throughs adjustable in 0.5 percent or 1.0 percent increments for controlling modulation levels remotely are provided, while an RS-232 port provides graphing functions and remote operation through a 2400-band modem.

Displays include an infinite window histogram, a sliding window histogram, and peaks-per-unit time that stores in a 15-minute window. The peaks-per-unit time may be stored to disk for a 24-hour record that may be recalled in a given time segment.

Three-level password protection is provided for security—"look only," "change parameters" and "manager."

All this, mind you, in a one-rack height panel.

For information on The Wizard, contact Arno Meyer at Belar Electronics Lab: 215-687-5550; FAX: 215-687-2686, or circle **Reader Service 31.**

Reprinted from **Radio World** *January 23, 1991.*

Comrex Offers Remote Tools

by Bruce and Jenny Bartlett

ELKHART, Ind. Somebody's thinking about you.

Audio equipment manufacturers are making products designed specifically for the needs of the broadcaster.

Consider remote broadcast equipment. Many companies are producing devices tailored exactly to this purpose. In this issue, we'll focus on one such company—Comrex—to show examples of current remote equipment.

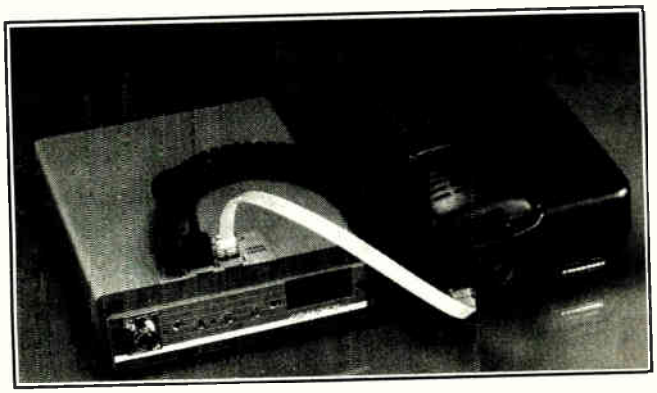
Since the company began in 1961, Comrex equipment has come to be used worldwide. National Public Radio routinely employs Comrex gear for its remote reporters. The company's products fall into four major types: telephone interfaces, frequency extenders, sports mixers, and cue equipment. Let's check out each type.

To interface your mixer with telephone lines, you need a telephone coupler such ►

Comrex SLX sports mixer

as the TCB-1A or TCB-2A. You could use the coupler on a remote to send audio from your mixer to the studio via phone lines. The coupler connects your mixer to the telephone line by transformer coupling and holds that line.

This switched-hold connection lets you hang up the telephone during program feeds. The telephone works normally. In the coupler is an audio connector for your mixer's signal and two telephone jacks for a telephone and the phone line.



Comrex PLX cellular interface

Programming can be sent or received on the phone line, but not both at once unless you use a telephone hybrid such as the Comrex TH-1 or TH-X. The hybrid (or balancing unit) lets you put callers on the air by mixing caller audio with studio audio.

Extend your frequencies

A frequency extender lets you send high-fidelity audio on a standard dial telephone line. It's an encoder/decoder that allows telephone lines to achieve broadcast quality.

Normal phone lines sound tinny because of their narrow bandwidth: about 300 Hz to 3 kHz. When you use a frequency extender, an encoder at the remote location shifts all frequencies up by 250 Hz. In this way, 50 Hz is shifted up to 300 Hz, so it passes through the phone line filters. In the decoder back at the studio, all frequencies are shifted down 250 Hz. This restores the missing 2½ octaves to the low end of the program.

There's help for the high end, too. A 5 kHz signal can be shifted to 3 kHz on a separate phone line. After restoring and combining the two lines at the decoder, you have audio from 50 Hz to 5 kHz. A third phone line gets you up to 8 kHz.

Comrex makes frequency extenders for one, two or three phone lines, permitting response from 50 Hz up to 3 kHz, 5 kHz or 8 kHz, respectively.

Why not use equalized phone lines instead? They cost more and may take at least two weeks to install. Also, according to Comrex, these lines are not available at all inter-data points, or beyond your telephone area code. A standard line and extender lets you cover an event with less advance notice.

When Illinois Bell laid additional fiber-optic cables to increase its traffic-handling ability, equalized phone lines were hard to get. In response to this, WCKG-FM (a classic rock station in Chicago) turned to standard dial-up phone lines with Comrex frequency extenders.

In a sports remote, KOMO-AM in Seattle switched to a Comrex extender when the satellite link became noisy due to an earthquake. They used Comrex in another remote when the satellite feed was accidentally pulled. The station was told that the Comrex multiline system sounded every bit as good as a satellite feed, so now they use the frequency extender exclusively.

A frequency extender can be combined with a telephone hybrid, as in the Comrex PLXmicro and TH-X.

Sporty mixers

A frequency extender encoder with noise reduction is built into the Comrex sports consoles. The STLX model incorporates a two-line extender; the SLX has a single-line extender.

Designed specifically for sports or news broadcasts on the road, the sports consoles include several useful features: four mixing channels, a built-in telephone interface, custom monitor mix with station talkback on each headphone, AGC, aux in and out for external PA feeds or monitors and a battery pack.

A cue system transmits program and instructions from a transmitter to a pocket receiver. Typical uses are for electronic newsgathering or satellite newsgathering field control.

The Comrex cue transmitter is the model CTA, a 1 W rack-mount unit that you install in your studio, remote van or press box. It accepts both program and cue signals and sends these to the LPQRA pocket receiver. Cue instructions automatically duck the program.

Comrex makes frequency extenders for one, two or three phone lines . . .

Resembling a Walkman, the LPQRA cue receiver comes with a belt pouch and earphone and has a response up to 6 kHz.

Bruce and Jenny Bartlett are regular **RW** *columnists. For information on Comrex, call Lynn Distler, VP of marketing at 508-263-1800; or circle* **Reader Service 11.**

Reprinted from **Radio World** *August 7, 1991.*

KRIO's Grand 816A

by John Furr
Partner, KRIO-FM

SAN ANTONIO, Texas I am impressed at what a nice box the Continental 816A transmitter is.

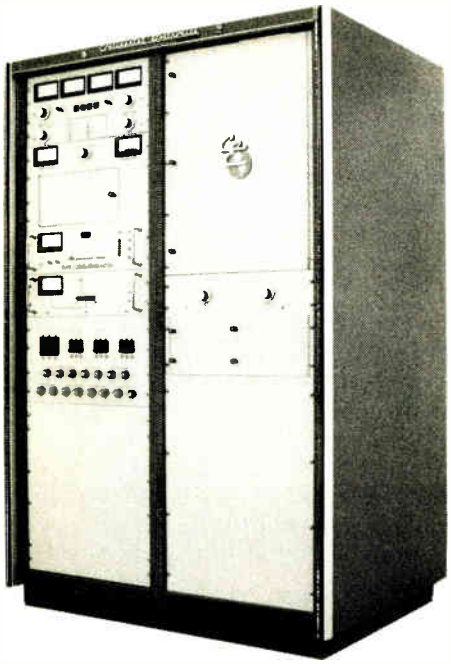
USER REPORT

We made our decision to purchase the 11 kW transmitter based on our past experience with Continental products. Although we expected simplicity and reliability, we also were pleased with features not seen previously in transmitter products.

The cabinet is only two rack units wide, instead of the older 10 kW transmitters, which were three rack-units wide. I suspected, on initial inspection, that the components were too cramped and access would be difficult.

Closer inspection revealed that all of the front-mounted equipment—including the 802A exciter, solid state driver and amplifier—are mounted on rails. This allows the units to slide forward for easy access to all components, inside and out.

If you have had at least 10 years of experience in maintaining a variety of transmitters, I know you have experienced the joy of tube socket maintenance. ►



The Continental 816A was purchased by KRIO in San Antonio, Texas.

Check this: The 816A tube socket is also mounted on slide-out rails for "lap top" style inspection and maintenance.

The 816A uses a 4CX15,000A power tube. In previous 20 kW transmitters, I have achieved 25,000 hours at full 20 kW power. This "overkill" on the PA tube should ensure a greater tube life operating at half that power.

Because the power heat loss of the tube is low for the rating of the tube, the blower operates at lower velocity than I expected. This has resulted in a much lower overall room noise level than I expected.

The 816A uses a 4CX15,000A power tube.

We've gotten superb audio quality from the 802A exciter. Installation was immediate with no "tune up" required. There's nothing more to say of the smooth ramp-up plate-on or rock-solid automatic power adjust.

At KRIO-FM in San Antonio, we are pleased. We brag to our Texas listeners that our transmitting equipment is manufactured by Texans in Dallas.

For information from Continental, contact Steve Claterbaugh at 214-381-7161; fax: 214-381-3250; or circle **Reader Service 37.**

Reprinted from **Radio World** *November 20, 1991*

Selecting a Dummy Load

by Mark Rubin
President
Electro Impulse Laboratory

NEPTUNE, N.J. Radio frequency dummy loads for radio stations, once considered an optional piece of test equipment, have become a necessity for testing and for reject load functions.

Electro Impulse Lab makes a wide range of dummy loads for nearly all standard and many special requirements.

To select a dummy load, you must specify maximum average power, including modulation, frequency range, input connector, cooling requirements and AC line voltage available.

Most station loads will dissipate all of the incident power into the ambient. If that space is air conditioned or poorly ventilated, however, the temperature could rise to unacceptable levels, causing the dummy load over-temperature safety interlock to cut out.

Therefore, the location for installing the dummy load should be considered carefully. It should not be installed in an air conditioned room unless the air conditioning is sufficient to handle its load.

The heat from some types of loads can be ducted, but check with the factory first. Forced air-cooled loads are designed for free air use; the back pressure of ducts may cause the load to overheat.

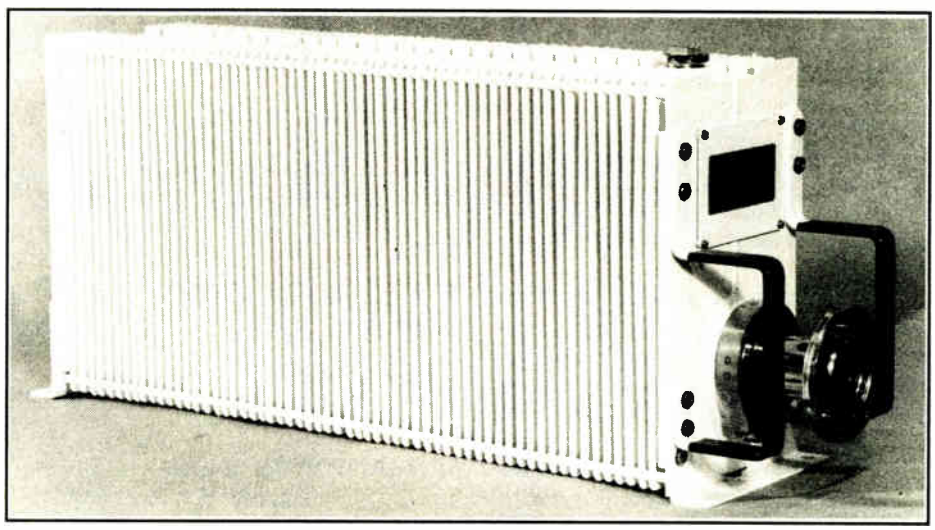
Loads are normally fitted with an interlock circuit, which provides for a set of dry floating form C relay contacts and a mating interlock connector, which should be tied into the transmitter plate circuit. Depending on the type of load, sensors are provided for load over-temperature, low coolant or air flow, loss of line voltage to the load, etc.

A device to measure RF power is normally installed with the dummy load. This device, depending on the frequency range, can be a voltage divider-type power meter, a directional coupler or a calorimeter. Of those devices, a calorimeter is the most accurate and has the widest frequency range, but is relatively expensive to purchase and calibrate.

TECHNOLOGY UPDATE

An in-line wattmeter (directional coupler) is the most popular and is easily recalibrated by checking or replacing the plug-in element. Mount the coupler in the transmission line away from the hot air discharge.

For AM band operation, many Electro Impulse loads can be fitted with a voltage divider-type power meter connected through an attenuator to the resistive bank; this provides an accurate calibrated method of measuring power from DC to 2 MHz.



Electro Impulse Lab makes a wide range of dummy loads.

For information from Electro Impulse, contact Tom McNicholas at 908-776-5800; fax: 908-776-6793; or circle **Reader Service 13.**

Reprinted from **Radio World** *November 20, 1991.*

CD Library Compiled with Care

by Hank Landsberg
President
Halland Broadcast Services Inc.

SIERRA MADRE, Calif. In 1988, Halland Broadcast made the decision to produce Rock'N'Roll Graffiti, a comprehensive oldies library on compact disc. The library would feature the best and most programmable rock oldies of the 1950s and 1960s.

Months were spent on research. We used record sales statistics, listener request tallies from oldies stations across the country and auditorium testing. The final count was more than 1,200 songs, released on 50 compact discs.

After the playlist had been set, we began the task of finding the best-sounding recordings of these tunes.

Various sources were used: commercial CDs, studio analog masters, R-DAT dubs and, as a last resort, vinyl recordings. In compiling the library, our preference obviously was a digital source—either a CD or a digital copy of a studio master. However, due to the age of the material, even a digital source was not originally digital; it was an analog recording transferred to CD or DAT.

If you've ever bought oldies CDs from a record store, you've probably run into a few of these headaches: "original" versions that aren't really original, CDs dubbed from scratchy records, audible dropouts, badly EQ'd audio, audio with gross phase error (where the vocal disappears in mono), phony stereo or reverb, channel imbalance, clipped intros, chopped off endings, tape hiss, hum, etc.

Interestingly, masters of songs from the 1950s and 1960s usually sound cleaner than those of the later 1960s. In the early days of rock, most studios were limited to two- or three-track tape recorders. This may have limited the producers' creativity, but it also limited the amount of tape hiss. In the mid-1960s, four- and eight-track recorders came on the scene, most without Dolby. More tracks created more noise.

TECHNOLOGY UPDATE

Another common problem with much source material was phase error. Many times the entire recording was out of phase, indicating a misaligned two-track mixdown recorder. This was rectified by introducing a calculated amount of time-shift into the leading channel to restore the time alignment of the two channels. Problem solved.

In other cases, only certain instruments (or vocals) were out of phase, due to a badly aligned multitrack master recorder. In this case, the only solution is somewhat of a compromise: Use whatever time shift is needed to bring the "most prevalent" audio into correct alignment.

This usually was the lead vocal, because human voices sound very non-human when heard with the comb filter effect of phase error. Instruments are much more tolerant in this regard. The phase-correction device we used contained a combination of time-shift and phase-shift capability, and it too was calibrated for each and every song as needed.

Another concern in producing Rock'N'Roll Graffiti was to eliminate the tics and pops of vinyl. We were able to obtain a studio master for about 80 percent of the material. For the other 20 percent, either the source material was vinyl or it was a commercial CD that was made from vinyl.

With some hard-to-find material from the 1950s and 1960s (some of it obscure), it's impossible to avoid vinyl entirely. There are many songs on the library for which tape masters either never existed, or the master tapes were lost or destroyed.

We then transferred each pressing to form a composite master. If only a few tics or pops were evident, this 30 ips analog master was manually edited. If the problems were more severe, we would transfer the material to DAT for digital processing that would virtually eliminate the tics and pops.

The Rock'N' Roll Graffiti Library is used by more than 300 stations worldwide.

"Hanky Panky" (Tommy James & the Shondells) was probably the worst-sounding raw audio we had to work with. The master tape for this particular tune was recorded in 1962 at an obscure recording studio.

Tommy James never received the tape, only an acetate 45, which by then had been played hundreds of times. That 45 has been the source of the song, used by Roulette ever since. Now you know why it always has sounded scratchy—it always was.

Problems with audio levels, channel balance and EQ were much more easily corrected, using conventional tweaking. The entire library was monitored using KEF model 107 speakers, although we monitored with Sennheiser Model 560 headphones also. CDs were played on a Denon DN950A player; all analog tape machines used were Ampex ATR-100 Series.

We used a Technics SP-15 turntable with a Shure V15-VMR cartridge mounted in a Stax UA-9 carbon fiber tone arm. The console was custom designed and built by Henry Engineering to facilitate accurate control and monitoring of the entire mastering process. Mastering for CD production was done on a Tascam DA-50 DAT recorder.

Rock'N' Roll Graffiti was first shipped to about 150 client stations in mid-1990. Since then, the library's use has grown to slightly more than 300 stations worldwide.

For information from Halland Broadcast Services, contact Steve Steinberg at 818-963-6300; fax: 818-963-2070; or circle **Reader Service 5.**

Reprinted from **Radio World** *December 25, 1991.*

ITC Excels in Analog Domain

by Lane Lindstrom
CE, WJEZ-FM

PONTIAC, Ill. Last fall, WJEZ-FM acted as a test site for the new Series 2 from ITC. With all the talk about cart machines being obsolete, I thought it was pretty intriguing that ITC was bringing out another new machine, particularly so soon after introducing its Series 1 in 1990.

But I learned that, in addition to its new digital products, ITC thinks cart machines will be around for a while, and they're not sitting still in the analog tape world.

USER REPORT

The Series 2 is evidence that ITC still is the leader when it comes to making cart machines for real people. They've listened to some of the requests we've made over the years, adding features like Dolby HX Pro and a tape timer to make life in the production room and the studio a little easier.

However, they haven't packed the Series 2 with bells and whistles that we not only wouldn't normally use, but that would increase prices beyond our budget.

Not a lot of guesswork

The machine's front panel provides quick and easy manipulation of functions without a lot of guesswork. Three cue tones are standard on the record/playback version, along with a meter function select button.

LED indicators are provided next to the main function buttons to signal the presence of audio, secondary and tertiary cue tones, 1 kHz defeat or looping and power on/off. LED bar graph meters are switchable for VU-type or peak ballistics metering. Anything a programming staff is going to want or need is right there up front.

Audio connections are made with XLR-type connectors on the rear panel. Remote connection is made with a 15-pin D connector. The rear panel also has a modular assembly containing an on/off power switch, fuse holder and universal AC power connector.

The power supply is a switching type, which means that no internal adjustment or tapping is needed to operate from 105 VAC/60 Hz to 264 VAC/50 Hz. That takes care of bad line voltage, a not-uncommon problem for a lot of us. Nice.

Everything is housed in a single piece steel shell, and the entire internal chassis slides right out for access to all mechanical or electrical components. The motor is a DC servo type, with crystal-referenced phase lock loop control, the same one used in ITC's top-of-the-line 99B machines. ITC doesn't skimp on the basics. And, like the 99B and Delta, the Series 2 is microprocessor-controlled.

Accurate reference point

The deck is a solid-cast aluminum unit, machined for accurate reference points, then nickel plated. The head blocks have independently locking, micro-adjustable set screws, which really cut down on repeat visits with the Allen wrench. A nice touch for us service-minded types is the cleaning mode, which lifts the pressure roller into position with the motor running without inserting a cartridge.

ITC came up with a winner in its solenoid and pressure roller linkage design. It's a unique setup that uses a latching cam. The mechanism is so efficient that it allows the solenoid to draw less current once the roller is in place. That, in turn, keeps the heat down and makes the Series 2 one very cool-running machine.

Inside, a motherboard runs the length of the chassis. Front panel and motor electronics plug into the motherboard. When unplugged, the entire motor/deck assembly lifts right out in one piece for service.

The Record Logic, Record Amp, Play Logic and Play Amp PC boards (two boards in the play-only version) also plug into the motherboard. Access to these boards for audio alignment is a snap, and of course ITC uses multi-turn pots. I like the addition of Dolby HX Pro to help prevent bias and erasure problems in recording. A universal extender board is available.

> ***ITC came up with a winner in its solenoid and pressure roller linkage design.***

Although its Series 1 heritage is evident in the outer package, the Series 2 is a more sophisticated machine. It boasts microprocessor logic control, high-end audio circuitry, XLRs and more, but without sacrificing the user-friendly controls and engineer-friendly components.

The Series 2 is a well-built, well-thought-out package. I can see why ITC is able to offer a four-year warranty.

I may just keep them.

WJEZ found pleasing results with ITC's new Series 2 cart machine.

For information, contact Bruce Helling at ITC at 309-828-1381; fax: 309-828-1386; or circle **Reader Service 35.**

Reprinted from **Radio World** *December 25, 1991.*

J.N.S. Takes Modular Route with 8000 Series

by John N. Stannard
VP, J.N.S. Electronics

SAN JOSE, Calif. The modular concept is not new. However, the availability of a large number of different purpose modules in one mounting configuration, specifically for broadcast needs, is new.

The 8000 Series Rack Frame from J.N.S., currently provides some 20 different modules—that is, 20 different functions. This product originated in Australia, and has been in use there for more than a decade. At transmitter sites, a frame concept minimizes rack space requirements and simplifies installation.

TECHNOLOGY UPDATE

Of more importance to the station engineer is maintenance. A single rack frame couldn't make it simpler. With modules in one location, if a problem occurs, trouble-shooting is easier. Interconnect between functions becomes interconnection between modules.

Making friends

The extender card can become a new friend. If the module must be fixed, it unplugs and goes on an extender card for servicing.

The following is but one configuration of the Rack Frame that is in use at a number of stations throughout Australia.

Upon entering the transmitter site of 3MMM in Melbourne, all control, audio, auxiliary and STL equipment is mounted in three rack cabinets. The modular system (see photo) is providing RF demodulation, audio monitor amplifier and automatic program audio changeover functions.

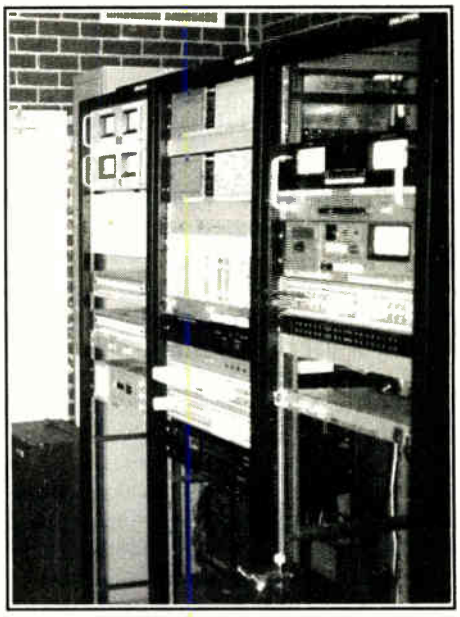
All this is accomplished in one 5¼-inch rack frame. 3MMM is an FM station, operating in stereo. Because of its dominance in the market, loss of air time cannot be tolerated. The station maintains three program paths: main aural STL, backup aural STL and local (transmitter site) tape source.

For ease of feeding monitoring and backup transmitters, audio distribution amplifiers are used. These are combined with the stereo audio feeds from both the STL receivers. Audio failure modules monitor both audio sources. These, in turn, are used to activate the program changeover module.

With the failure of both external sources, the changeover module selects the local emergency audio. When this source is tape (cart, etc.) or CD, the changeover module provides an output to start that source. An order is established within the changeover module for switching. In the case of 3MMM, the main STL is the primary source.

Next is the backup STL. Both are fed simultaneously at the studio. If the main STL fails, the backup is selected by the changeover module. If the backup STL fails before the main STL, the changeover module goes directly to the local source, should the main STL fail.

With the availability of frequencies being greater than in the U.S., 3MMM has the luxury of the two STL systems operating on separate, different frequencies.



Equipment rack cabinets house the modular J.N.S. system at 3MMM, Melbourne, Australia.

levels are supplied by a monitor amplifier module.

Remote controllable

It should be noted that the switch module can be remote controlled. This permits the use of a transmitter remote control system to select the monitored audio. If a return audio feed exists, this module can be used for both local and remote select.

The 8000 Series Rack Frame from J.N.S. currently provides some 20 different modules—that is, 20 different functions. This product originated in Australia, and has been in use there for more than a decade.

If the main STL fails (path fade, as an example), the audio is automatically selected from the backup STL.

If the main STL returns, the changeover module automatically returns to that feed. The desired priority for program audio source is set at installation, and the priority is automatically maintained through these three levels. The changeover module always goes to the highest level of audio available. The audio monitoring is rather straightforward.

An RF demodulator feeds a four-in by one-out stereo audio switch module. The switch module allows for selecting the four sources shown. The audio input to the switch module is bridging, providing isolation. Speaker and headphone

Some stations have used the switch module to select between various audio processors. With the remote capability, the transmitter remote control system is then used for studio selection of processing. This permits the program director to select his transmitter site-located processing to be compared.

So, why modules? They provide the most overall affordable solution: Less rack space is needed, they take less time to install and they are easier to maintain. The result is a "plug-in" equipment environment.

For information, contact John Leonard at J.N.S. Electronics at 408-729-3838; fax: 408-926-1003; or circle **Reader Service 38.**

Reprinted from **Radio World** *October 23, 1991.*

Kintronic Labs on the Money

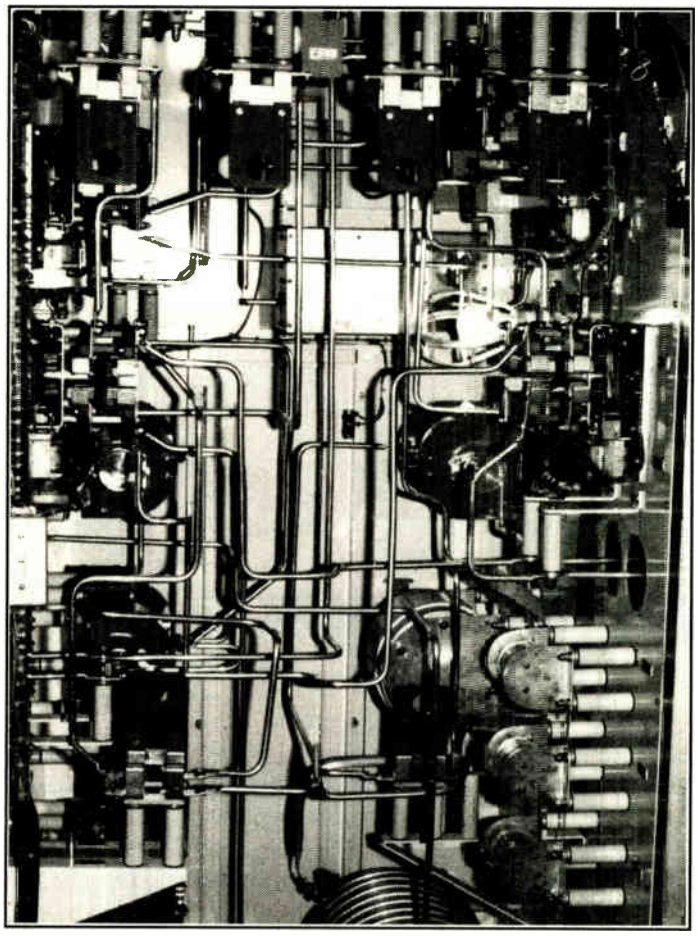
by W.C. Alexander, Dir. Eng.
Crawford Broadcasting Co.

DALLAS In early 1989, Crawford Broadcasting Co. was granted a construction permit to build a new full-time AM facility on 770 kHz here in Dallas.

With a target date of Dec. 1, it was a scramble to get a design completed and solicit bids from all the manufacturers for an antenna phasing and coupling system. When the bids were all in, the contract was awarded to Kintronic Laboratories.

The Dallas facility was to begin life as a four-tower, 5 kW day/1 kW night array, but a change was in the works. An application had been filed with the FCC to increase daytime power to 10 kW with the addition of a fifth tower. This complicated the design and burdened the manufacturer with the task of building the phasor in a way that the change would cause minimal fuss.

Before the towers were completely finished, the phasor and ATUs arrived by dedicated truck. Each cabinet had been individually crated and was packed in such a manner that there was no shipping damage. The crates were marked, so we had no trouble identifying the contents and unpacking them.



A view from inside KPBC's Kintronic Laboratories' phasor.

On the money

Dimensions supplied by Kintronic Labs for the mounting tabs on the ATU weatherproof housings were right on the money. A template was constructed using these figures so that the supports could be placed in advance; when the ATUs arrived, they fit the mounts like a glove. Likewise, a hole had been left in the dividing wall in the transmitter building in which to place the three phasor cabinets. The cabinets fit perfectly.

Drawings of the control circuitry were complete and well made. Hookup, while time consuming because of the complexity, was problem-free.

RF plumbing was as easy as it could be. The cable clamps, which are manufactured by Kintronic Labs, were much easier to deal with than EIA flanges, "spark plugs" or other common line terminations. They securely terminate the transmission line with a good mechanical and electrical connection. In fact, I liked these terminations so well that when I ordered my next transmitter for the company, I had it equipped with one as the output connection.

USER REPORT

Another novel product

Another novel Kintronic Labs product is its portable RF ammeter/transformer. It is really a Delta transformer/meter combination mounted on a self-contained insulated platform. To read base currents, I take the ammeter to the ATU and plug it into a parallel J-jack. The shorting J-plug is then removed and the current read on the meter. This device yields all the advantages of using a Delta ammeter at the tower bases.

Since one meter is used for all towers, ratios are more accurate than if multiple meters are used. The cost, obviously, is much lower than if a meter is permanently installed in each ATU and the meter/transformer combination can be stored inside the transmitter building.

Kintronic Labs manufactured all the RF components in the phasor with the exception of capacitors; the components were of excellent quality and reasonably easy to adjust. Roller inductors worked well, with the exception of one 40-amp tubing roller that had a sticky spot. This turned out to be foreign matter in a bushing; a thorough cleaning and lubrication with silicon grease made it smooth and easy to turn.

When completely assembled, the system performed as advertised. There were no mistakes in construction or documentation; the phasor and ATUs were exactly as I had envisioned them.

We finished the installation in mid-November 1989, and the DA tune-up and proof took a few more weeks. We were a couple of weeks late, but it didn't matter—for other reasons, the sign-on date was moved to April 1990. We signed on then with the four-tower, 5 kW array.

In June 1990, we had the CP for the change to 10 kW for the daytime array. The fifth tower was erected and we went back to work tuning up the DA.

Kintronic Labs had made provisions for this change in its construction. It was necessary to jumper several components, unjumper several others and generally reconfigure for the new ►

array. We did this in one night with the tubing, strap and other parts provided by Kintronic Labs. Tune-up of the new array was a snap.

Like a Rolls

The quality of the work turned out by the people at Kintronic Laboratories is tremendous. I would liken the products to a Rolls Royce automobile.

While that phasing and coupling system has been in service for more than a year now with no problems, the phasor at our Los Angeles station had been in place since the early 1950s. It was time to replace the old Gates radio unit and the ATUs with new equipment and we were so happy with the Kintronic equipment in Dallas that no other manufacturers were even considered for the L.A. job.

The phasor and ATUs arrived in good condition and met our high expectations. Every component was correct with respect to our design and specifications. Installation was a snap and went according to plan. We are very happy with the system.

As this company continues to grow, when the need arises for phasing and coupling equipment, you can bet we'll be calling Kintronic Laboratories.

For information on Kintronic Laboratories products, contact Tom King at 615-878-3141; FAX: 615-878-4224; or circle **Reader Service 44.**

Reprinted from **Radio World** *April 24, 1991.*

Mariner Sails Through Tests

by Tag Borland
President, Logitek

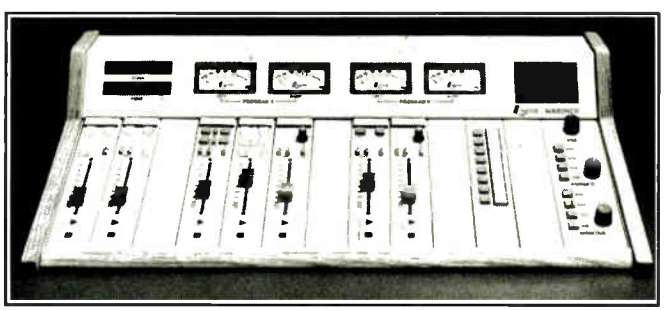
HOUSTON The Mariner console series was introduced at the NAB show in Las Vegas this year as a ground-up redesign of Logitek's popular Perfectionist on-air consoles.

Our two goals were to reduce initial cost while retaining durability and audio quality, and to reduce long-term cost by making the console resistant to wear and abuse while keeping it simple to use and to service.

With this in mind, we have used waterproof switches and pots, along with a special enclosure designed to keep dust, dirt and even liquids away from sensitive areas. In fact, the Logitek Mariner will continue to operate even while soda is being poured over its mixers.

Key switches, return springs and sealing bezels for each module are molded out of translucent rubber in a single sheet and will survive 10 million operations. LED backlighting provides even, long-life illumination and, when mounted, the rubber gaskets form a water-tight seal around each switch.

All the switches are momentary action with electronic latches. The actual audio is switched either by sealed, nitrogen-filled relays or speed-controlled FET T-switches.



The Logitek Mariner is designed to reduce initial cost while retaining durability and audio quality.

Long-term reliability is significantly increased because audio is not routed through mechanical switch contacts.

The Mariner also features new wiperless linear fader technology. Our new resistive element is composed of a pressure sensitive ink over a column of thin sensing fingers sealed between two sheets of tough plastic. The fader knob is connected to a small, low friction roller that runs up and down the element surface, changing the resistance of the section it presses against. This sealing scheme, plus the use of heavy duty main bearings, will provide years of maintenance free service.

Several new circuit features also are included in the Mariner.

TECHNOLOGY UPDATE

The electronically balanced inputs have an adjustment-free CMRR of 100 dB and 40 kilohm impedance. Special quiet VCA amps maintain low THD to within 1 dB of clipping and left to right tracking to within .25 dB. Opto-isolated machine control outputs reduce noise interference, while 60 ohm voltage drive audio outputs provide low loss drive of long cable runs. An optional backup power supply extends primary supply life while adding reliability.

The Mariner is available in three mainframe sizes that hold six, 12 or 22 input mixer modules. These mixers are available in three different types. One has a single stereo line input with a six-button, LED-lighted, machine control interface. Another has two line inputs with start and stop pulse machine control. The last has a single microphone input with phantom power supply and a balance control. Optional features include g-input preselector panels and a clock/timer module.

For flexibility, the Mariner has five mixing busses. Two stereo busses feed the main output channels. Two auxiliary mono busses are for mix-minus or IFB use. And the mono cue buss feeds a built-in amplifier and speaker.

The Mariner is fully modular. The plug-in mixers can be removed with the board still in operation for uninterrupted service. All audio connections are made using ADC's QCP connector posts. And the slim desktop cabinet is easy to position and install.

The new technology used in the Mariner, along with tight control of the assembly process, has allowed us to make a board with greatly increased reliability for only two-thirds the cost of our previous consoles.

For information on Logitek products, contact Tag Borland at 800-231-5870; fax: 713-782-7597; or circle **Reader Service 135.**

Reprinted from **Radio World** *August 21, 1991.*

LPB Helps Spread the Word

by Dee McVicker

FRAZER, Pa. Drive-in church services? They do indeed exist, thanks to LPB of Frazer, Pa., and Part 15 of the FCC Rules.

According to LPB President Edward Devecka, one of the first churches to offer a drive-in service was the Garden Grove Community Church near Anaheim, Calif. At the insistence of the congregation's renowned pastor, Dr. Robert H. Schuller, the system was built in 1955 so church-goers could drive through the church's parking lot and listen to the week's sermon on their AM receivers without leaving their automobiles.

So popular was the concept that Schuller later put in a similar system at the famous Crystal Cathedral. The drive-in system, installed by LPB, is one of the more distinguished in the country.

Open wall policy

"Evidently, there's a whole wall that opens up so you can see (the congregation) from the parking lot," said Devecka of the cathedral drive-in.

LPB, best known in broadcasting circles for its consoles and low-powered AM transmitters, has installed drive-in systems for Oreland Presbyterian Church in Oreland, Pa.; Reverend Bill Midema's El Dorado Park Church in Long Beach, Calif.; and countless others.

"We did an awful lot of drive-in theaters when they were popular," Devecka commented.

Church drive-ins, like drive-in theaters, are protected under the Commission's Part 15 regulations and are unlicensed services broadcasting on the AM band, typically on 530 kHz. Subject to restrictions that prohibit them from interfering with licensed AM stations, church drive-in services typically broadcast within a confined area at very low powers.

Typically, a low-powered 5 W to 30 W transmitter is used for the service. To radiate the signal, a cable usually is buried beneath the drive-through surface to act as the antenna. Unlike carrier current systems, which LPB also has been involved with, drive-in church services do not require a coupling unit.

"The RF output of the transmitter is connected directly to cable," said Devecka, whose company offers proprietary leaky cable for this purpose. Placement of the LPB cable, which is similar to standard coaxial only with an outer braid to leak RF, depends on the area of coverage, he added.

Hard of hearing parishioners

Inside the church, LPB and the Commission's Part 15 also have benefited hard-of-hearing parishioners.

Again using leaky cable and a low-powered AM transmitter, typically less than 5 W, this service offers parishioners the ability to hear sermons more easily on their AM receivers. To radiate the signal, LPB's exclusive RADIO-AIDE leaky cable, which runs approximately 300 feet, is looped overhead—or underfoot, in the facility's basement.

Audio source for the inside AM service, as with drive-in services, originates from the congregation's public address system to bring the sermon, choir or organ music to the church's airwaves.

Distributed cable AM transmission also is being used in churches for a myriad of other purposes, including language translation. In 1985, for example, a Billy Graham Crusade held at Anaheim Stadium in Anaheim, Calif., was host to more than 500,000 people—many of whom did not speak English.

Needing a system to relay language translations, the Graham organization decided to invest in low-powered AM transmission. The result—an expansive setup, with low-powered LPB AM transmitters operating on several unused AM frequencies based on LPB proprietary leaky cable.

During the crusade, volunteer trans- ►

Spreading the Word: LPB helps reach listeners outside the Crystal Cathedral.

lators, set up in the upper deck section of the stadium in announcement booths overlooking the stadium, translated Billy Graham's sermon into seven languages every night of the event.

The translators were supplied with headset mics, enabling them to translate the sermon over the AM band. These headsets provided the volunteers with an audio feed direct from the stadium sound reinforcement system and enabled them to translate the sermon into the headphone mic for broadcast to participants through the radio system.

Those wanting to hear the service on AM were free to bring their own battery-operated AM receiver or to purchase radios offered by the Graham organization at cost. More than 13,000 radios were sold by the organization for this crusade alone.

Today, this setup travels around the world with Billy Graham's crusades. Said Devecka, "They use at least five translators at each crusade and sometimes more than that. They reel out the cable and anyone with a pocket radio can listen in, so people who speak a foreign language can tune to the proper frequency and listen to the services in that language."

A brief hiatus

After six or so years of traveling with the Graham organization, the low-powered transmitters returned to the LPB factory recently for a brief hiatus and service check.

Despite having been bounced around the world and having translated hundreds of Billy Graham sermons, the transmitters were given a clean bill of health by LPB technicians, who found only one small part that needed to be changed in one of seven transmitters, according to Devecka.

Proud of LPB's product track record, Devecka pointed out that thousands of low-powered LPB transmitters are being used by a variety of companies and for a variety of reasons.

"We have a lot of different applications close to every major city," he said, listing sound systems for race tracks and baseball stadiums as just two of the low-powered applications for which LPB and the Commission's Part 15 have been responsible.

Dee McVicker is a free-lance writer and regular contributor to **RW**. *For information from LPB, call 215-644-1123; fax: 215-644-8561; or circle* **Reader Service 7.**

Reprinted from **Radio World** *September 11, 1991.*

LPB Consoles: The Industry Workhorse

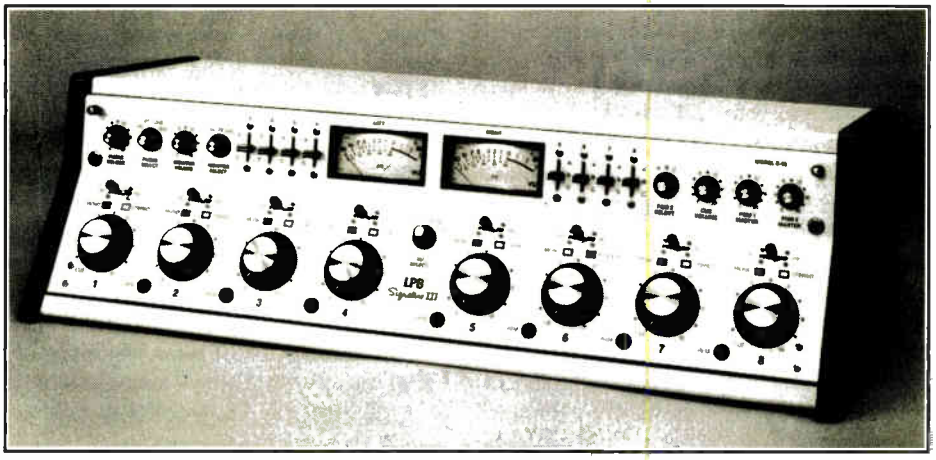
by William Lakatas
Director of Engineering
HGF Media Group

USER REPORT

ALLENTOWN, Pa. There are many advantages to operating several radio stations, including the ability to standardize on certain pieces of equipment.

This standardization helps keep your spare parts inventory to a minimum and enables your maintenance engineers to become thoroughly familiar with the equipment—fewer hassles, quick repairs and lower costs.

Of course, when you purchase a radio station, you don't have control over which equipment you "inherit"—you deal as best you can with the equipment that comes with the license.



The Signature III is among 13 LPB consoles owned by HGF Media Group.

> ***These consoles can take all of the abuse, misuse and daily wear and tear that can be imagined . . .***

I have been fortunate in that the vast majority of consoles in our group have been LPB products. The stations we owned and the stations we've bought have all had some LPB consoles. The standardization process has been that much easier for me.

We currently have 21 consoles in the group. Thirteen of those are LPB consoles, with 11 of them being Signature II or Signature III Series consoles. I am very happy with them.

The LPB Signature Series of consoles has to be the industry "workhorse." These consoles can take all of the abuse, misuse and daily wear and tear that can be imagined—and they still continue to function.

My LPBs are used for both on-air and production. They are as versatile and as easy to use as any console I've ever seen. They are easier to maintain than anything I've worked on and they sound good on the air.

The LPB Signature Series of consoles comes in either mono or stereo configurations with up to 12 faders. There are three inputs per fader. The output buss consists of an "on-air" buss (Program 1) and three Program 2 outputs. Additional outputs are provided for feeding tape recorders and for feeding a mono source (mono sum options on stereo consoles).

Also, LPB has introduced in the past year a mix-minus kit for its Signature ►

Series. This Mix-Minus kit allows you to interface the board with any broadcast-quality telephone equipment such as Gentner, Symetrix or Hnat-Hindes. You can finally do away with that "speaker-phone" in the control room and allow your air talent to carry on a phone conversation by using his studio mic and his headphones. The mix-minus adaptor works excellently.

LPB has an excellent reputation for high quality, low cost products. Not only is the initial cost well within almost anyone's budget, but the cost of maintaining the equipment is about as inexpensive as I can imagine.

Here in Allentown, we're home to Mack Trucks. Their slogan is "Built Like a Mack." Perhaps the phrase "Built Like an LPB" should become part of every broadcaster's vocabulary.

For information on the LPB Signature Series, contact Ed Devecka at 215-644-1123; fax: 215-644-8651; or circle **Reader Service 8.**

Reprinted from **Radio World** *August 21, 1991.*

Radiating Cable Uses

by Richard Crompton, App. Eng. LPB Inc.

ST. MICHAELS Md. Radiating cable can be described as a unique form of "antenna." Why? Read on.

The term "antenna" is actually a misnomer. A radiating or leaky cable is actually operated as a terminated transmission line. The characteristic impedance load termination at the end of the cable is the actual antenna, but terminations do not radiate usefully.

Like all current-carrying transmission lines, there is a field surrounding the cable. It is this field that we utilize, hence we incorrectly call the radiating cable an "antenna." This surrounding field is the induction field; it is highly localized to the immediate vicinity of the cable.

SPECIAL REPORT

While most other types of antennas strive to provide maximum coverage area, a radiating cable system is used to provide coverage of a small and specific geographic area. Practical reception range from the cable, in the AM broadcast band, will be limited to approximately one hundred feet.

Cable forms and applications

To produce a controlled amount of radiation from a coaxial cable, the cable is manufactured with some form of openings in the outer shield.

Andrew "Radiax," originally designed for VHF use in subways, resembles a semi-rigid transmission line with a solid slotted outer shield. Other radiating cables manufactured for specific AM broadcast band use employ a sparse copper braid for the outer jacket.

LPB produces the NF-1D cable for transmission zones of no more than 1000 feet. The NF-2D cable, also made by LPB, is a lower loss, heavy duty cable, which may be used for a linear transmission zone of up to 5000 feet. The cable is coaxial, with drain wire and a polyvinylchloride jacket.

Almost all applications of radiating cable have been in the AM broadcast band, where a standard AM radio is the receiver.

Travelers' information services (TIS), authorized in Part 90.242 of the Commission's Rules, may use either a radiating cable or a short vertical antenna. The first TIS installation, at the Los Angeles International Airport in 1972, employed two buried cable transmission zones.

A more recent installation is the system on the approach road to the Dulles International Airport near Washington, DC. This system utilizes a single length of approximately 11,000 feet of cable.

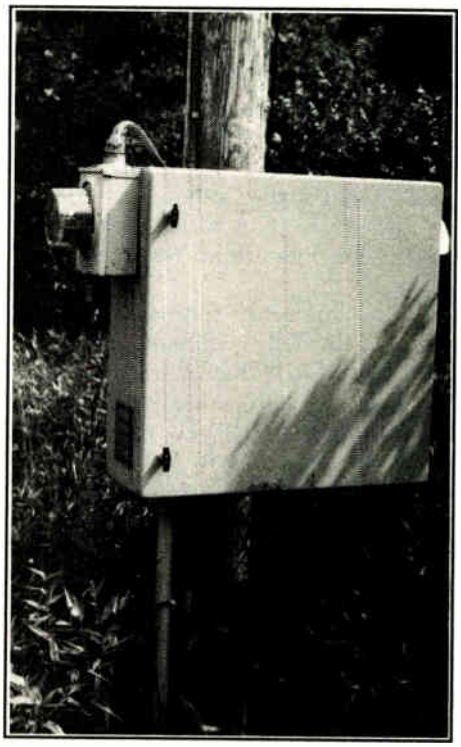
Unlicensed applications

Part 15 of the Rules allows unlicensed operation in the AM broadcast band under certain conditions which can be met by a radiating cable system operating at low power input.

A wide variety of applications have utilized this approach. Perhaps the best known are those on the entrance and exit roads to Disney's Magic Kingdom and EPCOT Center. A timely repeating message prepares visitors with information about daily features, hours of operation, ticket prices, etc., before they even get to the parking area.

In New Jersey, a visitor listening on 530 kHz while driving through the Animal Safari at Six Flags Great Adventure hears a series of informational tapes as he progresses from one animal area to another. Clarity is excellent and there is no interference between the 17 adjacent message zones.

Drive-in theaters and churches have long been users of radiating cable systems buried in the parking lot, to provide patrons a system that does not annoy the neighbors and is less expensive to maintain.



A typical equipment cabinet for a buried cable system along a road.

A length of approximately 7000 feet of type NF-2D radiating cable, a product found in most buried cable systems, can be driven by a small AM transmitter operating at about 20 watts.

These systems may be placed end-to-end to provide a sequence of messages as in the Great Adventure Animal Safari, or the system may be extended almost indefinitely using linear RF amplifiers and additional cable lengths.

The highly confined radiation pattern of a radiating cable system is advantageous for many specialized applications. In addition to the several examples above, the "smart road" of the future may prove to be based upon the induction field from a buried radiating cable.

Editor's note: For additional information on radiating cable and its applications, contact John Tiedeck at LPB: 215-644-1123, or circle **Reader Service 57.**

Reprinted from **Radio World Directory** *1991.*

Micromax Is NewCity Standard

by Conrad Trautmann
CE, WSYR/WYYY

SYRACUSE, N.Y. At NewCity Communications' WSYR-AM/Y94-FM, we had at least one cart machine from every manufacturer scattered throughout the studios, which made stocking parts quite a challenge.

USER REPORT

Rather than purchase additional machines to round out our existing inventory of ITC Delta and Series 99 machines, we decided to see what else was out there—and standardize to one brand of cartridge machine throughout the facility.

Pacific Recorders & Engineering is known for its Tomcat cart machine, which we have in many of our other NewCity stations. The company also manufactures a machine called the Micromax. We evaluated all of the top-rated cart machines and decided to go with the Micromax.

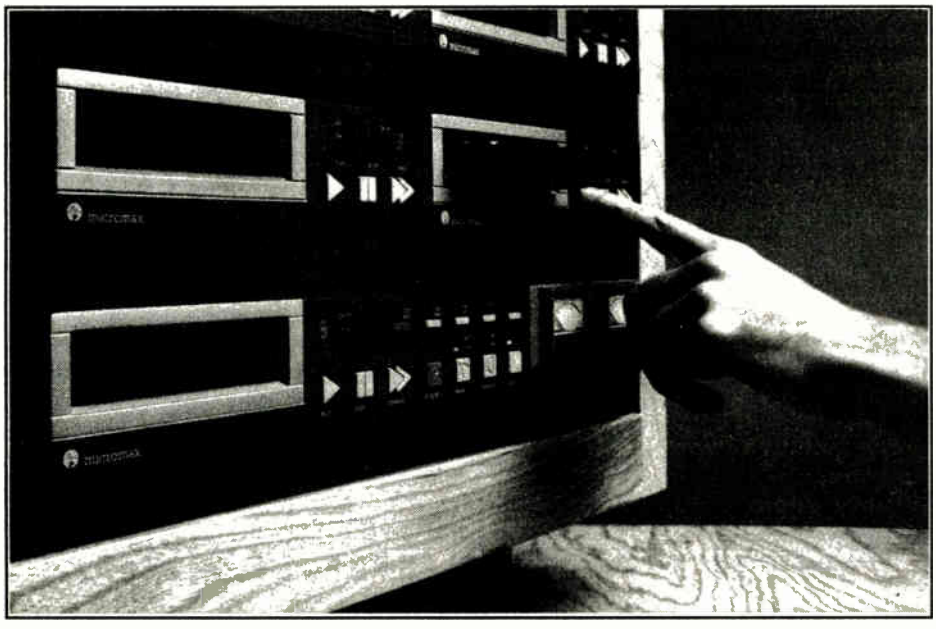
Ideal feature

The most important feature we were looking for in the machine was good phase stability. In many of our older machines, putting a cart in too hard was enough to throw out the entire alignment. We constantly had to reset tape guides to maintain good phase stability.

The Micromax has a fixed tape guide arrangement machined to maintain the exact tolerance of the tape you are using. The plastic cartridges are not seated against the guides. They are seated against an entirely flat block, which helps ensure the cart is in properly.

The guides are mounted to this block, so the cart and the guides always are in the same position. We have had only one machine in 40 get a bent tape guide—the result of a tape going in backwards.

The performance of the machines has been excellent over the 15 months that we've had them. We do a spot phase check once a month and we pulled every machine out and bench tested them at six months. Of the 40 machines, we may have had to adjust three or four, and even then they were only slightly out, not more than 90 degrees. Even recording on a Micromax recorder and then playing back on a reproducer, we found that the phase stability was rock-solid.



The Micromax from Pacific Recorders is used in 40 NewCity Communications' facilities.

Accessible service

All electronics in the Micromax are laid out horizontally on top of the machine, instead of sliding down vertically into edge connectors. All level and equalization controls are on top and easy to see. Pacific took many of the field adjustments that many other machines require and made them factory preset.

> ***The Micromax has a fixed tape guide arrangement machined to maintain the exact tolerance of the tape you are using.***

The pinch roller tension is a good example. Rather than having to adjust the solenoid pull in tension, Pacific uses a spring loaded arrangement that is preset. You never have to adjust it. And since there is no solenoid in the Micromax, the pinch roller engages quietly, rather than the "clunk" you get from many machines.

Some serious engineering went into this machine, including things such as reducing pinch roller drag by mounting it on ball bearings. Since the unit is belt-driven, the capstan also is mounted on bearings.

The belt drive, which scared us a little at first, works flawlessly. We just went through a complete wow and flutter test on all of the machines and every one still meets spec after 15 months with the same belts.

Deck numbering

Pacific has thought of everything, even down to the programmable deck number, which eliminates sticky Dymo™ labeling or masking tape to number the decks.

The Micromax cart recorders and players have worked out well in the new facility, and the sound quality of the machines is far superior to the nearest competitor. From performance to serviceability, these units have been excellent and problems have been kept to a minimum.

For information from Pacific Recorders & Engineering, contact Mike Dosch at 619-438-3911; fax: 619-438-9277; or circle **Reader Service 65.**

Reprinted from **Radio World** *December 25, 1991.*

ProductionMixer Excels at KPBS

by Christopher Durso
CE, KPBS-FM

Pacific Recorders' ProductionMixer can add a competitive edge with 20- and 28-input boards.

SAN DIEGO Pacific Recorders & Engineering has introduced a multitrack console designed specifically for the broadcaster. The PR&E ProductionMixer is a full-featured eight-track production console that combines the inherent operational characteristics of a conventional broadcast console with the flexibility of multitrack capabilities.

The ProductionMixer is custom configured according to the user's needs. The mainframe, available in 20- and 28-input sizes, can be stuffed with any combination of microphone and line level modules, in addition to eight multitrack modules.

In addition to the input modules, the console supports send/return facilities as well as full studio and control room monitoring systems with talkback. Room for up to 10 machine remote control panels is provided within the console to allow the operator to control studio tape

USER REPORT

equipment while concentrating on the mixdown session.

The console's meter bridge contains full metering for all eight-track outputs as well as for each stereo program output. Two auxiliary meters monitor the console sends, mono mix output, cue or solo according to the operator's switch selection. The cue and solo levels are automatically metered whenever either function is selected by an input module.

One of the many outstanding features of the ProductionMixer is the ingenious off-line mix. From each line or microphone module selected to participate in the off-line mix, a mix-minus signal is derived by the telco module. When the modules are turned off, the mix-minus is routed via the off-line mix buss so the selected configuration remains but is no longer on the program buss. This greatly simplifies production of telephone contest promos and talk shows by making the transition from on-air to off-air seamless to both the talent and the caller.

Both line and microphone input modules feature two switchable high impedance inputs. The number of inputs can be expanded with the addition of a remote line selector. Two independent stereo buss outputs can be selected on each module as well as eight track assign outputs.

Two stereo send/return busses are available with pre/post fader selection. Line input modules let the operator select between stereo, left, right or mono modes.

Alternate action cue with metering and light tally, as well as "solo in place" functions are supported on all line and mic modules. When the cue button is depressed, the stereo pre-fader signal is fed to two cue speakers located in the console meter bridge. When solo is selected, the monitor feed is interrupted and the post fader/post pan signal is fed to the control room monitor speakers.

> ***The engineering department will appreciate the layout and construction of the circuit cards.***

The solo in-place feature facilitates quick, non-destructive identification of a source within a mix. This is extremely useful for trouble-shooting or fine tuning of the stereo image.

Pan pots on the microphone modules and balance controls on the stereo line modules are used to position the source within the image. A self-contained low-, mid- and high-range equalizer is included on each line and mic module. Separate controls for each range vary frequency and gain, respectively.

The ProductionMixer also has incorporated a feature known as Auto-Q. The "Q" of the filter continuously adjusts in proportion to the amount of boost or cut dialed in. This gives the equalizer a smooth and natural sound across its range. A boost or cut of approximately 15 dB is obtainable in each band. In addition, patch points are included.

Like its close relative, RadioMixer, the ProductionMixer departs from the design concept of audio on the fader and incorporates the Aphex VCA. Through careful attention to the tapering of the VCA control signal, the Penny & Giles fader has the feel of a high-quality audio taper fader.

The multitrack modules have the same stereo send busses, pan pot and built-in equalizers mentioned earlier. Each multitrack module can be assigned to the remainder of the tracks to accommodate track bounce. A buss/tape selector on the multitrack module selects the source to be mixed by the module.

In most cases the selector would be left in the tape position to allow the tape machine's own input/output switching to control the feed to the mixdown mod- ►

ule. An alternate action button below the fader routes the signal to either of the two stereo program output busses. The Program 2 output module has a fader that can be placed in line with the circuit to provide a master gain control for the multitrack mixdown. In effect, the operator has both monitor mix and stereo mixdown capabilities on the same module.

Each module has remote control logic capability. Logic input/outputs are 12 V CMOS and RFI, as well as short-circuit protected. Logic can be configured to support both source inputs on each module. The meter bridge, which contains the built-in stereo cue speakers and clock/timer, has full metering for all console outputs.

The layout is logical with the main program meters located directly in front of the operator and the multitrack buss metering grouped together on the right hand side. The clock/timer is included with the console, and can be reset and started by the module-on function by setting a dip-switch on the module card or remotely operated from the timer control panel.

The flexibility of the ProductionMixer is a major plus for the production department—little or no training will be required to get product on tape.

The engineering department will appreciate the layout and construction of the circuit cards. All inputs are instrumentation amplifiers that yield a very high common-mode rejection figure. Module logic and track configuration is handled through a combination of on-board dip-switches and header jumpers. Component designations are clearly silk screened on the card for quick and accurate identification.

Console interconnects are handled through Molex connectors on the underside of the mainframe. A/B inputs, patch points and logic connections are arranged in order for each input. Control room and studio audio and logic signals also are available on the Molex connectors. PR&E makes available an array of logic interfaces to match the CMOS levels with external equipment.

Installation is straightforward and uncomplicated. Patch points can be brought out to a patchbay or simply jumpered across the connector. Machine control panels also are interconnected via Molex connectors.

For information on PR&E's ProductionMixer, call Dave Pollard, sales manager, at 619-438-3911; fax: 619-438-9277; or circle **Reader Service 42.**

Reprinted from **Radio World** *August 21, 1991.*

Questions to Ask in The Redesign Process

by Dave Pollard
Manager,
Sales and System Engineering
Pacific Recorders & Engineering

CARLSBAD, Calif. "Measure twice—cut once." That old wood-working adage is still true today. When applied to broadcast studio furniture, it could be rephrased: "Design completely and carefully first, then you'll build it right the first time."

INDUSTRY ROUNDUP

When beginning discussions on an appropriate design for new studios, numerous items should be taken into account. Will there be changes to the show or format, requiring different equipment or a different layout? Will the proposed requirements fit in the room dimensions that you've been given?

After the requirements have been met and the furniture has been installed, will there be any space left for people? Not surprisingly, the lack of actual working space is our most frequent design challenge.

Questions and answers

Following are questions that should be addressed during the design process and the reasons why each should be given priority.

Should the furniture be at sit-down or stand-up height? This can affect the amount of rack space available. Stand-up height furniture can require less chair clearance than sit-down furniture, thus working better in space-limited situations.

Is there a requirement for wheelchair clearance within control rooms and studios? If the answer is yes, the entire design approach will be different.

Would the operation be more functional with a second broadcast position, say for a news or sports person? This position can be fitted with a smaller mixer and cart machines. The second position also can free up other rooms for production. Where will the system interconnect point be and how will it be accessed? Depending on station needs, this can be a single block or a wall of blocks. Planning for easy access to this wiring will make life a lot easier

Also, where will inter-room cables enter the furniture? Designing for floor, wall or ceiling access shouldn't be an afterthought. How about access to the rear of equipment racks? If furniture is up against the wall, that is a problem.

Proper ventilation

Solutions include additional access panels, hinge-down racks or slide-out racks. Has proper ventilation been provided for all equipment? By determining in advance where heat-generating equipment is going, those racks can be properly ventilated. Finally, plan in advance for the installation of the furniture. Space limitations of doorways, hallways, stairs and elevators need to be considered before the furniture arrives.

> ***Space limitations of doorways, hallways, stairs and elevators need to be considered before the furniture arrives.***

Studio furniture that serves your station and personnel well is best achieved by planning. Be sure to gather as much information as possible before committing to a design.

It also never hurts to rely on a broadcast furniture supplier that can provide suggestions as well as solutions to design problems, avoiding costly mistakes and making it all sit right the first time.

Pacific Recorders & Engineering Corp. is a manufacturer of consoles, cartridge machines, production mixers and custom studio furniture. For information on the company's products, contact Dave Pollard at 619-438-3911; FAX: 619-438-9277; or circle **Reader Service 95.**

Reprinted from **Radio World** *July 24, 1991.*

Revolution at the Push of a Button

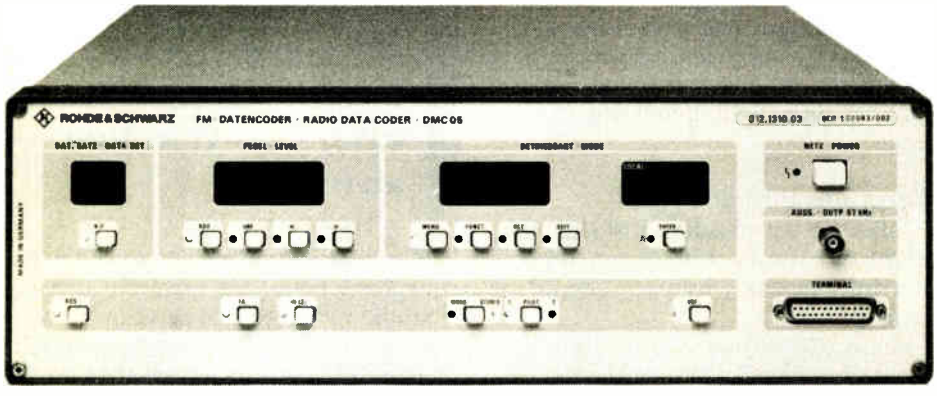
Rohde & Schwarz will manufacture the encoding and decoding portions of the highly-touted Radio Data System (RDS). In the following piece, the company explains the technology's potential uses and its part in its development.

by Matthew Straeb
Marketing Manager
Rohde & Schwarz

LANHAM, Md. The Radio Data System (RDS) is expected to revolutionize FM transmission in the U.S. The service provides additional information to listeners at home and in the car, including type and source of programming, radio texts, radio paging, emergency alerting, remote control and many other services.

TECHNOLOGY UPDATE

RDS was introduced at the 1987 International Radio Show in Berlin and is used according to the CENELEC 50067 standard developed by the European Broadcast Union (EBU). Currently, there is an installed base of more than 1,500 RDS encoders throughout the world, including Germany, France, the United Kingdom and Switzerland.



The Rohde & Schwarz RDS FM Datencoder.

RDS in the U.S.

In the U.S., the Radio Broadcast Data System subcommittee to the National Radio System Committee, is preparing a standard for the United States. The U.S. standard will utilize a large portion of the proven CENELEC standard with modifications to address the U.S. FM market.

Another service provided by RDS is the ability to automatically switch a car radio over to your frequency. Listeners can select a particular format. RDS will find a station with the pre-selected format as you travel from one listening area to another.

For example, if a driver is listening to a station with a format similar to your station format and moves out of the range of that station, RDS can automatically tune in to your station.

FM stations could further increase their revenue stream by becoming a transmitting site for local, national and international radio paging. Alphanumeric RDS pagers with four-line LCD displays are capable of displaying a message of 80 characters in length.

In areas near nuclear plants or other hazardous facilities, RDS will be used to transmit emergency notifications to the population.

When considering an advanced broadcasting system like RDS, it is easy to find specific applications varying from the described ones. Since the RDS operates on a data rate of 1187.5 bits/second, not all applications can be used at the same time via one FM station.

The radio data signals are inaudibly transmitted within monophonic or stereophonic FM broadcasts in a way that does not interfere with existing sound and data signals.

Frequency tolerance

A suppressed subcarrier at 57 kHz transmits the radio data signals, which are amplitude modulated by shaped biphase coded data signals. During stereo broadcasts, the subcarrier frequency will be locked to the third harmonic of the 19 kHz pilot tone.

Because the tolerance of the 19 kHz pilot tone is ±2 Hz, the tolerance on the frequency of the subcarrier during stereo broadcasts is ±6 Hz. The subcarrier will be locked in phase to the third harmonic of the 19 kHz pilot tone. The tolerance on this phase angle is ±10 degrees, measured at the modulation input to the FM transmitter.

The U.S. standard will utilize a large portion of the proven CENELEC standard with modifications.

The data is transmitted in a baseband coding structure called "groups" and different types of groups are specified to cover the various applications of the RDS system. Each of the 15 groups consists of 104 bits. Each group comprises four blocks of 26 bits. Each block comprises an information word and a checkword. Each information word includes 16 bits. Each checkword comprises 10 bits.

Rohde & Schwarz will provide the encoding and decoding portions of the system. Radio Data Coder DMC generates digital RDS signal and 57 kHz signals for traffic information. An integrated 16-bit microcomputer is capable of managing several RDS data sets and controls the interface for five RDS data channels. Alphanumeric displays for data sets, levels, modes and messages show operating status at a glance.

In addition to the FM coders generating the RDS signal, a Radio Data Decoder DMDC will perform the decoding function, monitoring, measuring and transferring of data for transmission. The decoder acts as a data link with simultaneous abilities to monitor signal parameters and make critical measurements. Both the coder and decoder are constructed using modern surface mount techniques and packaging that allows for easy servicing.

For information from Rohde & Schwarz, contact Matthew Straeb at 301-459-8800, ext. 229; fax: 301-459-2810; or circle **Reader Service 101.**

Reprinted from **Radio World** *November 20, 1991.*

Call-In Technology Takes Talk Shows on the Road

by Steve Church
President
Telos Systems

CLEVELAND Many radio shows that make use of call-in phones are taking to the road. We see Talknet's Bruce Williams and Mutual's Larry King on location at the NAB convention each year.

TECHNOLOGY UPDATE

"Rockline" often conducts interviews with the rock celeb subject located at a distant affiliate station. Local "Morning Zoos" take advantage of Disney World's studios and satellite link for a unique promotional opportunity, and many others use their network's facilities for far-flung origination.

These remote broadcasts have been made possible by the ubiquity and relative low cost of satellite links. While the ease of obtaining satellite connections has drawn programmers to these distant remotes, they bring some new challenges to those of us who are charged with creating the required engineering magic.

Generally, it is preferable to integrate the remote to allow the existing studio phone system and lines to be used. When the in-place system is used for the airing of telephone calls, we don't have to install special phone lines at the remote site for what is likely to be a one-shot affair. As well, programmers don't want callers to have to learn a new number for each remote origination and we certainly don't want to uproot the studio telephone system.

Discussing goals

Our goal, then, is to find some way for the telephone audio to be sent to the remote talent. At the same time, the talent audio signal has to be sent back to the callers. While this would seem a simple enough proposition, there are some complications. Let's start with the basic set-up (see Figure 1).

At the remote site, an audio mixer feeds the talent audio to the uplink. At the station end, the audio is received and brought up on a studio console fader. Since the station off-air signal is not available for monitoring, a return audio path also is required. This is generally provided by a standard dial-up telco circuit, as fidelity in the return direction is not a concern.

Here's where it starts to get a bit tricky. Because of the time delay inherent in satellite transmission, we must ensure that talent do not hear themselves "round-trip" from the studio via the delayed path. It is a generally accepted rule of thumb that a talker hearing himself via headphones will find delays of greater than 10 ms objectionable.

Coherent speech

At the nearest, our earth-bound satellite transmitting and receiving dishes are 22,300 miles from the orbiting "repeater." At 186,000 miles per second, an up-and-down trip takes about 300 ms, a delay that varies only slightly with the surface distance between the endpoints.

As you have probably observed at one time or another with the aid of the production studio MCI, when the delay reaches hundreds of milliseconds, it becomes very difficult to speak coherently. That means that we must create a return-to-talent feed that lacks the talent audio, so that the local non-delayed audio can be used for talent headphone listening. A mixing bus in the studio console dedicated to summing all of the fader sources that are active to the program output, but which excludes the remote talent, is required.

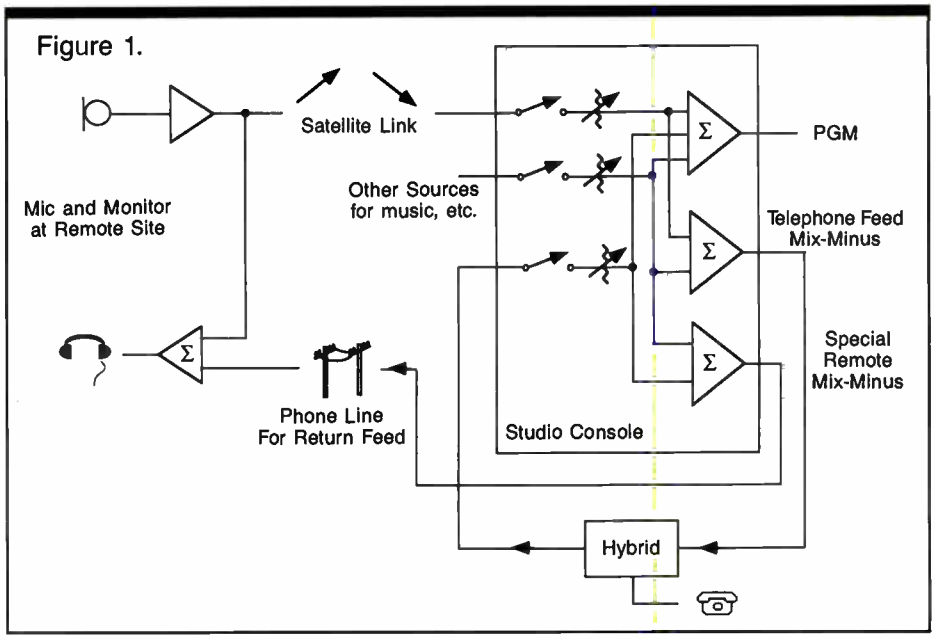
In sophisticated consoles, an auxiliary send bus could be pressed into service for this function. With others, the audition bus could be put to the task, but only when it is possible to assign a fader to the audition and program channels simultaneously. A Henry Engineering Co. MixMinus Plus adapter is another option. One input of this unit is fed the program output, while the other is given the remote feed, and the two signals are subtracted to create the desired signal.

This special remote "mix-minus" arrangement provides a very similar function to that of the usual telephone mix-minus bus, which continues in the normal fashion to send to the telephone hybrid interface all of the sources the callers must hear, but which now also must include the remote feed from the satellite. In consoles that have assignable sends for the phone interface system, this is no problem.

In other cases, it will be necessary to provide some external method for accomplishing this. An additional mixer or summing system may be required. Regardless of the method, it must be made certain that the telephone hybrid's output is prevented from reaching its input.

Back at the remote site, the talent is ►

Figure 1.



mixed to headphones locally with a full-fidelity, non-delayed mic signal. This same mix may be used for loudspeaker monitoring for the audience at the site, or a separate mix for the audience monitor could allow independent adjustment of relative levels without disturbing the talent headphone balance. Assuming success in creating the various audio mixes and paths, we're now ready to consider some of the more subtle issues.

A significant problem results when the telephone hybrid isn't doing a good job of preventing the send audio from leaking to its output. When this happens, the special remote send mix-minus is corrupted. Therefore, the better the phone interface's trans-hybrid loss, the less the possibility that talent is going to be confused (by engineering-related problems, anyway). If the hybrid has variable caller ducking, it could be increased to enhance effective isolation.

Another lurking trouble spot is acoustic feedback, as are the two feedback paths in our setup. One is the usual path from the talent mics to the audience monitors; the other is the loop involving the talent mics, the audience monitors and the telephone hybrid. Again, maximizing trans-hybrid loss helps. If the hybrid has a ducker in the send direction path, this should be switched in.

Ducking and old tricks

Particularly effective is a ducking system that has the send and receive sections linked so that a minimum loss across the hybrid is maintained. Another is the old PA trick: insert a 3 Hz or 4 Hz pitch shift at some point in the loop to prevent sustained feedback from building up by damping out any oscillations as they develop. An improvement in feedback margin of around 10 dB can be expected from this procedure.

An equalizer also can be a very good tool for reducing feedback. The acoustic path usually has a few pronounced nodes where gain is at its highest and these are the frequencies where feedback will occur. Finding and notching the appropriate frequencies can have a dramatic beneficial effect.

With a fiber optic link from the remote site to the studio, there is, of course, no satellite delay. However, MUSICAM and other similar higher-order compression schemes proposed for the encoding of audio into the digital domain have significant delays that can cause similar problems to those created by satellite links.

ISDN digital telephone lines are coming. These lines permit a "four-wire" connection to be made with the two required independent opposite direction paths being obtained with a single dial-up call. Since these are most likely to be conveyed on fiber optic cables rather than by satellite, delay will be a problem only when created in the audio-to-data coding process. Feedback will be with us for the foreseeable future.

Steve Church is president of Telos Systems, a phone interface manufacturer. For information, contact him or Trisha Ristagno at 216-241-7225; fax: 216-241-4103; or circle **Reader Service 80.**

Reprinted from **Radio World** *October 23, 1991.*

TTC FMS Series Offers Options, Dependability

LOUISVILLE, Colo. Television Technology Corp. (TTC) has manufactured a solid state (FET) FM Transmitter since 1989. The FMS series is available in 1 kW, 2 kW, 4 kW and 8 kW power levels. Cost effective to purchase and operate, the following is a brief overview of the FMS-4000.

TECHNOLOGY UPDATE

The FMS4000 RF system consists of: the Model X FM exciter; an intermediate power amplifier (IPA) module; four 1 kW power amplifier (PA) modules; an RF combiner module; and a low pass filter/directional coupler.

All of these units are contained in one 70-inch rack-mount enclosure. The FMS series solid-state broadband design goals included increased stereo separation, improved signal-to-noise ratios, improved intermodulation distortion and group delay, and ultra wide bandwidth for transparent audio performance. These goals have all been achieved.

TTC recommends use of its own Model X Exciter. CD-quality specifications and field-proven reliability enhance overall performance of the FMS system.

The IPA module amplifies the exciter RF output to approximately 200 W. This signal is then split to provide a nominal 50 W to drive each of the four PA modules.

Inside each PA module, RF is split again to feed four separate RF amplifiers. Each RF amplifier is powered through an individual regulator circuit in the module. LEDs on the PA module front panel indicate DC voltage and function status.

The four RF amplifier outputs in each PA module are combined to produce the module's 1 kW output. The outputs of each PA section are in turn fed to the combiner to yield the transmitter's final 4 kW output. The amplifiers are conservatively rated with 10 percent headroom.

Operation over the entire FM band is obtained without tuning or adjustments.

The combiner module output feeds a lowpass filter/directional coupler. For lightning protection, a DC path to ground is provided in the high pass section of the low pass filter. The output of the lowpass filter is sampled by an integral directional coupler, where forward and reverse RF is sampled and fed to the controller. A 15/8-inch EIA Flange connects to the transmission line.

All CMOS control and monitoring circuitry is located in a separate chassis. Two digital front panel meters monitor transmitter operation. The first is a wattmeter, which can be set to indicate forward or reflected power. The second is a multimeter, which measures voltage, current or temperature at all critical points in the transmitter circuitry.

A front panel toggle switch allows for local control. When power is first applied to the transmitter, all logic in the control unit is reset and Remote mode is selected. The wattmeter is set to measure forward power and the multimeter displays total amps.

A column of two-color LEDs is also located on the front panel. These indicate the status of the output power control (ALC) circuitry, which is designed to maintain the transmitter output power set in the controller. This circuitry is enabled whenever RF input power to the IPA module has been detected. Automatic VSWR foldback maintains maximum output power, even into a bad load.

Fault handling is designed to keep the transmitter on-air whenever possible, even if at reduced power levels. PA cur- ►

rents, antenna VSWR and all temperatures (PA, IPA and Combiner) are continuously monitored and integrated into the power control circuitry, which protects the transmitter from failures due to abnormal operating conditions.

The power supply consists of a single phase 208/240-volt AC ferroresonant transformer as well as a rectifier/filter circuit. The ferroresonant transformer maintains a near-constant output voltage across wide variations in line voltage and DC load.

Inherently, a ferroresonant transformer provides protection against line transients or surges. There is also a surge suppressor at the AC input.

A multipin connector is provided on the rear of the control chassis for interconnection to a remote control unit. Any function or meter reading capable of being executed locally from the front panel can be accessed by any remote control unit.

The FMS series of solid-state (FET) FM transmitters offer an exceptional value. Customers from as far away as Cyprus and Thailand have bought multiple units. TTC can help you solve your transmitter problems, too.

For information, contact Russ Erickson, sales manager for radio, at 910-938-0396; fax 303-673-9900; or circle **Reader Service 110.**

SP-44: Tradition, and a Twist

by Ray Esparolini
Director of Sales
Wheatstone Corp.

SYRACUSE, N.Y. The new Wheatstone SP-44 console offers full multitrack production capability, while providing familiar program and audition bussing, allowing production rooms to double as back-up on-air facilities.

In talk or news formats, the SP-44 can free up primary air studios for routine calibration and maintenance sessions. Beyond its on-air capability, the SP-44 can be used as a four-track production console; it is equipped with three-band equalization, auxiliary send busses, subgrouping capabilities and full on-air type machine and console logic.

Input modules consist of two types: mono mic/line and stereo line. Both have familiar program and audition bus assign switches for on-air application and routine two-track transfers

TECHNOLOGY UPDATE

and dubs. Mono inputs have an additional internal dip-switch feeding a mix-minus bus, making the console suitable for call-in production work.

Cue, phantom power, phase reverse and separate mic and line gain trims all are standard. Module on/off switches may be remotely controlled and can trigger control room and studio mute, as well as auto timer restart. Control room and studio tally relays permit an on-air type of production environment as well as direct-to-air capability.

Stereo inputs have A/B source select capability, three-band reciprocal curve EQ and a stereo/mono send section for auxiliary effects (sends may be switched pre- or post-fader).

Channel on/off buttons are coupled to an on-air type machine and console logic system and can fire external machines, as well as receive tally back signals from same. The logic system also may be dip-switch-selected to command control room and studio mute, plus timer restart.

The new SP-44 offers multitrack production and on-air capabilities in one package.

SP-44 subgroup modules provide record outputs to the multitrack tape recorder during mixdown sessions, with each subgroup fader controlling the level of one track.

The same modules are equipped with bus/ext switches and tape level controls, allowing direct tape playback with no repatching; the final mix may then be monitored by assigning the subgroups to the console's master stereo program output. Alternatively, tape outputs may be routed to mono module line inputs, allowing the addition of EQ to playback.

Output modules have bus/tape phone amp, CDR output, source select (including two external line inputs) and automatic cue interrupt and control room mute functions.

All components are Wheatstone quality throughout, with all-gold contact switches, gold bus connectors, gold I/O connectors, solid state on/off lamps and triple burned-in ICs. Faders are Penny & Giles long-throw conductive plastic. Performance specifications include typical frequency response at +0.1 dB, 10 Hz to 20 kHz; THD+N less than .004 percent 20 Hz to 20 kHz; and dynamic range of −114 dB.

For information, contact Ray Esparolini at Wheatstone: 315-455-7740; fax: 315-454-8104; or circle **Reader Service 47.**

Reprinted from **Radio World** *August 21, 1991.*

ADVERTISER INDEX

Page No.	Advertiser	Reader Service No.
64	Amp Services	79
34	ATI	84
116	ATI	115
23	Altronic Research	2
45	Aphex Systems	56
11	Audio Animation	151
64	Audio Dynamics	32
12	Audiopak	29
27	Audiopak	33
9	Auditronics	10
63	Autogram	75
61	Broadcast Devices	91
110	Broadcast Electronics	92
16	Broadcast Equipment Sales	100
20	Broadcast Services	15
64	Broadcast Software Ltd.	103
4	Cablewave Systems	54
13	Capitol Production Music	67
111	ComStream	141
41	Comtech Antenna	60
42	Crouse-Kimzey	41
15	ESE	72
62	Econco	137
54	Electro-Impulse Lab	111
115	Elenos	98
2	Eventide	50
7	Flash Technology	22
64	Focal Press	150
25	Gepco International	12
47	Hall Electronics	152
49	Hall Electronics	9
51	Hall Electronics	96
30	Halland Broadcast Services Inc.	23
62	Hallikainen & Friends	114
155	Harris-Allied	126
14	Henry Engineering	77
23	Henry Engineering	87
53	Henry Engineering	62
58	Henry Engineering	25
43	Holaday Industries	81
19	ITC	16
21, 22	International Broadcast Supply	89
24	Inovonics	51
39	Inovonics	93
10	Intraplex	76
117	JNS Electronics	83
114	Kintronic	26
38	Motorola	17
112	Multiphase	45,109
63	Murphy Studio Furniture	94
29	Myat	122
55	Nautel	119
63	Northern Technologies	55
61	Nott Ltd.	4
17	Pacific Recorders	—
52	Peter Dahl	124
46	+4 Audio	131
16	QEI	3
28	QEI	46
36	QEI	147
44	QEI	36
50	QEI	143
56	QEI	128
26	RF Technologies	105
35	ROHN Towers	113
33	SMARTS Broadcast Systems	6
113	Sailors Audio	71
62	Sontec Electronic	73
3	Studer Revox	19
61	Studio Technology	48
57	Symetrix	70
112	Tapecaster	63
62	The Management	24
37	Tri-Tech - Celcast	138
48	Walters-Storyk Design Group	39
156	Wheatstone	112
31	Will-Burt	116

HARRIS ALLIED 70th ANNIVERSARY

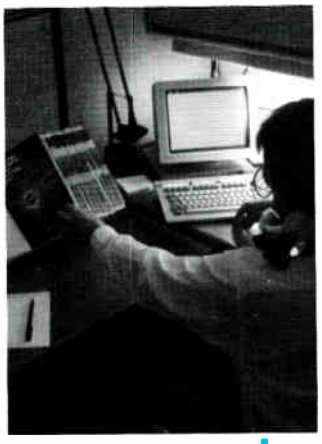
TUNED TO TOMORROW

Call On Our Strengths

Harris Allied has the strength to turn tough times into growth opportunities. While others are scaling back, we're adding new divisions, new capabilities, new ways to help you make the most of your potential.

we're working when you are

Our product experts are here twelve hours a day, Monday through Friday. So whether you call at 8:00 A.M. Eastern or 5:00 P.M. Pacific, you can count on fast, friendly service.

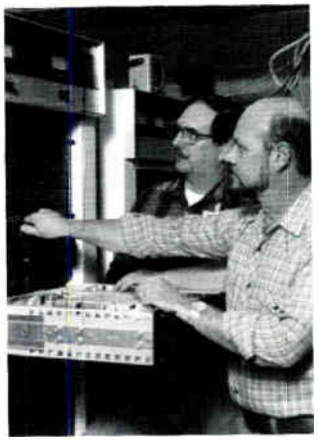


we respond right away

We've just added even more phone lines to make sure you won't have to wait for personal assistance. When you know what you need, we'll give you the right price. When you don't, our product experts are ready with experienced advice.

we deliver when you need it

Over 90% of our orders are shipped within 24 hours. And our selection is the broadest in broadcasting — over 5,000 products from more than 240 manufacturers.



we're committed to your success

Millions in lease financing for you to draw on. An expanded systems and mobile van division. Ongoing pursuit of the most advanced and efficient studio and RF technologies available. Used equipment and trade-ins to stretch your budget. Factory-authorized service for many top lines. Our dedication shows in all these ways and more.

With service, selection and support like this, it's no wonder more broadcasters count on Harris Allied than any other distributor. For all your equipment needs, dial the strongest number in broadcasting: 800-622-0022.

HARRIS ALLIED
BROADCAST EQUIPMENT

800-622-0022

Fax (317) 966-0623 • In Canada (800) 268-6817

Circle (126) On Reader Service Card

Each Tiny Tape Logs A Full Week of Audio.

With analog cassettes or reel-to-reels, logging was a chore. With Eventide's revolutionary VR240 Digital Broadcast Logger, logging is a competitive weapon. Now you can store 168 hours of audio on a single DAT cassette. Record from 1 to 24 channels simultaneously on each tape. Find any audio segment on the tape in under one minute.

With power and speed like that, the VR240 can do much more than just log your own station. It's easy to monitor the competition. Keep track of the new songs in their playlist—and the new clients in their stopsets. Use other channels to record police, fire and aircraft frequencies to give your news department an extra edge.

With analog tape, logging was expensive and inconvenient. Now the VR240's digital technology slashes the cost of tape stock and eliminates the need for dedicated storage space. A week's worth of audio fits in your shirt pocket. A year's worth fits in a file drawer with plenty of room to spare. The VR240's optional label printer clearly identifies each tape with a time/date and ID stamp.

We don't have to tell you that staying competitive today means using every advantage you can get. So what are you waiting for? Call your broadcast distributor for more information on radio's newest secret weapon—the VR240 Digital Broadcast Logger from Eventide.

Eventide®

VR240 Digital Audio Logger

Eventide Inc. • One Alsan Way • Little Ferry, NJ 07643 • Tel: 201-641-1200 • Fax: 201-641-1640

Circle (50) On Reader Service Card