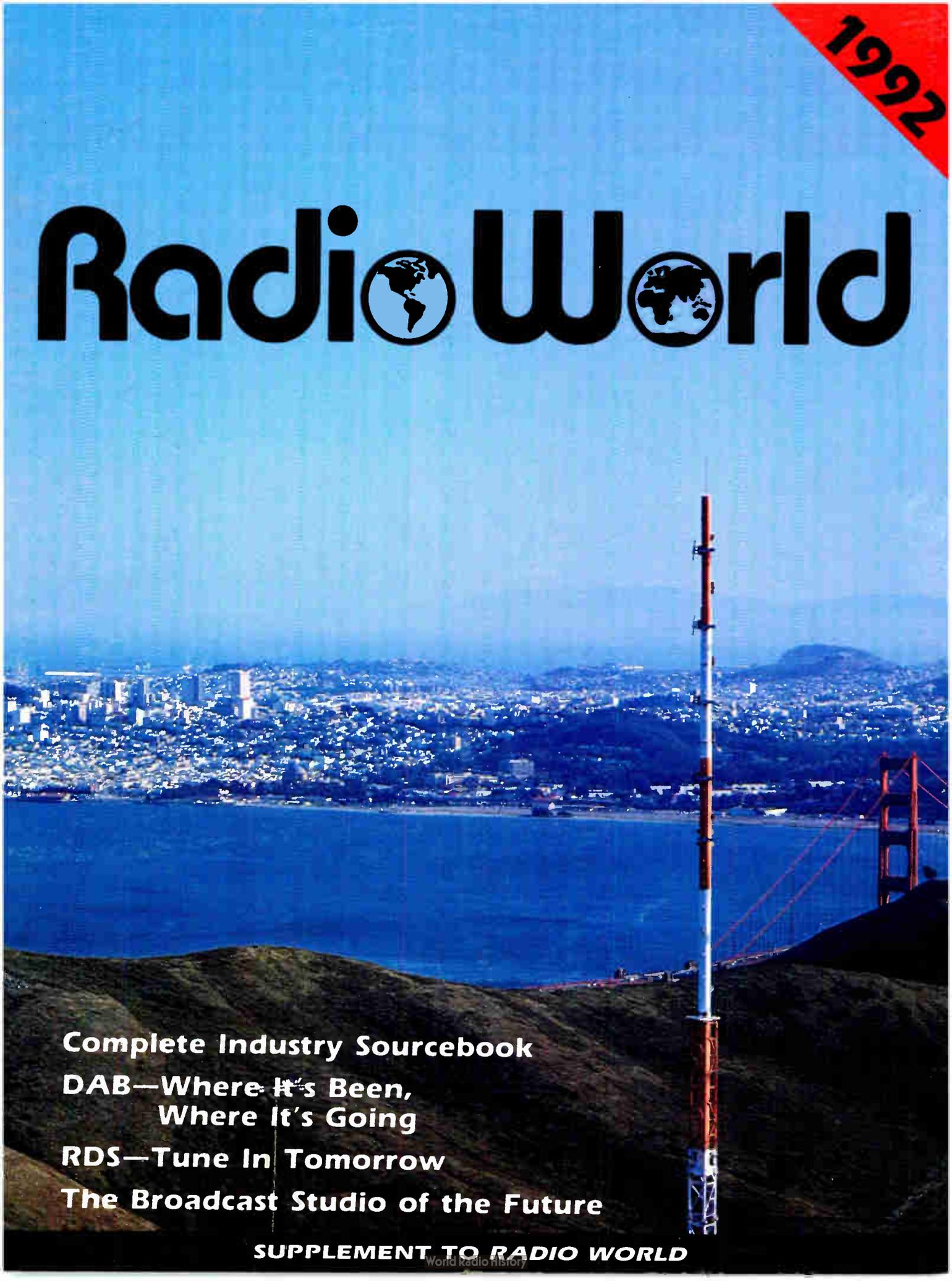


1992

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

World radio history

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



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

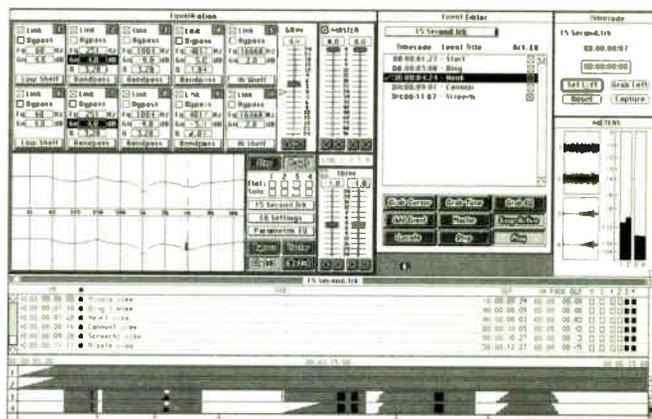
circuit designs, Dyaxis has achieved a worldwide reputation for outstanding sound quality.

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

© 1992 Studer Revox America, Inc.

Circle (19) On Reader Service Card

World Radio History

STUDER

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”



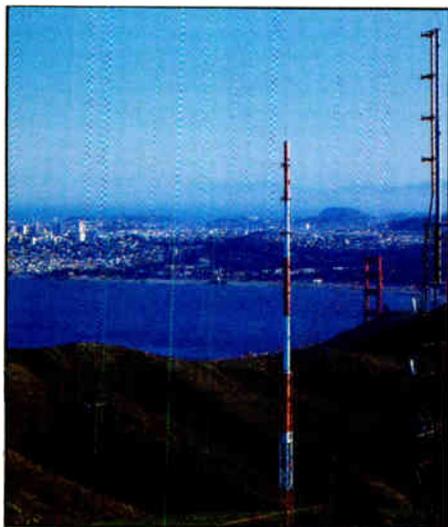
Cablewave Systems

60 Dodge Avenue
North Haven, CT 06473

Circle (54) On Reader Service Card

World Radio History

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 Dea'herage
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

Was It Hot Or Was It Not	6
Show Calendar	7

Special DAB Section

1991—A Year of Surprises	8
1992—When the Dust Settles	13
DAB Proponent Summary	14

RDS Success Spelled Out for U.S.	16
Renovating Right from Ground Zero	18
FCC Refines Its Fine Schedule	54
How FCC Rules Are Made	23
Learning: The Never-ending Story	24
Workbench: Top Tech Tips of 1991	27
Trade Terms You Thought You Knew	31
A Guide To Interpreting Specs	32
Taking A Hard Look at Soft Times	38
Calling AP12-8C3, Chief Engineer	40
How to File FCC Comments	51

Contact/Phone Listings

Society of Broadcast Engineers	44
National Association of Broadcasters	47
Federal Communications Commission	48

Directories & Profiles

Product Source Book	70
Supplier Source Book	90
Company Profiles	110

Indices & Reprints

Subject Index	118
Buyers Guide Index	119
Author Index	126
Buyers Guide Reprints	127
	129

Advertiser Index

154



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. All rights reserved.

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



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

RDS
In-band
U.S. DAB
Howard Stern
RAB's Gary Fries
New Rock
CBS's Nancy Widman
Debt restructuring
Arbitron's Jay Guyther
Mercury Awards
Larry King
Garth Brooks
DCC
Expanded AM band
One-to-a-market

Safe sex, condom ads
Cher's tattooed tush

Ervin Duggan
Radio drama
Pirate radio stations

Live news remotes
NPR's Nina Totenberg
Shortwave radio
Self-inspection

Not

DAB
L-band
Eureka systems
Mark and Brian
RAB's Warren Potash
New Age Contemporary
Emmis' Jeff Smulyan
Leveraged buyouts
Arbitron's Rhody Bosley
Clio Awards
Rush Limbaugh
Ricky Skaggs
Consumer DAT
NRSC standard
Move-ins, a la Tom Gammon's Anniston, Ala. rule relaxation deal

Just Say No ads
Sinead O'Connor's coiffure

Sherrie Marshall
Morning zoos
Pirate Radio (and all its imitators)

"Rip'n'read" newscasts
Deborah Norville
Cable radio
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.

ElectroFlash FTB 301

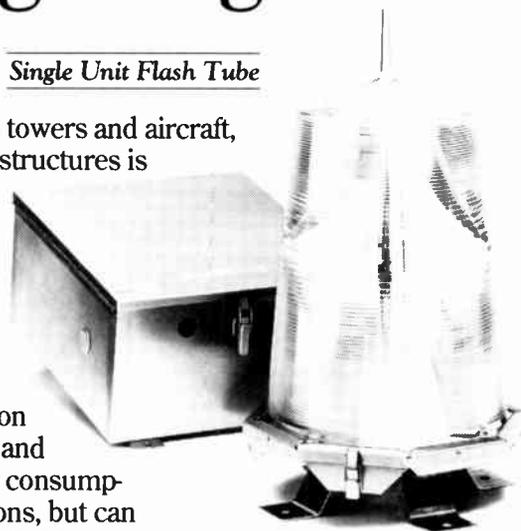
Obstruction Lighting That's Not Sky High.

Single Unit Flash Tube

Life is full of surprises, but when it comes to radio towers and aircraft, you don't need any surprises. Strobe lighting for tall structures is the most effective method of alerting air traffic to the location of obstructions. Why sacrifice visibility and waste money on the old-fashioned method of painting and repainting when the **ElectroFlash FTB 301** offers a much better method for marking structures 500 feet or less AGL?

The **ElectroFlash FTB 301** is an ETL tested, FAA approved medium intensity white flashing beacon that's simple to install. The fixture itself is affordable and operates reliably 24-hours a day with very low power consumption. The **FTB 301** is primarily used in AC applications, but can be ordered for DC compatibility if no electricity is available.

If obstruction lighting sounds like a tall order, let Flash Technology show you how inexpensive it can be to make your tower shine.



FLASH
TECHNOLOGY

Meeting the World's Safety Needs in a Flash

Flash Technology Corporation of America • P.O. Box 329 • Nashua, NH 03060 • (603) 883-6500 or FAX: (603) 883-0205

ElectroFlash FTB 301

Circle (22) On Reader Service Card

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

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

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.

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.



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.

NEW Discrete Digital STL

CD Quality Audio



At a cost comparable to your current backup.

The INTRAPLEX 4800 DDAT LINK Discrete Digital Audio Transmission LINK with 16-bit linear coding and **no compression** gives you far better audio performance than a good analog system.

The 4800 DDAT LINK and the T1 line available from all telephone companies offer enough bandwidth for your 15 kHz stereo (or dual monaural) signal...and more.

Call us at INTRAPLEX for full details and a quotation.



Intraplex

Intraplex, Incorporated, 80 Taylor Street, Littleton, MA 01460-3427
TEL: (508) 486-3722 / FAX: (508) 486-0709

Circle (76) On Reader Service Card

*"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



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

Circle (151) On Reader Service Card

**AUDIO
ANIMATION**
INCORPORATED

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.

**TRUE BLUE
FOR
THE
BLUES.**

More stations play their music on the world's best-selling tape carts.

audiopak
BROADCAST CARTRIDGES

P.O. Box 3100 • Winchester, VA 22601
Tel: (800) 522-CART or (703) 667-8125
Fax: (703) 667-6379

Circle (29) On Reader Service Card

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 FM's 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)

Ole Georg Presents

THE PROFESSIONAL
PRODUCTION MUSIC

THE SOUND of SUCCESS

COM P
dis
DIGITAL ALB

CAPITOL PRODUCTION MUSIC
6922 Hollywood Blvd., Suite 718
Hollywood, CA 90028

Capitol
RECORDS

1-800/421-4163
213/461-2701 FAX 213/461-1543

Circle (67) On Reader Service Card

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.

New

IT MIXES!



MICROMIXER is a nifty stereo utility mixer! Four balanced line-level inputs with level controls. "MicroAssign" switches permit each input to feed L, R, or *both* outputs. Hundreds of uses... keep one handy. Just \$195.00

Henry Engineering
(818) 355-3656 FAX (818) 355-0077
We Build Solutions.

Circle (77) On Reader Service Card

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.

MATCH IT! IF YOU CAN

- Top Quality Specifications
- Bi-directional Interface
- Front Panel Gain Adjustments and Power Indicator
- Rugged, All Metal Enclosure
- Single or Dual Rackmount
- Internal Power Supply

Audio Level and Impedance Interface



\$179



ES-244



PRACTICAL SOLUTIONS FOR 19 YEARS

142 SIERRA ST., EL SEGUNDO, CA 90245 • (213) 322-2136

Circle (72) On Reader Service Card

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

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



WHY QEI?

Single Phase 30 kW.



Our new FMQ 30000B is the only 30 kW transmitter available with a single phase power supply.

For over 20 years, QEI has been the American value leader in FM transmitters, modulation monitors, exciters,

stereo generators and more. Call or write for full details. Dealer inquiries welcome.

QEI CORPORATION

ONE AIRPORT DRIVE • P.O. BOX 805
WILLIAMSTOWN, N.J. 08094 U.S.A.
(609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (3) On Reader Service Card



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

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)

BROADCAST
EQUIPMENT
SALES
& ENGINEERING INC

(601) 857-8573

P.O. Box 20331 • Jackson, MS 39289

- New & Used Equipment
- Equipment Refurbished
- Installation Available

Circle (100) On Reader Service Card

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

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



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

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.

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.



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

THE OPTIONS GET EVEN BETTER

Series 2

New



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!

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

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.*

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
<i>In Canada:</i> Maruno Electronics Ltd.:	416-255-9108

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

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

World Radio History



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

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

the bids and reduce the scope of the project where appropriate.

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.

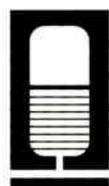
"The most common consequence of poor planning is a poor relationship with the contractors and vendors. It's important that you appreciate that contractors are not in the business for their health. You must accept the fact that they're out to do business (for the same reasons you do) and that's to make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

We are pleased to announce the



BROADCAST SERVICES/EME Priority Lease Plan

a nationwide offering with
\$25,000,000
in available funding

Funds up to \$50,000 available on credit application only —
no financial statements required in most situations.

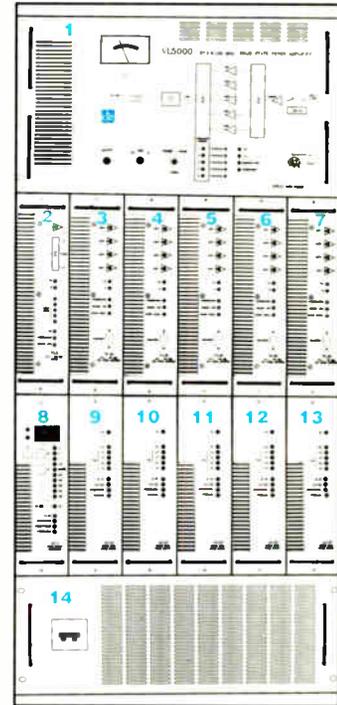
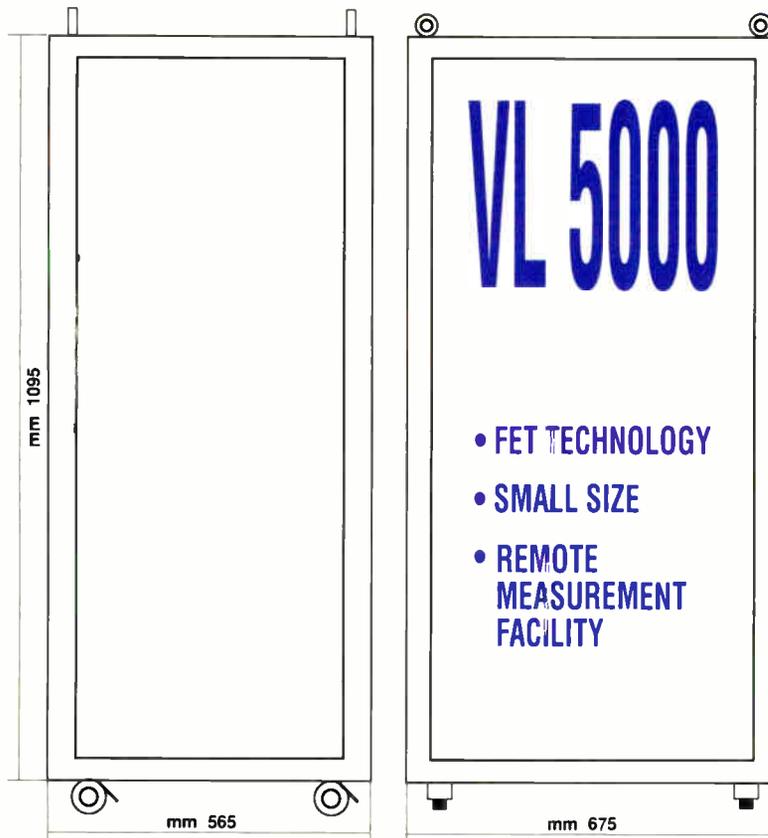
Purchase the equipment you need — now — on easy, straightforward terms. A sound solution to the current industry slowdown, the Priority LeasePlan has been put together especially for broadcasters. Our professional staff can show you how leasing can actually save you money. One more reason people are calling us...

The Preferred Source

Mid Atlantic 800/345-7112 Southeast 800/525-1037 West Coast 800/523-1037 Video Sales 800/942-6005

Circle (15) On Reader Service Card

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 1⁵/₈" 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 dependent on working frequency. Also this module is protected against over-heating and excessive SWR values at the output.

3 1 kW Module

The CTE 1 kW Module is composed of 4 basic amplifiers, combined both in input and output by a coupler circuit conceived and developed in our labs.

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.

A switching power supply assures a tolerance on the power supply voltage of +/- 20%. Each module can supply up to 40 A and is complete with luminous LEDs, indicating input and output voltage, auxiliary voltages, overload, 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 Reggione Emilia - Italy
Tel. 0039-522-516660-47441 - Telex 530156 CTE I - Fax 0039-522-47448



Circle (89) on Reader Service Card



KT 3000
250 WATT TRANSMITTER

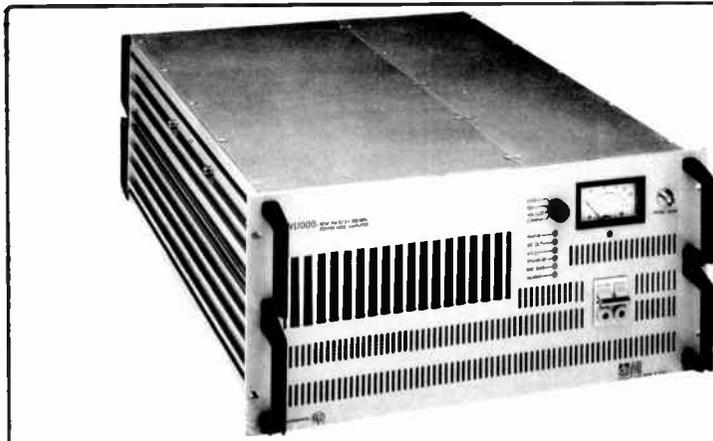
HUNDREDS OF THESE UNIT ARE WORKING ALL OVER WORLD UNDER THE TOUGHEST ENVIRONMENT CONDITIONS, REPAYING GENEROUSLY THE LOW COST. THE UNIT CAN BE EASILY CONVERTER FROM MONO TO STEREO AND VICEVERSA. OUTPUT POWER IS FRONT PANEL ADJUSTABLE FROM 50 UP TO 250W. THE BALANCED INPUTS AVOID MAINS AND RF INTERFERENCE ON THE AUDIO INPUTS AND ALLOW DIRECT CONNECTION OF THE UNIT TO PROFESSIONAL AUDIO EQUIPMENT.



KT 24

30 WATT PLL EXCITER

THIS EXCITER FEATURES A FULL 30 WATT 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"/5U 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/50 HZ. 15%, WHICH IS DIRECTLY SELECTABLE BY THE USER, DURING THE INSTALLATION.

"CTE" EQUIPMENT

	MODEL
FM EXCITER 2-20 WATT SYNTHESIZED, MONO/STEREO.	S-22
FM EXCITER 2-30 WATT SYNTHESIZED, MONO/STEREO.	VL-30
500 WATT 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 WATT STL AMPLIFIER.	S-02
LOW POWER TV TRANSMITTER.	
ANTENNAS UP TO 5 KW.	

OTHER PRODUCTS

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

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

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 ei-

ther 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



DIGISTOR is a digital phone-message device that is ideal for broadcaster's "information lines", e.g., concert information, ski report, etc. It holds up to 4 minutes of audio in digital memory. There are no tapes to break or carts to jam! Battery backup saves your message even during a power failure. The caller always hears the message from the beginning... with no wasted re-cue time! Record your message from a mic, or connect to a tape deck or your studio. Easy to use... the ultimate in reliability. In Stock.

Henry Engineering
 (818) 355-3656 FAX (818) 355-0077
We Build Solutions.

Circle (87) On Reader Service Card

**Air Cooled
 Dummy Loads
 now in power
 ratings of
 5kW, 10kW,
 15kW, 25kW,
 35kW, 50kW,
 and 75kW
 with low VSWR
 that is stable
 under power
 with a
 frequency range
 of 60hz to
 240Mhz.**

**QUIET
 COMPACT
 PORTABLE**



**ALTRONIC
 RESEARCH
 INC.**

For (OMEGALINE) RF
 Coaxial Load Resistors

WATER AND AIR COOLED
 MODELS FROM 5 to 200KW

CALL TOLL FREE
 1-800-482-LOAD

P.O. Box 249
 Yellville, AR 72687
 (501)449-4093

Circle (2) On Reader Service Card

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 even-

tually 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



...because you can't always trust your ears.

The Sentinel is a Station Monitor Receiver with all-mode reception: NRSC AM/AM-Stereo, FM/FMX™-Stereo and SCA. But what's more important, The Sentinel has built-in diagnostics that measure and display 12 separate parameters of the program audio signal.

With 24 station presets and well-defined readouts, even non-technical personnel can instantly compare their audio with anyone else on the dial for Peak Modulation, Relative Loudness, Dynamic Range, Spectral Profile and Stereo Image.

The Sentinel: see what your ears have been missing!

Inovonics Audio Recording,
Signal Processing and Instrumentation
1305 Fair Ave., Santa Cruz, CA 95060—CALL (408) 458-0552 FAX 458-0554

Circle (51) On Reader Service Card

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

Successful completion earns you a cer-

the Greenville, N.C., transmitting site, VOA's instructors develop both general electronics and product-specific educa-

minister the assessment, education and qualification programs at that site.

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-

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

tificate 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.

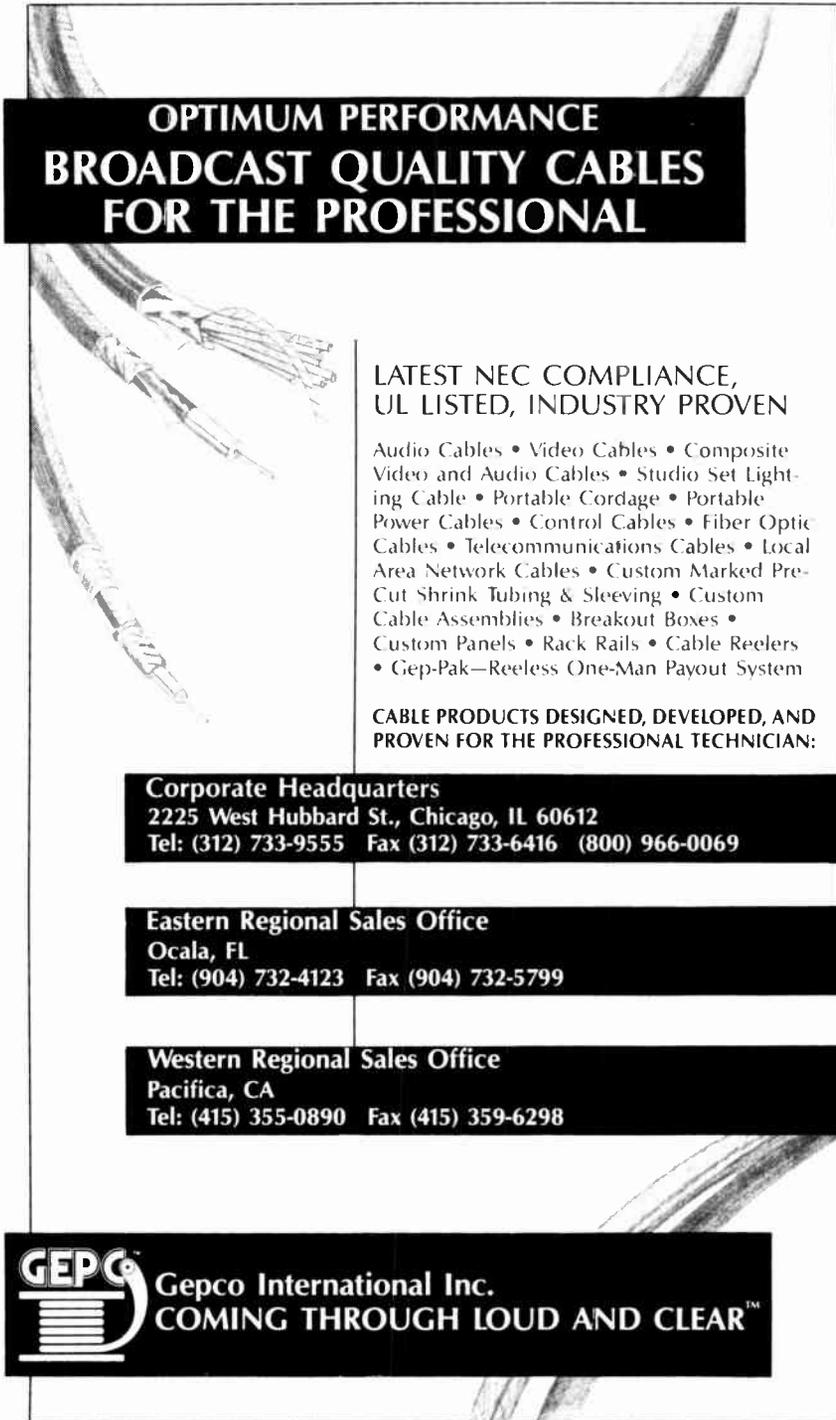
The four-day AM and FM transmitter workshops take participants from the operator level through RF systems. At a more advanced level, Harris offers three week-long courses: RF Circuits I, II and Solid State RF Devices and Control Logic. Among the topics presented are power measurements, neutralization,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

tion packages that are delivered at relay stations around the world. Each relay station has its own training officer to ad-



**OPTIMUM PERFORMANCE
BROADCAST QUALITY CABLES
FOR THE PROFESSIONAL**

**LATEST NEC COMPLIANCE,
UL LISTED, INDUSTRY PROVEN**

Audio Cables • Video Cables • Composite Video and Audio Cables • Studio Set Lighting Cable • Portable Cordage • Portable Power Cables • Control Cables • Fiber Optic Cables • Telecommunications Cables • Local Area Network Cables • Custom Marked Pre-Cut Shrink Tubing & Sleeving • Custom Cable Assemblies • Breakout Boxes • Custom Panels • Rack Rails • Cable Reelers • Gep-Pak—Reeless One-Man Payout System

CABLE PRODUCTS DESIGNED, DEVELOPED, AND PROVEN FOR THE PROFESSIONAL TECHNICIAN:

Corporate Headquarters
2225 West Hubbard St., Chicago, IL 60612
Tel: (312) 733-9555 Fax (312) 733-6416 (800) 966-0069

Eastern Regional Sales Office
Ocala, FL
Tel: (904) 732-4123 Fax (904) 732-5799

Western Regional Sales Office
Pacifica, CA
Tel: (415) 355-0890 Fax (415) 359-6298



Gepco International Inc.
COMING THROUGH LOUD AND CLEAR™

Circle (12) On Reader Service Card

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

The old mentoring system is no longer in place.

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.

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.

FM & TV RF Transmission Products

We manufacture solutions for your RF component requirements

- Hybrids/Combiners
- Directional couplers
- Power dividers
- Coaxial line
- Filters
- Constant impedance or branched transmitter combiners
- FM & TV duplexers
- Dummy loads
- Harmonic filters
- Bandpass filters
- Notch filters
- Antennas
- Waveguide
- Transitions
- Impedance matchers
- Coaxial switches
- Power couplers

Expert Field Engineering Services

Call, write or circle our Reader Service number for further information on complete RF systems

-RFT- RF TECHNOLOGIES CORPORATION

238 Goddard Road • Lewiston, ME 04240
1-800-634-4075 207-777-7778 FAX: 207-777-7784

Circle (105) On Reader Service Card

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 de-icer, 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.

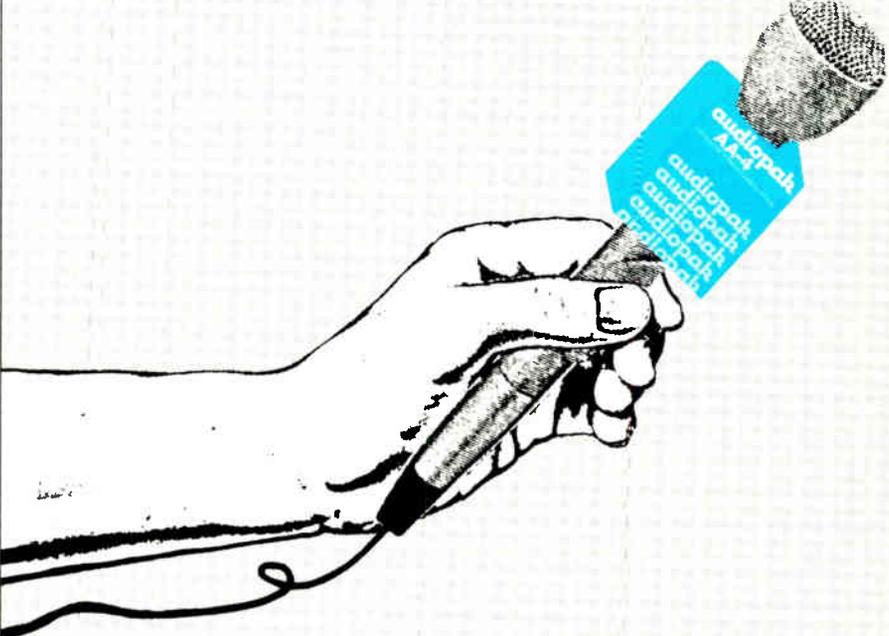
Speaking of exciters, for those engineers without a backup FM, you may want to consider investing in a motorized coaxial transfer switch, or at the very least, a manual patch panel. Such an arrangement will permit the exciter to be wired through the switch.

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

TRUE BLUE

FOR THE NEWS.



For top reliability, put your news cuts on the cart more stations count on.

audiopak

BROADCAST CARTRIDGES

P.O. Box 3100 • Winchester, VA 22601
Tel: (800) 522-CART or (703) 667-8125
Fax: (703) 667-6379

Circle (33) On Reader Service Card

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,



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.

get out the auto paste wax and give the dish a good waxing—snow will slide right out.

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 in-

put 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.

QEI QEI QEI QEI QEI

WHY QEI?

Built-in Backup.



QEI's constant 50 Ohm interstage impedance lets you bypass the IPA or PA in the unlikely event of a problem.

For over 20 years, QEI has been the American value leader in FM transmitters, modulation monitors, exciters, stereo generators and more. Call or write for full details. Dealer inquiries welcome.

QEI CORPORATION
ONE AIRPORT DRIVE • P.O. BOX 805
WILLIAMSTOWN, N.J. 08094 U.S.A.
(609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (46) On Reader Service Card

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.

Perfect Fit.

★ MYAT PRODUCTS FIT YOUR APPLICATION.

Our new 40th anniversary catalog has the widest selection of radio and TV hard line and components ever to wear the bright blue MYAT logo. It also has technical specifications and a complete engineering section to help you locate an

emergency repair item— or completely outfit a new tower. There's seldom a wait for delivery, either, because virtually every item listed is in stock for immediate shipment.

★ MYAT QUALITY FITS YOUR REQUIREMENTS.

We've been perfecting MYAT rigid RF transmission line and components for four decades. Today, computer-assisted design/computer-assisted manufacturing is just one of

the advanced techniques we use to turn pure brass, copper and aluminum and other high-quality materials into finished components of unprecedented precision and consistency.

★ MYAT DURABILITY— FIT FOR LONG LIFE.

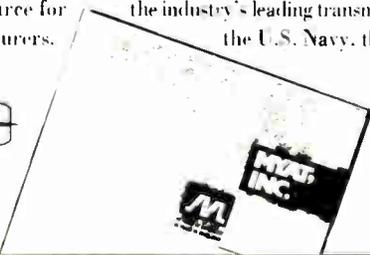
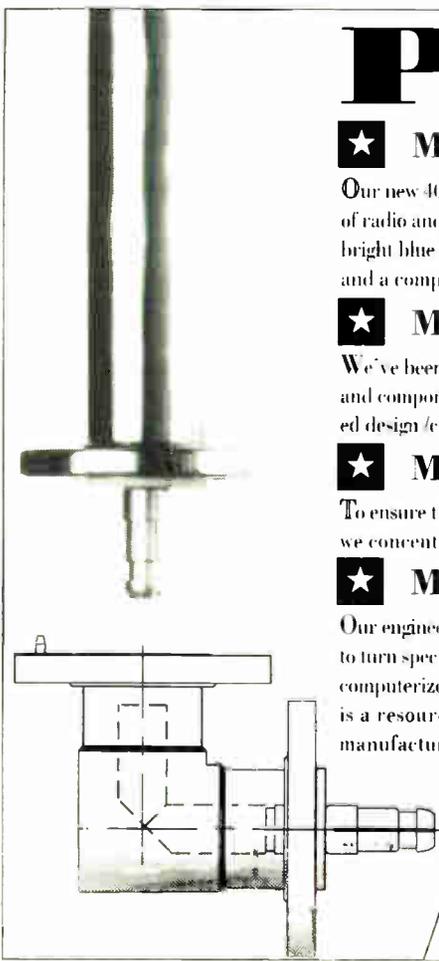
To ensure the highest standards of longevity and reliability, we concentrate on details like non-galling silver-plated

beryllium copper contact springs, brass elbow reinforcements and rigid, pure virgin Teflon supports.

★ MYAT SERVICE FITS YOUR NEEDS.

Our engineering staff is always ready to provide advice—or to turn special requirements into "routine" projects with our computerized design and testing facilities. MYAT expertise is a resource for manufacturers, the industry's leading transmitter the U.S. Navy, the

newest TV tenants in New York City's Empire State Building, and broadcasters all over the world. Contact us for your copy of the new MYAT catalog, and let us deliver for you. Just phone 201-767-5380 or fax 201-767-4147.



**40 Years of Experience.
40 Years of Excellence.**

380 Chestnut Street
P.O. Box 425
Norwood, NJ 07648
Tel 201-767-5380
Fax 201-767-4147

Circle (122) On Reader Service Card



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 buy out" basis. There are NO additional monthly or yearly fees.



1289 E. Alosta Avenue • Glendora, CA 91740
Tel (818) 963-6300 • Fax (818) 963-2870

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 inaccessible 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. ▶

HURRY UP

TELESCOPING MAST
for fast and easy deployment
of lightweight antennas

- Manually deployed with quick lock/release collars in one minute or less
- 25' extended height
- 6' retracted height
- 20 lb. top load capacity
- Rigid azimuth locking
- Over 50 mph wind speed capacity
- Free standing
- Universal vehicle mounting stand included
- Portable - 20 lbs.
- High strength anodized aluminum construction
- Ideal for lightweight antennas
- Designed and built by the leading manufacturer of pneumatic telescoping masts.

W3
WILL BURT

P. O. Box 900
Orrville, Ohio 44667-0900
Phone 216-682-7015
FAX 216-684-1190

Circle (116) On Reader Service Card

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.

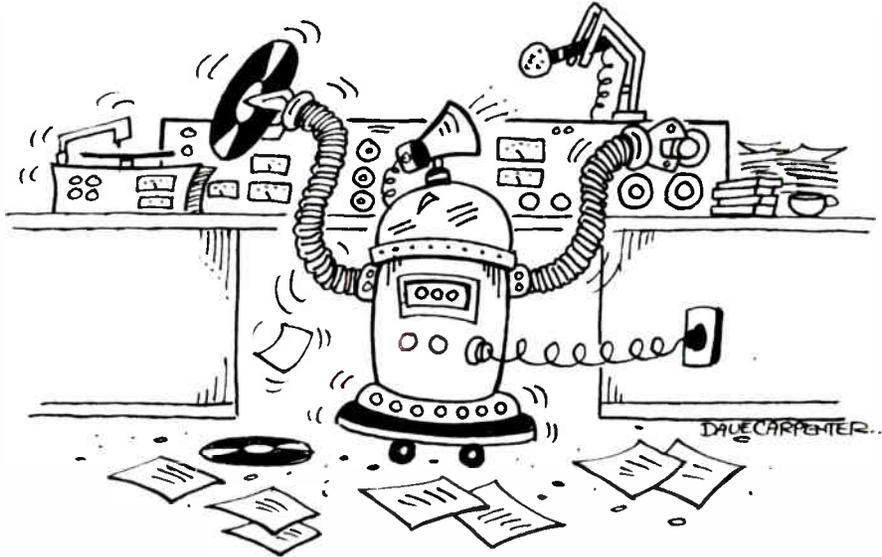
24-hour service—Given 14 hours, we can usually find a second person to ignore your problem.

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

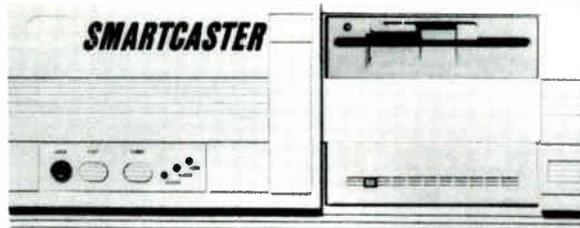
The origin of the previous guide apparently rests with Sequoia Electronics in Los Gatos, Calif., though no individual can be pin-pointed with the blame. For information, you may call the company at 408-356-3232.

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

World Radio History

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.

Your Problem Solvers

from **ATI**

- Mike
- Line
- Phono
- Mixing
- Matching
- Metering
- Monitoring
- Processing
- Distribution
- Rack Mounting



AUDIO TECHNOLOGIES, INC.

328 W. Maple Ave., Horsham, PA 19044 • (215) 443-0330 • FAX (215) 443-0394



Circle (84) On Reader Service Card

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 over-modulate 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.

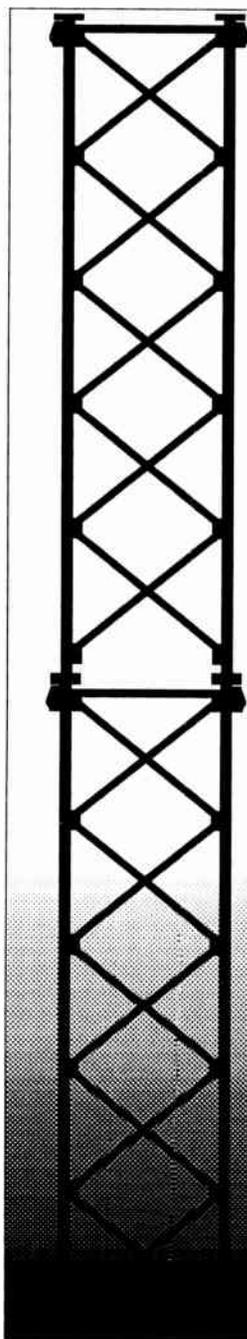
Rack mount: A rack or cabinet of stan-

dard 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.



WHAT'S NEW?

We Are!

Always the leader in Quality...
 Always the leader in Engineering
 Always the leader in Galvanizing and Warranty

and now...

The New Leader In Affordable Pricing!
for towers and equipment shelters direct to the end user on turnkey installations

Including the ROHN 20 year warranty!

ROHN®
 Division of UNR Industries, Inc.
 6718 W. Plank Road, P. O. Box 2000
 Peoria, Illinois 61656 USA
 Phone: 309-697-4400 FAX: 309-697-5612

43 years of service to broadcasters

Circle (113) On Reader Service Card

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.

QEI QEI QEI QEI QEI

W H Y Q E I ?

Power Up.



With our FMQ 3.5/5/10kW or 20/30 kW FM transmitters, you can upgrade power in the field.

For over 20 years, QEI has been the American value leader in FM transmitters, modulation monitors, exciters, stereo generators and more.

Call or write for full details. Dealer opportunities available in selected countries.

QEI CORPORATION

ONE AIRPORT DRIVE • P.O. BOX 805
WILLIAMSTOWN, N.J. 08094 U.S.A.
(609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (147) On Reader Service Card

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.

*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.

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.

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

World Radio History

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.

**With the whole world
turning to Stereo . . .**



**Why in the world
broadcast in AM Mono?**

Modernize with C-QUAM® AM Stereo!

Face it. We live in a stereo world. And you join a family of winners when you choose C-QUAM AM Stereo. You'll find . . .

- Over 800 C-QUAM AM stations around the globe
- Over 20 Million C-QUAM decoder IC's shipped to receiver manufacturers
- 4 countries to date with a C-QUAM AM Stereo standard
- IC technology, broadcast equipment, receiver design, international seminars and technical/marketing support . . . from studio to listener, Motorola is totally committed to AM Stereo!

For details on the Motorola C-QUAM Stereo system, call Don Wilson collect at 708/576-0554. Fax 708/576-5479.



MOTOROLA
C-QUAM® SETTING THE INDUSTRY STANDARD

C-QUAM® IS A REGISTERED TRADEMARK OF MOTOROLA INC.

Circle (17) On Reader Service Card

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

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.

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.

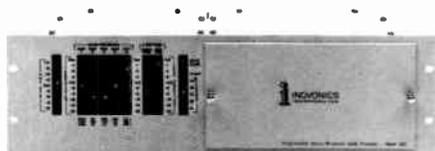
Frank Kramer, VP of engineering for Viacom's radio division, said the recession has "definitely impacted us—we're

(continued on page 53)

iNOVONICS . . . an industry leader in broadcast audio since 1972!

Since 1972, Inovonics has provided disarmingly affordable, top-quality equipment to broadcast and audio professionals worldwide. Our dedication to innovative, leading-edge technologies is demonstrated in the 1982 introduction of programmable audio processing, extensive use of pulse modulation and other digital techniques, and our pioneering work with the FMX™ system.

Now in our 20th year, Inovonics reaffirms its commitment to cost-effective excellence in professional audio.



250—Programmable Stereo Processor for AM, FM and TV. AGC, 5-band Compressor/EQ, Split-band FM or Matrix AM Peak Control. Five separate processing setups, or may be computer-controlled.

255—Triband/PWM Stereo Processor for aggressive FM-Rock formats. AGC, 3-band Compressor/Limiter.

260—Multifunction Stereo Processor for FM and TV. AGC and Split-band Compressor/Limiter.



222—"NRSC" Mono Processor for AM to increase intelligibility and coverage. Exceeds NRSC-1 spec. Also available in European and Shortwave versions.



705 and 706—Stereo Generators with patented overshoot compensation and overmodulation protection. CBS/NAB FMX™ Coverage-Extension System available as a plug-in option.



"TVU"—Puts VU/PPM Audio Level Monitoring on a video monitor where it can't be missed!

Inovonics Inc.

1305 Fair Avenue
Santa Cruz, CA 95060

CALL: (408) 458-0552
FAX: (408) 458-0554



Circle (93) On Reader Service Card

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 sing-along 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



Calling AP12-8C3, Chief Engineer

by Judith Gross

Photography Courtesy of Smithsonian Institute

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 sur-

face 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

World Radio History

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

. . . the cultural, political, social,
and religious pulse of the nation
And the world . . .

RADIO! The beat goes on!

**CROUSE-KIMZEY
OF ANNAPOLIS**

tops in broadcast equipment

1-800-955-6800

ask for Kathleen

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

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

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.

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 sta-

tion'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

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

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

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.

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 home-job 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

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.

The Complete RF Exposure Measurement System from Holaday Industries

<p>Measure Both E and H fields ANSI RF exposure standard requires measurement of both the electric and magnetic field.</p> <p>Automatic Self-zero Completely automatic self-zeroing eliminates drift, improves accuracy of readings.</p> <p>Recognized by Federal Agencies Evaluated and used by NIOSH, OSHA, EPA and CORH, as well as state, local health departments and consulting engineers.</p> <p><i>Call or write for more information on these reasonably priced systems. Rental systems also available.</i></p>	<p>NBS Probe Design Isotropic probe design originated by National Bureau of Standards.</p> <p>Displays Time Average Reading Real-Time display of the current six minute relates directly to the ANSI RF average exposure standard.</p>
---	--



HOLADAY INDUSTRIES, INC.
14825 Martin Drive
Eden Prairie, MN 55344
Telephone: (612) 934-4920
Telex: 29-0922 FAX 612/934-3604



HI-5000-BX

Circle (81) On Reader Service Card

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

QEI QEI QEI QEI QEI

WHY QEI?

No Extras.



We never charge you extra for single phase power. Not on our FMQ 10000 or our FMQ 20000B—not even on our 30 kW FMQ 30000B.

For over 20 years, QEI has been the American value leader in FM transmitters, modulation monitors, exciters, stereo generators and more. Call or write for full details. Dealer inquiries welcome.

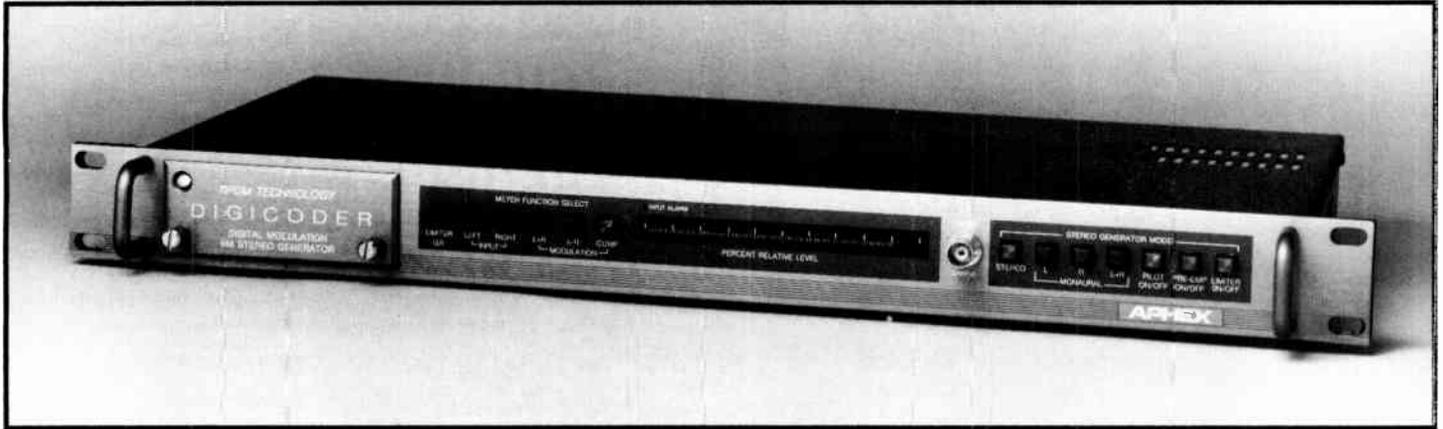
QEI CORPORATION
ONE AIRPORT DRIVE • P.O. BOX 805
WILLIAMSTOWN, N.J. 08094 U.S.A.
(609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (36) On Reader Service Card

The Aphex Stereo Generator ... A Leap Beyond Digital

On Air
Around the
World!



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 unequalled 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 C 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—Ormikron S.A.; HONG KONG—Ace Co. Ltd.; HUNGARY—ATEC; INDONESIA—David Sutedja & Assoc.; ISRAEL—Sontronic; 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

© Aphex Systems

Circle (56) On Reader Service Card

World Radio History

Chapter 62—Utah

Chuck Condon
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
WLTJ
28411 Northwestern Hwy.
Southfield, Mich. 48034
313-354-9300

Chapter 84—Winston-Salem

Ed Kasovic
3439 Hunting Creek Drive
Pfaftown, 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 Brcdst, #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



THE MIC

MC

Find Out Why

+4Audio

508-745-8522

P.O. Box 566, Salem, MA 01970

Circle (131) On Reader Service Card

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

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

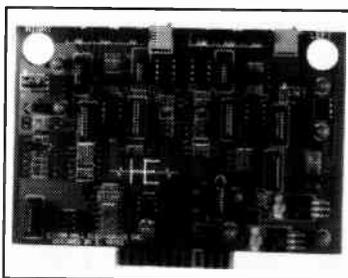
NAB Department Listings

- 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

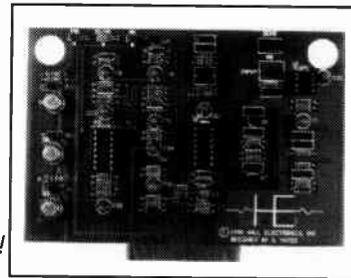
Relationship Between System Reliability and Outage Time

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

ITC Replacement Cards for Premium Line Machines



◀ Audio replacement board. Improve reliability and get specs. equal to today's best cart equipment



▶ Que detector replacement card. Add 3 tones to existing machines economically. Improve reliability too! One tone version available

Also Available:

- ☆ ITC replacement power supply capacitor cards.
- ☆ Original equipment tape heads for ITC and most other cart machines at great prices!
- ☆ Audio Dynamics ITC Delta replacement carts.

THE SMART CHOICE!

HE HALL Electronics

1305-F Seminole Trail
Charlottesville, VA. 22901
(804) 974-6466

Mastercard & Visa Welcome

Circle (152) On Reader Service Card

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. Delores Browder	632-7116	• Radio Broadcasting	632-6485	Annual Report Form (CC)	632-7084	• General Mobile (PRB)	(717) 337-1511
Confidential Asst. Elaine Lorentz	632-6600	Senior Advisor Robert Branson	632-7116	• Emergency Broadcast System	632-3906	Annual Employment Report (CCB)	632-0745	• Industrial (PRB)	(717) 337-1511
Chief of Staff Terry Hanes	632-6600	Legal Advisor Byron Marchant	632-7116	• National Public Safety	632-7060	Antennas & Towers (FOB)	632-7521	• Land Transportation (PRB)	(717) 337-1511
Senior Advisor Kenneth Robinson	632-6600	Legal Advisor Madejon Kuchera	632-7116	Alien Restricted Permits (FOB)	632-7240	Application Status		• Equipment Authorization RF Devices only:	
Legal Advisor Cheryl Tritt	632-6600			Allocation		• Amateur (PRB)	(717) 337-1212	• 24 Hour computer access	(301) 725-1072
Legal Advisor Lauren Belvin	632-6600	Commissioner Ervin Duggan	632-6996			• Aviation (PRB)		• Non-computer access	(301) 725-1585
		Confidential Asst. Linda Botbyl	632-6996	• Broadcast	634-6530	• Aircraft	(717) 337-1212	• Offshore Radio Service (CCB)	653-5560
Commissioner James Quello	632-7557	Senior Legal Advisor Leonard Kennedy	632-6996	• Call Signs	634-1923	• Aviation Ground	(717) 337-1511	• Rural Radio Service (CCB)	653-5560
Confidential Asst. Ginger Clark	632-7557	Legal Advisor Michele Farquhar	632-6996	• Call Sign Block	653-8126	• Business (PRB)	(717) 337-1511	• Microwave (Industrial) (PRB)	(717) 337-1421
Senior Advisor William Harris	632-7557	Legal Advisor Linda Oliver	632-6996	• Call Sign Policy	653-8126	• Cellular	632-6400	• Public Safety (PRB)	(717) 337-1511
Legal Advisor Robert Corn-Revere	632-7557			• Charts and Tables (OET)	653-8108	• Commercial Operator (FOB)	632-7240	• Radio, TV. & Aux. Serv (MM)	634-6307
Special Advisor Brian Fontes	632-7557	Inspector General James Warwick	632-0471	• Government (OET)	653-8108	• Common Carrier	634-1800	Assignment of Microwave Common Carrier Licenses (CCB)	634-1706
				• Non-Government (OET)	653-8141	• Domestic Satellite	634-1624	Auctions (OPP)	653-5940
Commissioner Sherne Marshall	632-6446	Access Charge (CCB)		• International (OET)	653-8108	• Mobile Services (CCB)	254-6810	Automobile Emergency (PRB)	(717) 337-1212
Confidential Asst. Patricia Hunter	632-6446	• Rules and Policies	632-9342	• Amateur Licenses (PRB)	(717) 337-1212	• Microwave (CCB)	634-1706	Bills (Legislative) (OLA)	632-6405
Senior Advisor Stevenson Kammer	632-6446	• Tariff	632-6387			• Multichannel Service (CCB)	634-1706	Broadcast, Inspection of Stations (FOB)	632-7014
Legal Advisor Diane Cornell	632-6446	Accounting systems (CC)	634-1861			• International (CCB)	632-7265	Broadcast Services--(MMB)	
Legal Advisor Peter Ross	632-6446	Advisory Committees				• Experiment (OET)	653-8146	• AM Service	
Commissioner Andrew Barrett	632-7116							• Engineering Rules	

JOHN M. STORYK

ARCHITECTURAL & ACOUSTICAL DESIGN

TEC
1990 WINNER

TEC
1991 WINNER



PLATINUM POST • ORLANDO, FL

A DIVISION OF
WALTERS-STORYK DESIGN GROUP, INC.

We are proud
to announce the formation of our
Installation Division

- * Acoustic Wall Treatments
- * Turnkey Design-Build Capability
- * Soundproof Doors and Windows
- * Studio and Technical Furniture

- Construction Management as well as Contract Bidding for all media facility installations
- * radio recording
- * video production
- * broadcast performance

Please contact Beth Walters or John Storyk to discuss your specific design or installation.
914-255-2255

Radio World's International Edition reaches 20,000 radio broadcasters around the world.

For information on advertising call 1-703-998-7600 or fax: 1-703-998-2966

- 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, RPU's, 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 Reports 632-7069
- 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, RPU's, 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

Circle (39) On Reader Service Card

• Microwave		• Attach to Telephone (CCB)	634-1833	• Personal & Amateur	632-7197	• Government (OET)	653-8147	• Interference (OET)	653-8126
• Legal	632-7480	Customer Toll Dialing (CCB)	632-7553	Requests for Enforcements		• Non-Government (OET)	653-8108	Interlocking Directors (CCB)	632-4887
• Engineering	254-3420	Depreciation Rules (CCB)	632-7500	• Washington, DC Area (FOB)	(301) 962-2727	• Allocation Treaties (OET)	653-8144	• Permits to Operate in Canada	653-8126
• Pole Attachments (CCB)	632-4890	Development Stations		• All other areas—Refer to local field office (FOB)		• International (OET)	653-8126	• Radio Publications (OET)	653-8126
• Policy		• Aviation or Marine (PRB)	(717) 337-1431	Engineering Surveys (OET)	632-7080	• Lists		• Satellite Systems Coordination	653-8153
• Access	632-7480	• Common Carrier (CCB)	634-1706	Environmental Law (NEPA)(OGC)	632-6990	• Government (OET)	653-8147	• Telecommunications Union (OET)	653-8126
• Public Reference Room	632-7076	• Experimental (OET)	653-6288	Equipment Measurement (OET)	(301) 725-1585	• Non-Government (OET)	653-8108	• Telegraph & Telephone Rates (CCB)	632-5550
• Special Relief	632-7480	• Dial-a-Porn Complaints	632-7553	Examinations—(FOB)		• Notification and Registration (OET)	653-8126	• Treaties & Agreements (OET)	653-8144
• Technical Standards & Rules	254-3420	Dialthermy Approval (OET)	(301) 725-1585	• Washington, DC Area	(301) 926-2727	• Usage Data & Utilization (OET)	653-8108	Investigations—	
Cablegrams (CCB)	632-7265	Digital Terminations Systems (DTS)	634-1706	• Outside Washington, DC	632-7240	General Counsel (OGC)	632-7020	• Unlicensed Operations	
Call Letters (Signs—)		Digital Electronic Message Svc	634-1706	Ex Parte Rules (OGC)	632-6990	General Mobile Radio (PRB)	(717) 337-1212	• Washington, DC Area (FOB)	(301) 962-2727
• Private Radio Services	(717) 337-1212	Direct Broadcasting Satellites	632-9356	Facsimile—Wire (CCB)	634-1800	Harrasing Telephone Calls (CCB)	632-7553	• All other areas refer to local field office (FOB)	
• Broadcast	634-1923	Direct Distance Dialing (CCB)	632-5550	Fairness Doctrine	632-7586	Hearing Calendar (OLJ)	632-7680	• Interference	
Campus Radio Stations (OET)	653-6288	Domestic Public (CCB)		FCC Rules (Interpretations) (OGC)	632-6990	Incidental Radiation (Rules) (OET)	653-6288	• Washington, DC Area (FOB)	(301) 962-2727
Carrier Equipment (CCB)	634-1800	• Auxiliary Test and Repeater Stations	653-5560	Fee Information	632-FEES	Infraction Reports—International (OET)	653-8138	• All other areas refer to local field office (FOB)	
Cases in Court (OGC)	632-7112	• Cellular Radio	632-6400	Field Disturbance (Pt.15)	653-6285	Information—General (OPA)	632-7000	• Interference	
Cellular Mobile Radio	632-6400	• Land Mobile Radio Service	653-5560	Field Offices		Infraction Reports—International (OET)	653-8138	• Washington, DC Area (FOB)	(301) 962-2727
Cellular (Recorded Message)	653-5858	• Microwave	634-1706	• Common Carrier (CCB)	634-1861	Injunctions (OGC)	632-7112	• All other areas refer to local field office (FOB)	
Certification of RF Gear (OET)	653-6288	• Rural Radio	653-5560	• Field Public Service Staff	634-1940	Inspections (FOB)	632-7014	Ionosphere (OET)	653-8166
Civil Air Patrol (PRB)		Duplication Contractor (ITS)—		• Fire (PRB)	(717) 337-1212	Interception of Radio Comms (OGC)	632-6990	IRAC (Interdepartment RAC) (OET)	632-7025
• Applications/Licenses	(717) 337-1212	• Washington, DC	9-857-3800	Foreign Attachments—		Interference Complaints		Land Mobile—	
• Rules	632-7175	• Gettysburg, PA	(717) 337-1433	• Telephone (CCB)	634-1833	• Washington, DC Area (FOB)	(301) 962-2727	• Common Carrier (CCB)	653-5560
Coast Stations (PRB)		Eavesdropping (Electronic) (OGC)	632-6990	• Interconnection (CCB)	634-1800	• All Other Areas (Refer to Local Field Office)		• Requests for Monitoring (FOB)	632-6975
• Applications/Licenses	(717) 337-1212	Electronic Switching (Telephone) (CCB)	634-1800	Forfeitures/Fines		International Conferences (Future)	653-8126	• Other than CC (PRB)	(717) 337-1212
• Rules/Hearings	632-7175	Emergency Broadcasting System (EBS)	632-3906	• Mobile Services (Includes CB)	632-7197	Conference (past)	632-7025	• Public Safety	(717) 337-1212
Commercial Operators—(FOB)		Employment Verification	632-6234	• Collection of (OGC)	632-6444	WARC (OET)	632-7025	• Special Emergency	(717) 337-1212
• Examinations (DC Area)	(301) 962-2729	Enforcement—Common Carrier Bureau	632-4887	Forms Distribution—		• Conferences and Meetings (OET)	632-7025	• Business	(717) 337-1212
• Examinations (Other Areas)	632-7240	Enforcement—Private Radio Bureau Forfeitures Show		By form number only	632-7272	• Frequency Allocations (OET)	632-7025	• Other Industrial	(717) 337-1212
• All other matters	632-7240	Cause Orders Revocations, Suspensions	632-7197	General form request	632-7000	• Frequency Allocation Tables (OET)	632-7025	• Land Transportation	(717) 337-1212
Commission Proceedings	632-7000	• Land Mobile (PRB)	632-7125	Freedom of Information (OGC)	632-6990	• Frequency Coordination (OET)	653-8126	Land Transportation (PRB)	(717) 337-1212
Common Carrier Radio (CCB)		• Aviation & Marine	632-7197	Frequencies Allocations—		• Frequency Lists (OET)	653-8126		
• 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)	653-812E								
CCITT (CCB)	632-3214								
Conflict of Interest (OGC)	632-6990								
Congressional Liaison (OLA)	632-636E								
Consumer Assistance/Small Business	632-7000								
Control Devices (non-licensed) (OET)	653-628E								
Copy Contractor	857-3800								
Cordless Telephone (Pt. 15) (OET)	653-628E								
Court Cases (OGC)	632-7112								
Customer Owned Equipment—									

Value & Economy for Tough Economic Times

- ☆ Rebuilt & New equipment at 'bottom line' prices
- ☆ Replacement electronics & update kits for ITC, Harris, Autogram & other brands
- ☆ Full rebuild & repair service for ITC, BE and other popular cart & reel equipment.
- ☆ Tacsam and Otari factory authorized service center
- ☆ Tape heads, transformers, RF & other engineering supplies

THE SMART CHOICE!

THE HALL Electronics 1305-F Seminole Trail
Charlottesville, VA. 22901
(804) 974-6466

Mastercard & Visa Welcome

Circle (9) On Reader Service Card

Law Suits Litigation (OGC)	632-7112	Metered Service (CCB)	632-7553	• U.S. Citizens—DC	(301) 962-2729	Real Property (FOB Field Installations)	632-7593	Tort Claims (Legal) (OGC)	632-6990
Law, General (OGC)	632-6990	Microwave—		• U.S. Citizens—All Other Areas	632-7240	Recording Phone Conversations (CCB)	632-7553	Towers—Painting and Lighting of (FOB)	632-7521
Leased Facilities (CCB)	632-7553	• Auxiliary—Common Carrier (CCB)	634-1706	• Aliens—All Areas	632-7240	Records Management (OMD)	634-1535	Towing (PRB)	(717) 337-1212
Library (FCC) (OMD)	632-7100	• Auxiliary—Mass Media (MM)	634-6307	• Oral Arguments (OMD)	632-7535	Reduction of Carrier Service (CCB)	632-7553	Transfers—	
License		• Closed Loop (CCB)	634-1706	• Original Plant Cost (Telephone) (CCB)	632-3772	Relay—Microwave (CCB)	634-1706	• Microwave License (CCB)	634-1706
• Amateur (PRB)	(717) 337-1212	• Data Base (OET)	653-8163	• Paging—Common Carrier (CCB)	653-5560	Relay Press (PRB)	(717) 337-1212	Transit Systems (PRB)	(717) 337-1212
• Business (PRB)	(717) 337-1212	• Digital Electronic Message (CCB)	634-1706	• Paging—One-way (PRB)	(717) 337-1212	Religious Petition (RM 2493)	632-7000	Transportation—Land (PRB)	(717) 337-1212
• Commercial Operator (FOB)	632-7240	• Multipoint Distribution (MDS) (CCB)	634-1706	• Personnel—Employment (OMD)	632-7106	Repair and Calibration	(301) 725-1585	Treaties—	
• Domestic Satellite	634-1624	• Ovens (OET) (Pt. 18)	653-6288	• Physicians Radio—Private (PRB)	(717) 337-1212	Rescue Squads (PRB)	(717) 337-1212	• Administration Interpretation (OGC)	632-6990
• Mobile Services (CCB)	632-6400	• Radio Relay (CCB)	634-1706	• Point-to-Point Microwave—		Restricted Radiation Devices (OET)	653-6288	• Frequency Allocation (OET)	653-8126
• Cellular	632-6400	• General/Operational	632-6497	• Common Carrier (CCB)	634-1706	Retirements (Telephone Plants) (CCB)	634-1861	Treaty Library (OET)	653-8126
• Microwave (CCB)	634-1706	• Military Stations (OET)	653-8141	• Private (PRB)	(717) 337-1212	Rules and Regulations—		Troposphere (OET)	632-7025
• Wire or Cables (Auth. or Cert.) (CCB)	634-1800	• Mobile Telephone Services (CCB)	653-5560	• Pole Attachments (CCB)	632-4890	• Aviation and Marine	632-7175	• Interference (D.C. Area) (FOB)	(301) 962-2729
Internat'l & Satellite (CCB)	632-7265	• Mobilization Planning (OET)	632-7025	• Political Broadcasting	632-7586	• Business	634-2443	• All other areas—Refer to Local Field Office	
• Experimental (OET)	653-8146	• Monitoring (FOB)	632-6975	• Power (Electric, Gas, Water) (PRB)	(717) 337-1212	• Other, Industrial	634-2443	• Military (OET)	653-8141
• General Mobile (PRB)	(717) 337-1212	• Monitoring Stations (FOB)	632-7593	• Press Relations (OPA)	632-5050	• Land Transportation	634-2443	• Pickup (Common Carrier) (CCB)	634-1706
• Industrial (PRB)	(717) 337-1212	• Monitoring Telephone Svc. (CCB)	632-5550	• Press (Relay)(PRB)	(717) 337-1212	Subject		Type Acceptance (OET)	(301) 725-1585
• Land Transportation (PRB)	(717) 337-1212	• Motor Carrier (PRB)	(717) 337-1212	• Privacy Act—Procedures (OGC)	632-6990	• Microwave (PRB)	634-2443	Type Approval (OET)	(301) 725-1585
• Manne (PRB)	(717) 337-1212	• Multipoint Distribution	634-1706	• Private Carrier Comms (PRB)	(717) 337-1212	• Personal and Amateur	632-4964	Ultrasomics Equipment (OET)	653-8247
• Microwave (Industrial) (PRB)	(717) 337-1421	• National Environmental Policy (OGC)	632-6990	• Private Operational Fixed Services (PRB)		• Public Safety	634-2443	Unlicensed Operators—	
• Operators Licenses (FOB)	632-7240	• Navigation (Air or Water) (PRB)	632-7175	• Microwave Applications		• Rules—Ship Earth Station	632-7175	• Investigation of (FOB)	632-6345
• Public Safety (PRB)	(717) 337-1212	• News Gathering/Publishing (PRB)	(717) 337-1212	• Technical Questions	(717) 337-1212	• Interpretation of (Gen.) (OGC)	632-6990	Administrative Sanctions (FOB)	632-7240
• Radio (See Broadcast Services)		• Noise—Radio (OET)	632-7025	• Status of	(717) 337-1212	Rural Radio (CCB)	653-5560	Violations Records	
Lighting devices (RF) (Pt. 18) (OET)	653-6288	• Obstruction Markings—Antenna (FOB)	632-7521	• Private Wire Systems (CCB)	634-1800	Safety—Sea (PRB)	632-7175	• FOB Violation Records (FOB)	632-7278
Local Government Radio (PRB)	(717) 337-1212	• Offshore Radio Service (CCB)	653-5560	• Procurement (OMD)	634-1528	Safety Manager (OMD)	632-7541	Walkie-Talkies (OET)	653-6288
Manufacturing (PRB)	(717) 337-1212	• Off-the-Air Pickup (CCB)	634-1706	• Propagation—Radio Waves (OET)	632-7025	Sampling and Measurements	(301) 725-1585	Watch Officer (Monitoring) (FOB)	632-6975
Marine Services (PRB)		• One-Way Paging and Signaling (CCB)	653-5560	• Property—Common Carrier (CCB)	634-1861	Satellite—Sanction (FOB)		Wire Facilities (CCB)	634-1800
• Applications/Licenses	(717) 337-1212	• Operating Revenues—		• Public Affairs, Office of	632-5050	• International Facilities (CCB)	632-7265	Wireless Microphones—	
• Rules/Hearings	632-7175	• Int'l., Telephone & Telegraph (CCB)	632-7084	Public Information—		• Domestic Facilities (CCB)	634-1624	• Non-licensed (OET)	653-6288
MD's Licensing	634-1706	Operator Licenses (FOB)—		• Consumer Assistance	632-7260/632-7000	• International Coordination	653-8144	• Licensed (PRB)	(717) 337-1212
Measurement for		• Commercial		• Legislation	632-6405	• Maritime (PRB)	632-7175	• Licensed (MMB)	632-7505
• Type Acceptance	(301) 725-1585	• Administration & Suspension of	632-7240	• Press & News Media	632-5050	• Rates (CCB)	632-5550	• Licensed (PRB)	632-6990
• Type Approval	(301) 725-1585	• Examinations (1st, 2nd & 3rd Class)		• Public Reference Rooms—		• Systems (CCB)	634-1624	Wiretapping (OGC)	632-6990
• Certification	(301) 725-1585	• Washington, DC Area	(301) 962-2728	• Carrier Reports (CCB)	632-7084	• Spread Spectrum (OET)	653-8163	Yellow Page Advertising (CCB)	632-7553
• Notification	(301) 725-1585	Subject		• Carrier Tariffs (CCB)	632-5550	• Coordination and Interference (OET)	653-8153		
• Verification	(301) 725-1585	• All Other Areas	632-7240	• Public Safety (PRB)	(717) 337-1212	Search & Rescue (FOB)	632-6975		
• Registration (Part 68)	634-1833	• License Records (Commercial)	632-7240	Radar—		Security Officer (OMD)	632-7143		
Mergers and Acquisitions (CCB)	632-4887	• Restricted Radiotelephone Permit (FOB)		• Intrusion Alarms (OET)	653-6288	Ship Inspections (FOB)	632-7014		



WHY QEI?

24 Hours.

Our 24 hour service hotline number is 609-728-2020.

For over 20 years, QEI has been the American value leader in FM transmitters, modulation monitors, exciters, stereo generators and more. Call or write for full details. Dealer opportunities available in selected countries.

QEI CORPORATION
 ONE AIRPORT DRIVE • P.O. BOX 805
 WILLIAMSTOWN, N.J. 08094 U.S.A.
 (609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (143) On Reader Service Card

Radiation hazards (OET)	653-8169	• U.S. Citizens—DC	(301) 962-2729
Radio Broadcasting (See Broadcasting Services)		• U.S. Citizens—All Other Areas	632-7240
Radio Complaints	632-7048	• Aliens—All Areas	632-7240
Radio Control Devices		• Oral Arguments (OMD)	632-7535
• Non-licensed (Pt. 15) (OET)	653-6288	• Original Plant Cost (Telephone) (CCB)	632-3772
• Non-licensed (Pt. 95) (OET)	653-6288	• Paging—Common Carrier (CCB)	653-5560
• (PRB)	632-4964	• Paging—One-way (PRB)	(717) 337-1212
• Non-licensed (other Pts.) (PRB)	632-4964	• Personnel—Employment (OMD)	632-7106
• (OET)	653-6288	• Physicians Radio—Private (PRB)	(717) 337-1212
Radio Frequency Devices (OET)	653-6288	• Point-to-Point Microwave—	
Radiograms (CCB)	632-7265	• Common Carrier (CCB)	634-1706
Radiolocation—Industrial (PRB)	(717) 337-1212	• Private (PRB)	(717) 337-1212
Radio Propagation (OET)	632-7025	• Pole Attachments (CCB)	632-4890
Radiotelegraph—		• Political Broadcasting	632-7586
• Common Carrier (CCB)	632-7265	• Power (Electric, Gas, Water) (PRB)	(717) 337-1212
• Marine (PRB)		• Press Relations (OPA)	632-5050
• Operator License, Issuance of (FOB)	632-7240	• Press (Relay)(PRB)	(717) 337-1212
Radiotelephone—		• Privacy Act—Procedures (OGC)	632-6990
• Applications/Licenses	(717) 337-1212	• Private Carrier Comms (PRB)	(717) 337-1212
• Rule Interpretations	632-7175	• Private Operational Fixed Services (PRB)	
• Common Carrier Services (CCB)	653-5560	• Microwave Applications	
• Equipment	(301) 725-1585	• Technical Questions	(717) 337-1212
• Operator License Issuance of (FOB)	632-7240	• Status of	(717) 337-1212
• Permits, Restricted (FOB)	632-7240	• Private Wire Systems (CCB)	634-1800
Railroad (PRB)	(717) 337-1212	• Procurement (OMD)	634-1528

News Tip? Interesting Story?

Let the Industry Know

Call Radio World News Editor John Gatski: 703-998-7600

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.

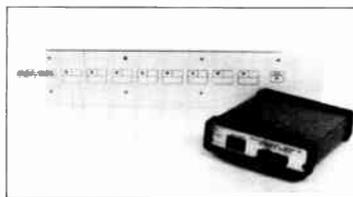
And the House subcommittee on Telecommunications and Finance plans additional hearings on DAB. (Perhaps this time, unlike its first hearing, Congressmen can actually question DAB system proponents other than NAB).

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.

Sine Systems Dial Up Remote Control

New Features For 1992!

- ☆ Automatic transmitter power control
- ☆ Alarm dial out for six telephone numbers
- ☆ Timed functions for PSA, PSSA or other uses
- ☆ Optional RS-232 computer interface
- ☆ Software update for older units available for less than \$100!



Complete 8 channel expandable system costs less than \$1,500!

THE SMART CHOICE!

HE HALL
Electronics

1305-F Seminole Trail
Charlottesville, VA. 22901
(804) 974-6466

Mastercard & Visa Welcome

Circle (96) On Reader Service Card

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.



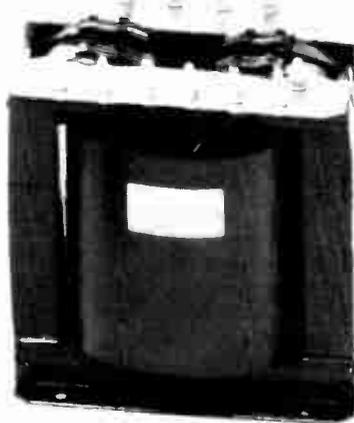
Right: Tiptoe through the Test Tones... The annual NAB convention drew a record crowd of 51,217 and a surprise visit from 1960's crooner Tiny Tim.

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."

PETER DAHL CO.

Save \$\$

Heavy Duty Replacement Transformers, DC Filter chokes and capacitors for AM & FM transmitters manufactured by: AEL, CCA, CSI, COLLINS, CONTEL, CONTINENTAL, BAUER, GATES, GE, HARRIS, ITA, MCMARTIN, RAYTHEON, RCA, SINGER, SINTRONIX, WILKINSON. Many other models also available.



FAST Delivery and FREE Technical Support.



—Write For Free List—

5869 WAYCROSS AVENUE, EL PASO, TEXAS 79924
(915) 751-2300 FAX: (915) 751-0768



Circle (124) On Reader Service Card

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

...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.

needed money, others couldn't get it."

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.

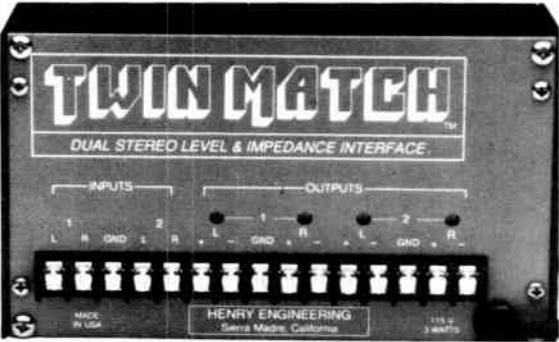
The SBE's Whitaker also was cautious about the future, advising his audience at the SBE convention to "hold on for a rough ride" for the next two years.

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.

New

IT MATCHES!



TWINMATCH is the "one-way Matchbox" that's perfect for matching CD players. There are *four* channels of interface, to match a **pair** of CD players using *one* box! Direct-coupled circuitry and lots of headroom for absolute sonic transparency. In stock... just \$195.00

Henry Engineering
(818) 355-3656 FAX (818) 355-0077
We Build Solutions.

Circle (62) On Reader Service Card

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)

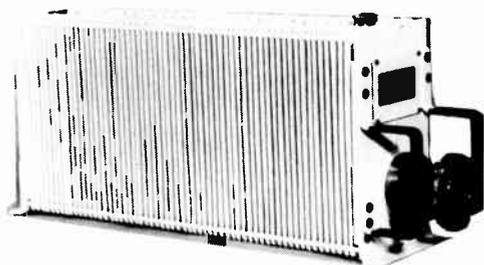
Some stations announce every community but the one they are licensed to after the call letters. Call letters must be immediately followed by the licensed community. If desired, the frequency, channel number and station licensee may be inserted between the call letters and the community.

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.

ELECTRO IMPULSE LAB., INC.

AIR COOLED, LIQUID DIELECTRIC

RF DUMMY LOADS



CPTN-3000

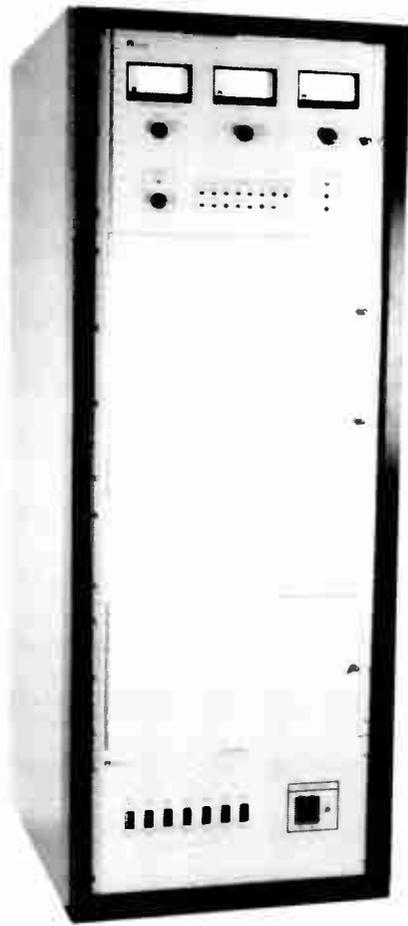
ALWAYS IN STOCK

LOADS FROM 500 WATTS TO 500 KW



ELECTRO IMPULSE LAB., INC.
1805 CORLIES AVENUE, PO BOX 278
NEPTUNE, NJ 07754-0278
FAX: 908-776-6793
PHONE: 908-776-5800

Circle (111) On Reader Service Card



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 serviceability 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.



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



W H Y Q E I ?

Less is More.



All of QE1's FM transmitters have no plate blockers or sliding contacts.

For over 20 years, QE1 has been the American value leader in FM transmitters, modulation monitors, exciters, stereo generators and more. Call or write for full details. Dealer inquiries welcome.

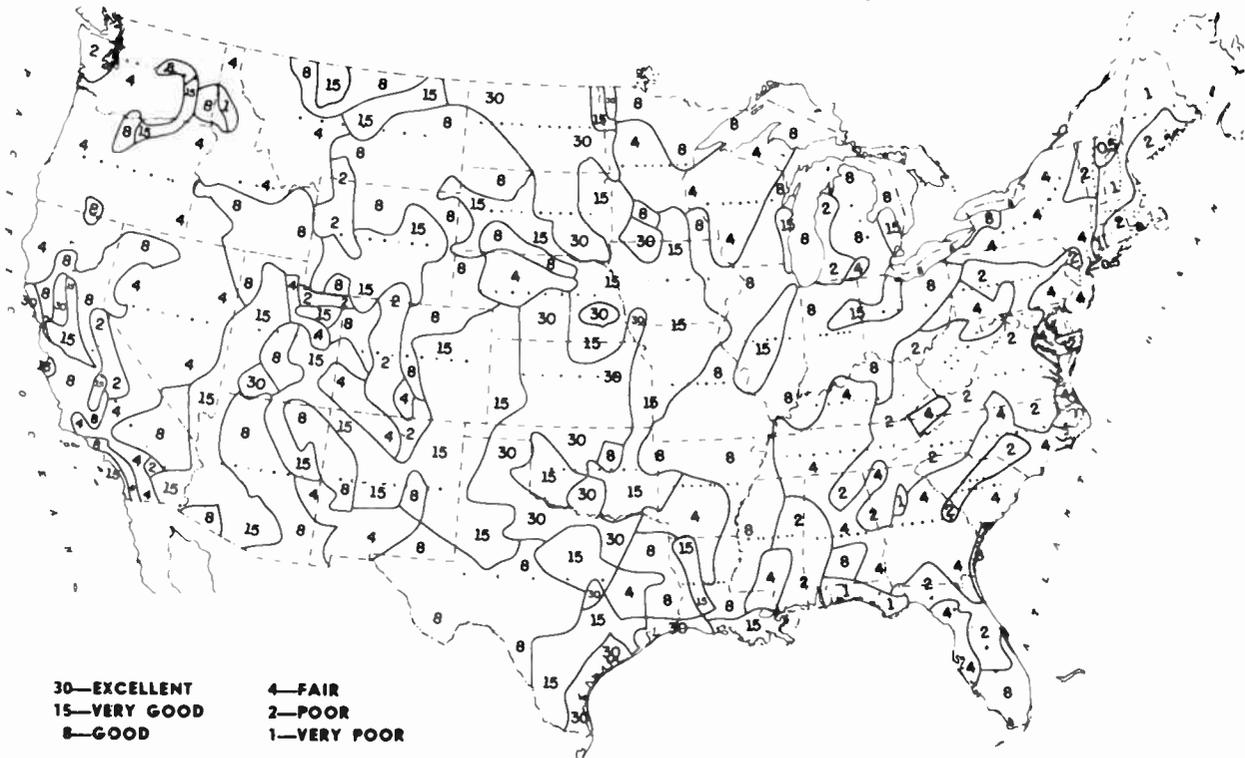
QE1 CORPORATION

ONE AIRPORT DRIVE • P.O. BOX 805
WILLIAMSTOWN, N.J. 08094 U.S.A.
(609) 728-2020 • FAX (609) 629-1751

QUALITY • ENGINEERING • INNOVATION

Circle (128) On Reader Service Card

Estimated Ground Conductivity



Courtesy of Continental Electronics

On Voices It's Perfection. On Everything Else, It's Merely Superb.

A Symetrix 528 Voice Processor can also:

- clean up news actualities
- eliminate monitor feedback
- punch up wimpy sound effects
- tighten and brighten mushy agency dubs
- bring dull samples to life

Symetrix

4211 24th Avenue West • Seattle WA 98199 • USA
Toll Free (800) 288-8855 • Tel (206) 282-2555
Fax (206) 283-5504

It's no secret that many of radio's 'perfect' voices rely on the Symetrix 528 Voice Processor. After all, even the top broadcast consoles can't offer the 528's combination of unmatched processing power and uncompromising signal quality. With its mic pre-amp, switchable phantom power, de-esser, expander, compressor/limiter, and three bands of fully parametric EQ, the 528 gives you the control you need to handle any on-air situation.

But don't let the name mislead you: This 'voice processor' is just as helpful in the production studio, the newsroom or on live remotes.

Your voice may not be perfect. And with the hectic pace of radio, your productions may occasionally fall short as well. But who says anyone else has to hear about it? Call your broadcast distributor for more information on radio's most versatile 'audio tool kit,' the Symetrix 528 Voice Processor.

Circle (70) On Reader Service Card

Useful Engineering Formulas

REACTANCE FORMULAS

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

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

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

$$X_L = 2\pi f L$$

RESONANT FREQUENCY FORMULAS

$$f = \frac{1}{2\pi\sqrt{LC}}$$

$$f_{\text{kHz}} = \frac{159.2}{\sqrt{LC}}$$

$$L = \frac{1}{4\pi^2 f^2 C}$$

$$L_{\mu\text{HY}} = \frac{25,330}{f^2 C}$$

$$C = \frac{1}{4\pi^2 f^2 L}$$

$$C_{\mu\text{FO}} = \frac{25,330}{f^2 L}$$

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

RESISTORS IN SERIES

$$R_{\text{TOTAL}} = R_1 + R_2 + R_3 + \dots$$

CONVERSION FACTORS

$$\pi = 3.14$$

$$2\pi = 6.28$$

$$\pi^2 = 9.87$$

$$\log \pi = 0.497$$

$$1 \text{ meter} = 3.28 \text{ feet}$$

$$1 \text{ inch} = 2.54 \text{ centimeters}$$

$$1 \text{ radian} = 57.3^\circ$$

FREQUENCY AND WAVELENGTH FORMULAS

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

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

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

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

$$0.625\lambda = 225^\circ = \frac{5}{8} \text{ WAVE}$$

$$0.5\lambda = 180^\circ = \text{HALF WAVE}$$

$$0.311\lambda = 112^\circ$$

$$0.25\lambda = 90^\circ = \text{QUARTER WAVE}$$

RESISTORS IN PARALLEL

EQUAL RESISTORS

$$R_{\text{TOTAL}} = \frac{R}{n} \quad \text{Where } n \text{ is the total number of resistors}$$

UNEQUAL RESISTORS

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

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

If the current through a resistor doubles, the power dissipated quadruples

BINARY TO BASE 10 CONVERSION

$$\begin{array}{r} 1 (2^3) = 8 \\ 0 (2^2) = 0 \\ 1 (2^1) = 2 \\ 1 (2^0) = 1 \\ \hline 11 \end{array}$$

IT'S A STUDIO IN A BOX!



FAST TRAC lets you make dubs without tying up your production studio. It's a "one-pot board", with the input selection, gain control, and monitoring functions of a console. Connect a CD player, R-DAT, turntable, and cart recorder to dub carts with one-button ease. Automatic recorder timing produces tightly cued carts *every time* with *no* guesswork! Built-in test oscillator, multi-mode recording, processor insert ability. It's like adding another studio for a fraction of the cost! In Stock.

Henry Engineering
(818) 355-3656 FAX (818) 355-0077
We Build Solutions.

Circle (25) On Reader Service Card

DIRECT POWER FORMULA

$$P = I^2 R$$

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

$$P = IE(\text{effy})$$

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 | F. Recording studio |
| A. Commercial AM station | G. TV station/teleprod facility |
| B. Commercial FM station | H. Consultant/ind engineer |
| C. Educational FM station | I. Mfg, distributor or dealer |
| E. Network/group owner | J. Other _____ |

II. Job Function

- | | |
|-----------------------|---------------------------|
| A. Ownership | D. Programming/production |
| B. General management | E. News operations |
| C. Engineering | 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 subscription, 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!”**



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 | F. Recording studio |
| A. Commercial AM station | G. TV station/teleprod facility |
| B. Commercial FM station | H. Consultant/ind engineer |
| C. Educational FM station | I. Mfg, distributor or dealer |
| E. Network/group owner | J. Other _____ |

II. Job Function

- | | |
|-----------------------|---------------------------|
| A. Ownership | D. Programming/production |
| B. General management | E. News operations |
| C. Engineering | 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 cor-
responding 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 subscription,
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 editori-
al items of interest. Then circle the correspond-
ing Reader Service Inquiry numbers above to
receive more information. Circle every item that
interests you, there is no charge for this service!

Tiana Hickman
Circulation Manager

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

THE FOLDED UNIPOLE

THE ULTIMATE ANTENNA FOR AM BROADCAST



BROAD BANDWIDTH
FOR BETTER SOUND—MONO OR STEREO—
AND EFFECTIVE RANGE INCREASE.

GROUNDING ANTENNA
HELPS ELIMINATE LIGHTNING AND STATIC
ELECTRICITY PROBLEMS.

ELIMINATES ISOCOUPPLERS
VHF AND UHF ANTENNAS ON A UNIPOLE ARE
FED WITHOUT A DISCONTINUITY IN THEIR
TRANSMISSION LINES.

ELIMINATES LIGHTING CHOKES,
TRANSFORMERS, BASE INSULATORS, STATIC
DRAIN CHOKES AND SPARK GAPS.

FULLY ACCEPTABLE BY FCC

**CAN BE USED IN DIRECTIONAL
ANTENNA SYSTEMS.**

Designed and Manufactured by:

nott ltd.

P.O. Box 761
Farmington, New Mexico 87499

4001 LaPlata Hwy.
Farmington, New Mexico 87401
(505) 327-5646 FAX: (505) 325-1142

READER SERVICE NO. 4

IS YOUR FURNITURE READY TO BE PUT OUT TO PASTURE?

WE'RE OUTSTANDING IN THE FIELD...

- High Quality Studio Furniture.
- Modification & Repair of Existing Studio Furniture.
- Installation.

For Additional
Information Call:
VINCE FIOLA
215-640-1229



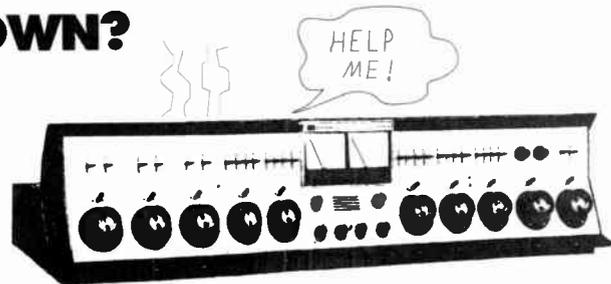
STUDIO
TECHNOLOGY

4 Pennsylvania Ave.
Malvern, PA 19355
215-640-1229
FAX: 215-640-5880

READER SERVICE NO. 48

AUDIO CONSOLE DOWN?

**GET FAST DIRECT
REPLACEMENT
AMPLIFIER MODULES!**



Get your console back on line fast using our complete line of modular console retrofit electronics! The majority of our console electronics (mic preamps, line amps, monitor amps, power supplies ...) are direct plug-in replacements that can have you back on line quickly and inexpensively. Many broadcasters today are using consoles that have little or no factory support. We have developed many new retrofit products based on specific customer requests. Our commitment to customer satisfaction is paramount — and with that commitment our line of replacement electronics continues to grow. **Call us first** — our products and services will be a cost effective advantage to your operation.

In-stock replacement modules for:

- Harris
- RCA
- McMartin
- McCurdy

Call to find out if your console is supported. We also have many generic replacements and custom designs at reasonable cost.

914-737-5032

bdi

Broadcast Devices, Inc.

5 Crestview Avenue
Peekskill, NY 10566

READER SERVICE NO. 91

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

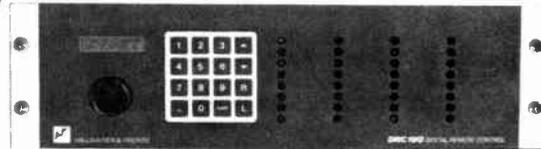
The Management

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 minimum, 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 REBUILT POWER TUBES



Approximately One Half
the Cost of New

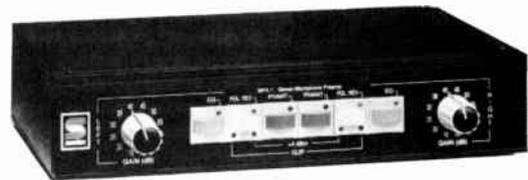
3,000 Hour Unconditional Guarantee

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

SUPERIOR TRANSIENT PROTECTION TCS-SERIES



- Two Stage Protection
- Silicon Avalanche Diodes
- Field Repairable
- 3 Year Replacement Warranty

A Silicon Avalanche based transient control system with redundant back-up stage, non-degrading and extremely fast response time to voltage transients makes this device critical in protecting transmitters, rack equipment, master control rooms, etc.

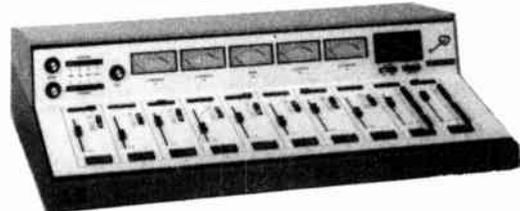


15602 E. Marietta Lane, Spokane, WA 99216-1820

1-800-727-9119

READER SERVICE NO. 55

LOOK



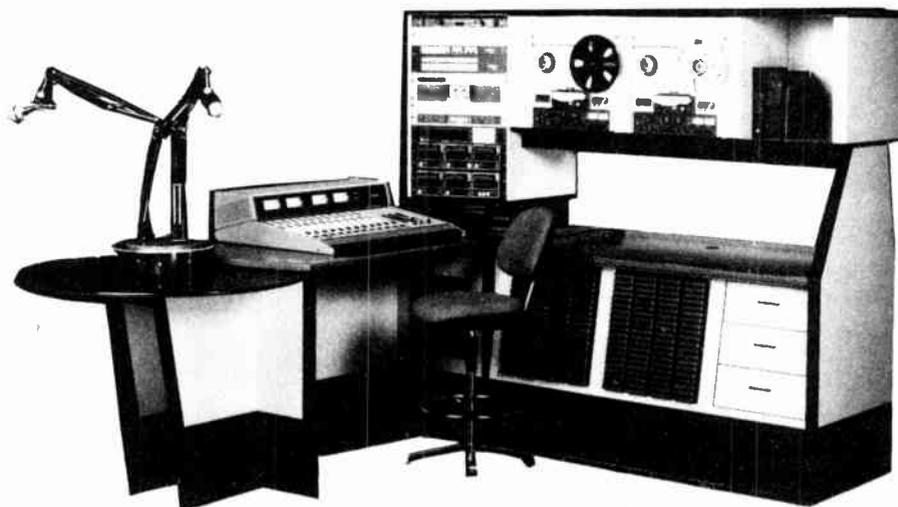
PACEMAKER 1032 BUILT WITH INTENSIVE CARE

AUTOGRAM CORPORATION

1500 Capital Ave. (214) 424-8585
Plano, Texas 75074-8118 1-800-327-6901

READER SERVICE NO. 75

▲ DELINEATING THE NEW STANDARD ▲



▲ AVANT-GARDE SERIES ▲

MODULAR FLEXIBILITY WITH A CUSTOM FIT

WE OFFER A CHOICE OF FIVE ELEGANT LINES OF STUDIO FURNITURE

MURPHY
STUDIO FURNITURE

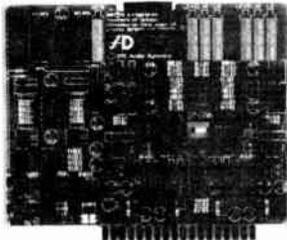
▲ 4153 N. BONITA STREET ▲ SPRING VALLEY, CA 91977 ▲ TEL (619) 698-4658 ▲ FAX (619) 698-1268 ▲

READER SERVICE NO. 94

PRODUCT SHOWCASE

UNLEASH YOUR ITC

If you own an ITC Delta or Type 99, Audio Dynamics retrofit cards can upgrade your existing cart machines to an unprecedented level of cartridge audio performance.



- DNR® Dynamic Noise Reduction provides up to 14 dB of non-encoded noise reduction.
- An innovative split equalization network delivers a playback frequency response of 32Hz-16Hz ± 0.7 dB.
- Full drop-in compatibility.

Reserve a FREE demo today.
(804) 296-4111

AD Audio Dynamics

137 W. Buckingham Circle,
Suite B
Charlottesville, VA 22901

DNR® is a registered trademark of National Semiconductor Corporation under U.S. Patents 3,678,416 and 3,753,559.

READER SERVICE NO. 32

ATTENTION BURK® & GENTNER® USERS

BSL Guardian transmitter management software allows remote control & analysis of remote transmitter sites utilizing the Gentner VRC-2000 or Burk ARC-16 remote control systems.

The new generation of the BSL Guardian is "Smart Software," a software package that allows a central monitor computer to operate the Gentner VRC-2000 or Burk ARC-16 on the same computer and will also support the Gentner VRC-1000.

For information regarding the BSL Guardian or "Smart Software," contact Gary Schmidt at:

Broadcast Software Ltd.

1076 Sixth Avenue North
Naples, Florida 33940

Phone: 813-649-5978 Fax: 813-649-1933

READER SERVICE NO. 103

Books

Focal  Press

Opens the Door
to

New Skills

Books published specifically for
broadcast professionals and students.

Check out our new series of succinct, topical
handbooks: *The Electronic Media Guides*

Managing Electronic Media
Broadcast Writing
Sportcasting

The Federal Communications Commission
Full Service Radio
Radio Music Directing

...And Many, Many Other Books ...

Call or Write today for our free catalog:
Professional & Technical Books on Operations & Techniques

FOCAL PRESS, Office #2

80 Montvale Avenue
Stoneham, MA 02180

1-800-366-2665



READER SERVICE NO. 150

SOUND YOUR BEST ON THE AIR!



CART MACHINE SERVICES:

CART MOTORS REBUILT to quiet flutter-free
perfection-shafts resurfaced
Single \$110.00 Triple \$130.00

CART HEADS RELAPPED guaranteed to
perform like new

Same day turnaround

Replacement heads and motors available

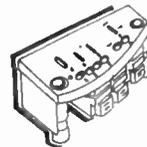
REEL TO REEL SERVICES:

HEADS RELAPPED and precise digital/optical

ASSEMBLY ALIGNMENTS
performed for maximum
response & head life



CAPISTAN & REEL MOTORS REBUILT
for MCI, OTARI and more.



For peak performance from your recording equipment, call
The Audio Magnetic Professionals.

AMP SERVICES

224 Datura Street, Suite 614, West Palm Beach, FL 33401
Call 1-800-826-0601 for "Same Day Service" in Florida (407) 659-4805
Authorized Parts Dealers for: MCI • OTARI • TEAC/TASCAM

READER SERVICE NO. 79

SERVICES

•BUY•SELL•EMPLOYMENT•
Data Bank
Computer Listings
900 329-8080
 300 to 2400 baud
 MNP-5, V.42bis modem
 \$.99 minute, Average
 call 7 minutes.

Eastern Tower Erector
"We climb anywhere, anytime!"
 P.O. Box 007
 Sharptown
 Maryland 21861

Erection
Maintenance
 1-800-832-2366 or 1-301-883-2030

RADIO & TV
 Painting, Lighting,
 Maintenance & Repair
INTERSTATE
TOWER SERVICE
 Todd Callahan
 5913 Bermuda Dr.
 Boise ID 83709
 208-385-0896

*When cost and
 quality count!*

NORTH
STAR
TOWER
 Tower Construction
 & Maintenance
 Canton, NY
 315-388-4932
 FAX: 315-379-0661

SPECIALIZING IN ERECTION,
 REPAIRING, PAINTING
 AND MAINTENANCE
 RADIO, TWO-WAY, TV, TOWERS
 AND FLAG POLES
A STEEPLEJACK CO.
 PAINTING AND STEEPLEJACK
 CONTRACTORS
 FULLY INSURED FOR YOUR PROTECTION
 DON HIGLEY 3722 ROMA
 713-462-6105 HOUSTON, TEXAS 77080

Spanish?
 Check on SCPC
 Westar IV - TR 1
 3704.7 Mhz - 1F 54.7
24-Hour feed—Low, low Cost!
 PromoSat, Inc.
 12655 N. Central, Ste. 423
 Dallas, TX 75243
 (214) 991-0388

EQUIPMENT FINANCING "LOANS BY PHONE"
 • NO FINANCIALS REQUIRED FOR TRANSACTIONS UNDER \$35,000
 • NEW OR USED EQUIPMENT
 • \$2,000 to \$200,000
 • NO DOWN PAYMENT
 • SALE-LEASEBACK EQUIPMENT
 FOR WORKING CAPITAL
 (800) 275-0185
 FAX: (214) 235-5452
 WE DO START UP BUSINESS
 TO APPLY OR REQUEST ADDITIONAL
 INFORMATION CONTACT MARK WILSON
 EXCHANGE
 NATIONAL
 FUNDING

1990 POPULATION COUNT for PC

 Our 1990 POPULATION COUNT for PC program utilizes the most
 recently published census data required for FCC filings for the next
 decade. Call today for more information. We also offer:
 • Real World Propagation™ Studies
 • On-Line Services
 • 3 Second Terrain Data on CD-ROM
 • FCC's AM, FM & TV Databases
 Richard L. & Richard P. Biby,
 Principals

Communications Data Services, Inc.
 1105-E Arlington Blvd. • Falls Church, VA 22044 • (800) 441-0034

Tower Sales & Erection
 Turnkey Site Development
 Installation & Maintenance
 AM/FM Broadcast, TV,
 Microwave Systems,
 Antennas & Towers

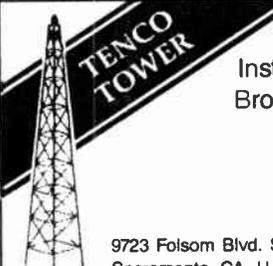
TOWERCOMM
 Communications Specialists
 Ben Wall 6017 Triangle Dr.
 President Raleigh, NC 27613
 Gen. Contractor #25891 Fax (919)781-6454

**REMOTE EQUIPMENT
 RENTALS**
 Hear 50-8000 Hz audio response from
 your next remote for much less than
 costly TELCO loops by renting the:
GENTNER EFT-3000
 — or —
COMREX 3XP/3XR
 3-line frequency extension system.
MARTI and TFT-8888 RPU
 equipment also rented. Call Dwight:
**WELLER AUDIO-VISUAL
 ENGINEERING**
 410-252-8351

 **Don't
 gamble
 with your
 advertising dollars.**
 Advertise in Radio World
 and reach 18,000 +
 subscribers. Call
 1-800-336-3045 today!

**BROADCAST
 DESIGN &
 CONSTRUCTION, INC.**
 • Facility Relocation
 • R.F. Systems
 • Soundproof/Acoustical
 • Custom Cabinetry
 24 HOUR EMERGENCY SERVICE
(313) 465-3226

PHASETEK INC.
 • High Quality RF Components
 • Custom Antenna Tuning Units
 • Custom Directional Feeder Systems
 • Field Installation Services
 • Replacement Parts for CSP Inc. and
 Vector Technology Inc. Components and Systems
 • Limited Supply of VTI FM Transmitters and Accessories
PHASETEK INC.
 P.O. Box 193 Fountainville, PA 18923
 Phone: 215-249-1977
YOUR NUMBER ONE SOURCE!


 Lic. No. 357096
 Installation & Maintenance of
 Broadcast & Communications
 Towers & Antennas
 Donald J. Tenns
 (916) 362-6846
 (916) 638-8833
 9723 Folsom Blvd. Suite A
 Sacramento, CA, U.S.A. 95827 FAX: (916) 638-8858


 Without Advertising
 a Terrible Thing Happens . . .
. . . NOTHING

CONSULTANTS

EVONS 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

V

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 WUPUBLTX 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
Galthersburg, 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

Radio World

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

SPENCER BROADCAST

*Supplying Radio Stations
Nationwide. Call us for
SAVINGS and SERVICE*

(602) 242-2211
FAX (602) 843-2860

Serving Radio Since 1979

... Canada, Alaska, Hawaii,
Puerto Rico, Virgin Islands,
Ye Ol' Forty-Eight ...

RADIO! The beat goes on!

CROUSE-KIMZEY OF ANNAPOLIS

tops in broadcast equipment
1-800-955-6800
ask for Kathleen

CORNELL-DUBILIER MICA CAPACITORS

FROM STOCK

JENNINGS VACUUM CAPACITORS

FROM STOCK

JENNINGS VACUUM RELAYS

SURCOM ASSOCIATES

2215 Faraday Ave., Suite A
Carlsbad, California 92008
(619) 438-4420

THE SOURCE

CALL US FOR ALL
YOUR NEW BROADCAST
EQUIPMENT NEEDS

Toll free: **800-HOT-AMFM**
(800-468-2636)
305-651-5752

FAX: **305-654-1386**

18620 N.E. 2nd Ave.
Miami FL 33179



EXPAND YOUR BUSINESS

Reach 20,000+ Radio Prospects
Twice Every Month

With an Ad Program in Radio World's
Consultants, Services, or Distributor Directories

Call Simone Mullins For More Information

1-800-336-3045

Audio Dividing Pads

CIRCUIT	NO OUTPUTS	DB LOSS	Diagram	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 70

The Product Source Book is an index which lists companies according to the type of equipment they make or distribute. The product information was provided by the vendors themselves, in response to a questionnaire sent by *Radio World* in 1991.

Supplier Source Book 90

Our Supplier Source Book lists names and addresses of the companies found in the Product Source Book.

Company Profiles 110

Those of you looking for more information on the companies listed can turn to the Company Profiles, in which firms have provided details about their businesses and products.

We hope these listings will save you time and help you find the products you want to buy.

Broadcast Electronics	110
Comstream	111
Tapecaster	112
multiphase consulting	112
Sailors Audio Studios	113
Kintronic Labs	114
Elenos	115
ATI	116
J.N.S. Electronics	117

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 Diffuser Systems Inc
Radio Resources & Services
Research Associates Inc
Ritz Audio-Visual Associates, Inc
Roscom General
Schoeps/Posthorn Recordings
Sonex Division of Ilbrook 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
 Tennenplex 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
 Chronrol 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
 Tennenplex 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



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
Int'l 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
 Shalco
 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
AV 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. Reprs.)
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
AV 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. Reprs.)
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
Radio 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. Reprs.)
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
 Telfa: 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.
 Alacronics
 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
 duFreil, 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 Svrs 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

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

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.

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-Kimzey 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-Kimzey 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 Service
 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
 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
 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 Service
 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

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
 Auditorics
 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
 Chronrol 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
 Auxip 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.
 Richard Hirschmann of America
 Rockwell International
 RRADCO Group
 Tepeco Corp
 TFT Inc.
 Tobias & Company Ltd
 Verda Corp
 Will-Burt Company

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
 Tepeco 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 Service
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 Service
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

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



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

Tectan Inc
 THAT Corporation
 UAR Professional Systems
 Valley International



Optical Disk Technology
 ASACA/SHIBASOKU CORP. of
 AMERICA



**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
 Audiotronics
 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
 Videotek 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 Hinds
 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 Svcs 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
 AudiLine, Inc.
 Audiomeia
 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.
 Audiomeia
 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
 Chronrol 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 Service
 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.
 Videotek 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 Service
 John E. Hillman Associates
 Marti Electronics, Inc.
 McMartin Incorporated
 Micro Controls, Inc.
 Modulation Sciences, Inc.
 Northeast Broadcast Lab, Inc.
 Old Dominion Broadcast Eng. Serv.
 Urban 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 Svcs 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 Svcs 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
 Ritzi 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
 Hamtronic, Inc.
 Harris-Allied
 Holzberg Inc.
 Hy James, Inc.
 IER (Industrial Equip. Reps.)
 Intraplex, Inc.
 J.N.S. Electronics Inc
 J-Squared Technical Service
 Landy Associates Inc
 Learning 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
 Alctronics
 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 Svcs Lab
 Chronrol 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

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

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

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

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.

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

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

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.
 Audiomeida
 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
 Intralex, 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
 Symatrix 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
Briel & 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
Briel & Kjaer Instruments, Inc.
Commercial Radio Company
Delta Electronics Inc.
Dorough 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

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
Briel & Kjaer Instruments, Inc.
Commercial Radio Company
Delta Electronics Inc.
Dorough 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
Audiotronics
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
Chronrol 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

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
 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.
 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.



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

**Find it First
in
Radio World**

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 Spe-
cialist
817-336-5114 FAX: 817-870-1271

AKG Acoustics
1525 Alvarado Street
San Leandro, CA 94577
Contact: David Roubesh, Corporate
Marketing Manager
510-351-3500 FAX: 510-351-0500

ANT Telecommunications Inc
211 Perry Pkwy, Ste 4
Gaithersburg, MD 20877
Contact: Natalie Hutson
301-870-9777

ARS Electronics
7110 DeCelis Place
Van Nuys, CA 91406
Contact: Marty Sanett
818-997-6200

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

Acoustionics 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

Alectronics
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 06477
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: 804-358-9496

Alpha Electronics
1365 39th Street
Brooklyn, NY 11218
Contact: S Popoli

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 Edinborough 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 Man-
 ager
 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
 818-508-9788 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

Amstel 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: 708-349-5442

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 Man-
 ager
 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: 602-898-7667

Antennas For Communications

326 Cypress Road
 Ocala, FL 32672
 Contact: Ronald S. Posner, Chairman
 904-687-4121 FAX: 904-687-1203

Anvll 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
 800-788-2875 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/Soundoller

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/PO. 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 & Mktng 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

PO. 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 Rebid

725 N Bush Avenue
 Fresno, CA 93727
 Contact: Allan Tatarian, President
 209-252-2787

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

Audislar

Box 1561
Bellevue, WA 98009
Contact: Robert Munger, Owner
206-454-2040

Audionics Inc

3750 Old Getwell Rd
Memphis, TN 36118
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, W1V 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 Man-
ager

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: 315-437-8119

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: 808-585-2221

Bethpage Associates Inc

507 Superior Avenue
Newport Beach, CA 92663
Contact: Jerry Page, Vice President
714-722-6733 FAX: 714-722-6508

Best 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 Scarborough 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, NJ 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

Bdct 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
904-822-9058 FAX: 904-629-7000

Broadcasting & Elect. Svcs 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 Peiz, 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

605 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

Caig 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 Man-
ager
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 Buttnr

Coaxial Dynamics Inc

15210 Industrial Pkwy
Cleveland, OH 44135
Contact: John R. Ittel, Product Man-
ager
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: 215-822-9129

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 Pedro, 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: 702-685-6705

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

Cremlo Inc

1600 Fourth Avenue NW
Rochester, MN 55901
Contact: Dan Estes

Crouse-Kimzey Company

PO. Box 155999
Fort Worth, TX 76155-0999
Contact: Mark Bradford, General Man-
ager
817-283-7700 FAX: 817-283-8133

Crouse-Kimzey of Annapolis

PO. Box 6300
Annapolis, MD 21401-0300
Contact: Kathleen Karas, Branch Man-
ager
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 Bailey, 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 Digulio, Sales
818-787-3334 FAX: 818-767-4732

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
818-567-2673

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
Gulfport, 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: Kevin 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

Dorrugh Electronics

5221 Collier Pl
Woodland Hills, CA 91364
Contact: Kay Dorrough, Partner
818-999-1132 FAX: 818-998-1507

Doug Vernier Broadcast Cast

1600 Picturesque Dr
Cedar Falls, IA 50613
Contact: Doug Vernier, Pres
319-266-8402 FAX: 319-273-6402

Drake-Chenault, div Bdcst Prog.

2211 Fifth Avenue
Seattle, WA 98121
Contact: John Carlile, VP/Sales &
Marketing
800-426-9082 FAX: 206-441-6582

duTrell, Lundin & Rackley, Inc

1019 19th St, NW, Suite 300
Washington, DC 20036
Contact: L. Robert duTrell, 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 Scholdt, Ad Mgr
FAX: 703-550-7560

E**ECS International Inc**

PO Box 330607
Ft Worth, TX 76163
Contact: Dick Townsend, Mgr Bdcst
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 Man-
ager
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
818-653-3318 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: 916-668-7760

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 Bdcst & Prod Pdct

600 Cecil St
Buchanan, MI 49107
Contact: Rick Sanchez, Bdcst & 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, Bdcst 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

Equito 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

Excallbur Electronics
4604 Sand Rock Ln
Chantilly, VA 22021-2468
Contact: Bill Ashley, VP

Excallbur 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 Tiedemanr
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
206-358-5293

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

Fuson 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 91387
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 Orderfer, 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



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 Tessenor 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 Eng
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 Hinds Inc
42 Elaine St, RR 1
Thompson, CT 06277
Contact: Bonnie Hnat
203-935-9066

Holiday 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 Moffitt Lane
Missouri City, TX 77489
Contact: Anna Sterling, Admin Assiet

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 Man-
ager
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



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 Crackers

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

Information

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 87124
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
Menio 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: 303-987-2735

International Music Company

1316 E. Lancaster
Fort Worth, TX 76102
Contact: James Martin, Akai Product
Specialist
817-336-5114 FAX: 817-870-1271

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

Ivlie

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

Jaffle 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
918-383-1177 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 Kalaniana'ole 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

Kintronc 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

Kilne 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 Man-
ager
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 Man-
ager

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

Larcam 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 & Cnsit.
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
Lowell, 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

Magnifax 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 Capito/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

Brøndbyvestervej 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 Ramblewood 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 Man-
ager

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 Montpelier Blvd
St Laurent, PQ, H4N 2G3 CANADA
Contact: Jerome Masson, Vice
President/General Manager
514-748-7811 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
Walworth, 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

Oakwood Audio Labs, Ltd

652 King Edward St
Winnipeg, MB R3H 0P2 CANADA
Contact: Ron Paley, Bdcst Sales Mgr
204-786-6715 FAX: 204-783-5805

Ocean Audio Inc

366 Las Casas Avenue
Pacific Palisades, CA 90272
Contact: David Hadler, President
213-459-2743 FAX: 213-454-6043

Old Dominion Bdcst 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



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 Rcds & 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

Phillips Components
100 Providence Pike
Slatersville, RI 02876
Contact: Greg J Murphy, Marketing
Manager

Phillips 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 Schmaczle

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 Man-
ager
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

**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 & 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. Stefan, 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-Helz, 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
PO. 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

Rosat 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

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 Blackburn, 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 Pedro 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
408-866-8434

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
818-640-6749 FAX: 818-640-6751

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: 803-642-3371

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
203-664-4444 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 7847
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 Guzowicz
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
918-256-7883 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 515784
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

Storell 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 Man-
ager
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/Man-
ager
601-349-2881 FAX: 601-349-2882

Tapex Corp
3608 Davison 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. Tenna, 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

Tepeco 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 Klienedinst, 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



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 43026-1297
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



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 Man-
ager
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 Ordo

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

Wiready Newswire Systems Inc
31-H Union Avenue
Sudbury, MA 01776
Contact: David M. Gerstmann,
President
800-633-4459 FAX: 508-443-5988

Wireworks Corp
380 Hillside Ave
Hillside, NJ 07205
Contact: Angela Kelly, Customer
Service Manager
908-686-7400 FAX: 908-686-0483

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 Patricia 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



Xedit Corp
218-31 9th Avenue
Queens Village, NY 11429
Contact: Claude M Karczmer,
President



Yamaha International Corp
PO Box 6600
Buena Park, CA 90622
Contact: Bob Shomaker
714-522-9011 FAX: 714-739-2680



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



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



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

World Radio History

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**.

COMSTREAM
 Satellite Technology Brought Down To Earth

TAPECASTER®

7174A Industrial Drive, Southaven, 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 turn-key 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 electrical 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.

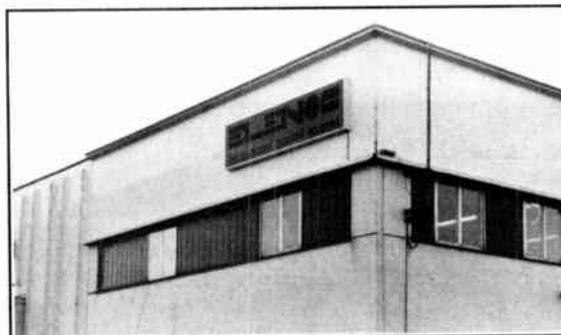
Major products from Kintronic include directional broadband antenna phasing systems, antenna tuning units, AM non-directional and directional multiplexed antenna systems, dummy loads, equipment racks, rigid transmission line and accessories, and RF contactors. Other products from the company include 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.

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 consulta-

tion, 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.

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.

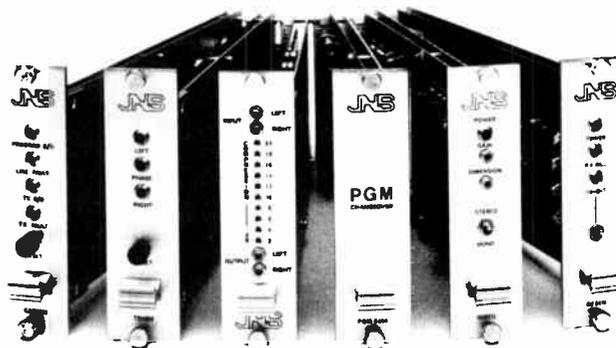
The firm spans two continents. J.N.S. Electronics, Inc. corporate, sales and service offices are in San Jose, CA. Manufacturing occurs in both California and Australia.

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

Subject Index 119

The Subject Index lists the news stories of the past year, cross-referenced by the topics covered in each story.

Buyers Guide Index 126

The Buyers Guide Index is a comprehensive list of 1991's equipment reports, referenced by company name.

Author Index 127

The Author Index provides a listing of the feature stories published in 1991, according to author name.

Buyers Guide Reprints 129

The final element in this part of the *Radio World Directory* is selected reprints from this year's Buyers Guides, paid for by the companies represented. Companies are in alphabetical order.

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.

360 Systems	129
Acoustic Technology	129-130
ATI	130-132
Audi Cord Corp.	132-133
Audio Dynamics Inc.	133-134
audiopak	134
Autogram Corp.	135
Belar Electronics Lab	135-136
Comrex	136-137
Continental	137-138
Electro Impulse	138
Halland	139
ITC	140
J.N.S.	141
Kintronic	142-143
Logitek	143
LPB	144-146
Pacific Recorders & Engineering	147-149
Rohde & Schwarz	150
Telos	151-152
TTC	152-153
Wheatstone	153

SUBJECT INDEX

A

Acoustic Technology

Alphaton FC-100, 3/27:71

Advanced Instrument Research Corp.

Pro-Announcer 500: Swiss Army
Knife for microphone
processing, 4/24:16

Advertising

ad tax considered by House
committee, 8/7:8
producing successful radio ads,
10/23:25

AES. See Audio Engineering Society

AfriSpace Inc.

FCC grants experimental authority
for digital DBS, 7/24:1

AKG

DSE 7000, 2/20:32

Alpha Products

decoder, 1/23:32

AM certification mark

AMAX chosen as certification
mark, 6/12:12
AMAX debuts at NAB, 10/23:1
EIA agrees to examine AM mark,
4/24:2
NAB backs AM certification mark,
3/13:7
which comes first: production or
demand?, 10/9:10

American Digital Radio

in-band to be exhibited at Radio
1991 convention, 9/11:7
prepares model of in-band pro-
posal, 10/23:28

Amplifier Fundamentals course

understanding RF amplifiers (part
IX), 1/9:19
understanding RF amplifiers (part
X), 1/23:15
radio frequency amp design
considerations (part XI), 2/6:33
klystrons, tubes and downlinks
(part XII), 2/20:15

AM radio

AM improvement comments re-
flect concern, 3/13:7
AM improvement rules cause
concern, 12/25:3
AM inquiry text expected by fall,
6/26:13
AM still serves its purpose in the
community, 11/20:22
AM suffers in today's world,
4/10:12
better AM antenna array
performance, 1/23:10, 2/6:22
editorial on FCC's AM
improvement decision, 12/11:5
extending your construction
permit, 4/24:21
FCC adopts AM improvement
package, 10/23:1
FCC docket on AM improvements

nearing completion, 9/11:10
FCC plans slow change for AM,
4/10:9
FCC's AM station crackdown,
4/24:18
high power AM station planned for
Caribbean, 8/7:8
how will the AM rules affect you?,
12/11:16
New York affiliate WKDM-AM
celebrates "Adelanto
Navideno," 12/25:1
problem checklist for AM
antennas, 1/23:12
SBE's New York chapter debates
AM's future, 6/26:10
special report, 4/24:29
WRIX-FM/AM Anderson, S.C.,
turns a profit by responding to
market, 3/27:10
WSM-AM/FM Nashville, Tenn.,
keeps the beat, 7/10:26
WWWE-AM Cleveland, Ohio,
relives deja vu, 7/10:27

AM stereo

editorial, 7/24:5
Japan endorses C-QUAM as
standard, 5/22:1, 6/12:10
legislation would require FCC to
select standard, 7/24:1

Antennas

better AM array performance,
1/23:12, 2/6:22
cows for monitoring DA proofs,
7/10:31
FCC weighs FM antenna rule,
1/9:11
Italian antenna firms prosper,
5/22:53
new antennas whip multipath,
8/7:10
problem checklist for AM
antennas, 1/23:12

Aphex

Audiophile Air Chain, 6/26:45

Armstrong, Edwin

profile of giant in radio history,
10/9:28

Armstrong Transmitter Corp.

special report on AM, 4/24:29

Arrakis

Series 12,000 console, 8/21:72

Association for Professional Recording Studios

upbeat mood at APRS show,
8/21:20

ATC

SCM20 monitor, 3/27:71

AT&T

Switched Digital International
Service, 5/22:9

Audi-Cord

DL Series, 12/25:34

Audio Dynamics

AD-302 retrofit board, 12/25:31

Audio Engineering Society

convention slated for New York,
9/25:12
editorial on combining shows with
SMPTE, 11/20:5

Audio Engineering Society convention, New York, N.Y.

AES show product review, 10/9:18
digital makes inroads at AES,
11/6:16
panel tests new cables, 11/20:9
product offerings, 11/20:7
SPL effects debated, 11/20:11

Audio Engineering Society convention, Paris, France

DAB demos held at show, 3/27:9
new products at AES Paris show,
3/27:14

audiopak

AA-4 cart, 12/25:33

Audio Precision

Portable One audio test system,
1/23:33

Audio Technica

Hi-Energy ATM microphone series,
3/27:70

Auditronics

800 series console, 8/21:68

B

BASYS

D-Cart, 12/25:28

BE

DT-90A cart machine, 12/25:37

Belar Electronics Laboratory

The Wizard, 1/23:36

Benchmark

IFA-9, 7/24:41
4 x 4 + microphone preamp,
3/27:74

Bext Inc.

"T" series amplifiers, 11/20:42

Book reviews

Electronic Communications,
4/10:16

British Broadcasting Corp.

decentralization in U.K. radio,
2/6:8
renovates U.S. studios, 6/12:13
tests Eureka 147 system, 1/23:3

Broadcast Audio Corp.

acquired by Fidelipac Corp., 2/6:3

Broadcast Automation

digital automation system, 2/20:39

Broadcast Electronics

Air Trak 90 console, 8/21:64
20-B transmitter, 11/20:37
Nevin named CEO, 1/23:3

BSW

Amber Electro Design 3501B,
1/23:39

Burk Technology

ARC-16 remote control, 10/23:40

C

Canada

L-band tests lead to Canada's
WARC position recommending
L-band, 12/25:11
Persian Gulf "airlift," 3/13:13
Radio Canada International
shortwave service cut, 5/8:12
radio stations left untouched by
CBC budget cut, 1/23:2

Cart equipment

NAB offerings, 5/22:21
NAB preview, 3/27:48

CBS Hispanic Radio Network

New York affiliate WKDM-AM
celebrates "Adelanto
Navideno," 12/25:1

CCIR

agrees on spectrum requirements
for digital radio, 1/9:1
decides to hold second round of
audio compression algorithm
"bake-offs," 6/12:7
manufacturers get CCIR
compression algorithm tests
postponed, 7/24:3

CDRB. See Committee for Digital Radio Broadcasting

Center for Strategic and International Studies

CSIS panel discusses effects of
new technologies, 7/10:8

Clark Wire and Cable

red/lavender color coding
differentiates left from right,
8/7:26

Committee for Digital Radio Broadcasting

calls for DAB testing, outlines
compression schemes, 5/22:7
calls for independent tests of DAB
systems, 3/27:3
names Skip Pizzi chairman, 2/6:1

Compact disks

CD recorders unveiled at CES,
2/20:8
CD rot, 6/12:12
debunking surface treatments,
2/6:9
Denon to show recordable CD at
NAB, 3/27:45
recordable CDs: a format reborn,
6/12:29
recordable CDs at NAB, 5/22:50
recordable CDs demonstrated at
CES, 2/20:10

Comparative renewal

FCC revises rules, 1/9:11

Compression

CCIR decides to hold second
round of audio compression
algorithm "bake-offs," 6/12:7
CDRB meeting outlines
compression schemes, 5/22:7
manufacturers get CCIR
compression algorithm tests

- postponed, 7/24:3
taking action on compression, 1/9:20
- Computer Concepts Corp.**
Digital Commercial System, 2/20:40
- Computers**
direction and azimuth PC program, 2/20:16
DOS 5.0 signals new era for PCs, 7/24:18
exploring computer software, 11/20:20
fax modems link world, 9/25:32
locating files on the hard disk, 1/23:20
Microsoft Windows software, 5/22:46
programs on a budget, 8/21:32
project management software, 5/22:41
radio niche, 6/12:22
tax packages, 2/20:16
use HyperCard to drill new radio operators, 7/24:15
virus cures, 3/27:23
virus prevention, 6/26:21
visualize STL paths in 3-D, 4/24:17
word processing, 10/23:31
- Comrex**
remote broadcasting equipment, 8/7:27
- Consoles**
NAB offerings, 5/22:22
NAB preview, 3/27:49
- Consultants. See Contract engineering**
- Consumer Electronic Bus**
NAB endorses CEBus remote system, 2/6:3
- Consumer Electronics Show**
DCC, CD recorders unveiled at show, 2/20:8
recordable CDs demonstrated, 2/20:10
summer CES debuts new digital format, 7/10:7
- Continental**
816 A transmitter, 11/20:37
FM Transmitter School, 7/24:17
314F-1 transmitter, 4/24:31
- Contract engineering**
choosing a business structure, 3/27:33
determine your unique selling proposition, 7/24:23
keeping on top of paperwork, 6/12:30
making money as a consultant, 4/24:15
managing your money, 5/22:34
marketing, 6/26:18
responding to leads, 11/20:25
selecting the right advertising media, 9/25:28
selling yourself with letters, 8/21:40
setting up your business, 2/20:26
using a technical consultant, 1/23:7
- Cook Inlet Radio Partners**
D.C. station WPGC-FM to test in-band DAB, 4/24:1
- Corporate Computer Systems**
Micro56, 10/23:47
- Cortana**
Crows Nests and Stati-Cats, 5/22:55
- Couplers**
a look at audio couplers, 9/11:24
- C-QUAM**
Japan endorses C-QUAM as AM stereo standard, 5/22:1, 6/12:10
- CRL**
MBL-100 processor, 6/26:44
- Cuba**
jamming of U.S. stations rare, 5/8:7
- Cue Paging**
plans paging system tests, 8/21:1
- Cutting Edge Technologies**
Unity 2000 digital audio processor, 6/26:37
- D**
- DAB. See Digital audio broadcasting**
- dbx**
563X Hiss Reducer, 1/23:8
- DC Fundamentals course**
current flow begins with electronics (part I), 10/23:24
coming to terms with circuits (part II), 11/6:28
principles of Ohm's law (part III), 11/20:13
understanding Watt's Law (part IV), 12/11:14
understanding primary and secondary cells (part V), 12/25:14
- Denon**
recordable CD at NAB, 3/27:45
- Digital audio broadcasting. See also Eureka 147**
ABC, CBS select SEDAT, 8/7:1
additional DAB systems surface, 2/20:1
ADR in-band to be exhibited at Radio 1991 convention, 9/11:7
Air Force opposes use of L-band for DAB, 5/22:2, 6/26:23
American Digital and Mercury Digital prepare models of in-band proposals, 10/23:28
buying a digital audio system, 8/7:22
CCIR agrees on spectrum requirements for digital radio, 1/9:1
CDRB calls for DAB testing, 3/27:3, 5/22:7
Cheney opposes L-band use, 9/11:3
competition among systems heightens, 3/27:25
Copyright Office receives numerous filings on DAB, 2/6:7
DAB scorecard, 7/10:22
DAB's saga gains momentum in 1991, 12/25:2
demos held at Paris AES show, 3/27:9
digital audio playback systems progress, 7/24:13
digital dominates technology at NAB, 5/22:28
digital on-air record and replay devices, 6/12:16
digital war can be hell, 7/10:15
editorials, 2/20:5, 4/10:5, 5/8:5, 5/22:5, 6/26:5, 8/7:5, 9/11:5
EmCee Broadcast Products Inc., debuting DAB in Mexico City, 9/25:3
FCC eyes microwave spectrum for DAB service, 4/10:8
FCC filings object to Satellite CD application to operate digital radio service, 1/9:2
FCC grants Westwood One permission to test L-band DAB, 6/26:1
FCC outlines DAB issues, 2/20:2
FCC vacillates on L-band, 7/10:1
Gannett introduces in-band DAB system, 3/13:1
Hill inquiry targets DAB, 12/11:10
in-band DAB proponents, 7/24:12
interactive DAB: the next step, 7/10:11
interfacing digital equipment, 2/6:28, 8/7:16
Japan's Radio GIGA becomes world's first DAB service to go on the air, 1/9:9
KinTel initiates in-band DAB, 9/25:26
L-band DAB could be NAB's curse, 10/9:5
L-band reception close to FM, 11/6:1
L-band tested in Canada, 12/25:11
L-band tests begin, 8/7:1
L-band tests readied, 4/10:1
LinCom debuts DAB system for NAB task force, 11/20:1
Mexico shops for DAB standard system, 4/24:7
microwaves and S-band interference, 11/20:19
NAB convention session examines, 5/22:8
NAB convention will highlight digital, 3/27:11
NAB DAB stand fuels battle, 7/10:14
NAB debut is a hit, 5/8:1
NAB eyes in-band tests, 12/11:1
NAB eyes L-band for DAB, 5/8:10
NAB preview, 3/27:47
NAB shift may help in-band, 9/11:1
NAB to consider in-band DAB, 8/21:1
NASA/VOA host DAB demonstration, 5/8:1
NRSC forms DAB study group, 2/20:9
Radio 1991 convention DAB session critical of NAB's stand, 10/9:8
Radio 1991 convention will not have mobile in-band demo, 9/11:1
RadioSat, Satellite CD Radio applications still pending, 7/24:8
Radiotechniques' Schober wants freeze on new FM stations and translators to keep band open for DAB, 4/24:6
receivers, 3/13:9
Satellite CD Radio files for digital audio radio service testing, 5/8:3
S-band for DAB will be U.S. WARC position, 12/11:1
searching for a common language, 12/11:23
Simon's Central Park concert uses digital link, 9/25:10
spectrum sought, 2/20:3
spectrum study analyzed, 3/27:16
starting your digital library, 9/11:28
Strother Communications amends DAB system test plans, 1/9:1, 2/20:3
Strother Communications creates DATA group for DAB, 9/25:8
Strother test plan approved by FCC, 6/12:8
Strother wants DAB test lab, 6/26:7
Synetcom enters DAB race with Digital FM•S, 6/26:14
Synetcom's DAB, 8/21:25
U.K. radio uses XIS digital, 8/21:14
Walt Disney World requests DAB testing authorization, 8/21:10
WARC filings prefer L-band, 6/12:1
WARC L-band accord not yet reached, 8/21:10
wireless cable as DAB option, 2/20:18
WPGC-FM Washington, D.C., to test in-band DAB, 4/24:1
WPR looks to digital production, 11/6:12
- Digital audio processing**
digital effects processors, 6/26:31
processing enters digital age, 5/22:19
- Digital audio tape**
DAT vs. DCC, 5/8:18
digital transports, 4/10:20
royalty agreement reached, 8/21:8
serial-capable DAT, 3/13:15
SV-3900 DAT recorder, 3/27:29
use by radio increases, 8/21:9
- Digital audio workstations**
making the switch to digital, 5/22:44, 10/9:16
maturity reached in digital workstations, 5/22:15
overview, 2/20:39
searching for a common language, 12/11:23
- Digital cable radio**
a concern for broadcasters, 1/9:8
- Digital compact cassette**
DAT vs. DCC, 5/8:18
- Digital interfacing**
editorial, 10/9:5
equipment manufacturers seek standard, 8/21:3
manufacturers start talks on digital I/Os, 10/9:1
refining digital I/Os, 7/10:33
- Digital telco links**
special report, 10/23:49
- Dorough**
stereo signal test set, 1/23:37
- D&R USA**
Aircom console, 8/21:78
- Dynamax**
DCR1000 Series, 12/25:33
- E**
- EBS. See Emergency Broadcast System**
- Education**
continuing education for engineers, 2/6:17
videotape production instruction, 2/6:12

EG&G

FlashGuard 2000 obstruction warning beacon, 5/22:52

EIA. See Electronic Industries Association

Electro Impulse Lab

dummy loads, 11/20:42

Electromagnetic Interference

avionics specs urged in bid to reduce FAA objections to radio and TV towers near airports, 3/13:1

editorial, 2/6:5

FAA, FCC face off planned for NAB, 3/27:45

FAA, FCC squabble over control of EMI in 1991, 12/25:7

FAA seeks EMI authority, 2/6:1

FCC filings support avionics specs, 4/24:1

Furr proposal, 3/27:24

Sikes urges Transportation head Skinner not to allow FAA to unilaterally impose EMI rules, 2/6:1

Electronic Industries Association

agrees to examine AM mark, 4/24:2

AMAX is chosen as certification mark, 6/12:12

DAB committee holds first meeting, 11/20:12

looking into DAB, 10/9:1

NAB delivers ultimatum on AM certification mark, 3/13:7

updated receiver standards likely, 7/10:9

ElectroVoice

635A microphone, 3/27:69
RE-27N/D, 10/23:26

EmCee Broadcast Products Inc.

debuting DAB in Mexico City, 9/25:3

Emergency Broadcast System

attacked for ineffectiveness, 12/25:3

editorial, 7/10:5

FCC cites EBS abuse, 6/12:9

FCC plans revamp, 7/10:1

FCC sets comment deadlines, 8/7:7

FCC to study new EBS technology, 5/22:11

guest editorial urges participation in EBS inquiry, 11/6:5

inquiry includes setting standards for digitally transmitted EBS, 8/21:22

keep up with EBS requirements, 5/8:23

WCBS-AM and FM embroiled in EBS furor, 10/9:1

EMI. See Electromagnetic Interference

E-Mu Systems

E-Mu Proteus digital sound module, 2/6:15

Encryption

FCC allows broadcasters to use digital encryption to foil eavesdropping, 9/11:8

Energy-Onix

AM transmitter, 4/24:34
triode-based transmitters, 11/20:45

Engineering. See also Contract engineering

audio nightmares, 7/10:36, 12/11:15
battery and capacitor shelf life, 10/23:22

cable wraps, 12/25:18

checking temperature of components, 5/22:36

"chicken coop" workmanship, 6/26:16

Dead Air Dreams, 6/26:29, 8/21:22
designing for versatility, 3/13:23

disaster planning, 4/10:17
drive systems maintenance, 8/21:35

editorial, 11/6:5

equipment deliveries planning, 3/13:14, 4/10:25

the erosion of engineers, 1/9:16

fire safety, 2/20:19

function generators, 3/27:34

fuses and fuse boxes, 11/20:15

grid dip meters, 9/25:39

hanging transmission line; all thread; Dracon magnetic cable clips, 9/25:31

hot newsroom and studio tips, 3/13:22

house monitor system, 2/20:17
"how to find a big paying radio job," 7/10:30

ice barrier for locks, 3/27:31

interfacing mismatched equipment, 1/9:27

keeping current, 2/6:17

LEDs, 8/21:42, 10/23:27

live assists in sync, 2/20:20

making test equipment, 6/26:26

planning for winter, 9/11:26

reduce costs, not engineers, 5/8:24

removing studio hot buttons, 8/21:27

safety, 8/7:21, 9/11:18, 12/11:12
Scum Busters for air conditioners, 7/24:17

sensors and remote control, 3/27:31

short cut to redundancy, 10/9:32

splice sensors, light sensors, jitters, and fasteners, 1/23:18

static electricity, 12/11:18
surge protection, 11/6:30

surplus electronic parts can pay off, 8/7:26

swabs, screwdrivers, and shorted stubs, 1/9:28

telco problem solving, 2/6:10, 4/10:21

ESE

ES-244, 7/24:44

Eureka 147

BBC tests, 1/23:3

demo slated, 3/27:7

editorial on NAB's endorsement, 5/8:5

licensing is stalled, 4/10:1

"met or exceeded" expectations of NAB's DAB group, 4/10:8

NAB bus riders praise Eureka demo, 10/23:14

NAB endorses, 2/20:1

NAB gears up for Eureka L-band tests, 9/25:3

NAB requests Eureka in-band, 9/25:1

NAB starts negotiations for licensing/royalty agreement, 7/24:6

opinions differ on Eureka plan, 3/27:1, 7

partners extend letter of intent, 6/26:1

Plenge discusses DAB, 11/20:3

Radio Operators Caucus withholds Eureka support, 3/13:3

Europe

EC rules affect U.S. and Japanese equipment manufacturers, 5/8:14

patchy FM coverage reveals flaws of European spectrum management system, 4/10:15

Eventide

H3000B Ultra-Harmonizer, 7/24:46

EZ Hook

pro audio test cables, 5/22:52

F

Facilities

extending your construction permit, 4/24:21

KATP-FM's shopping mall studio, 8/21:33

KCEV-FM checks out of motel and into new facilities, 3/27:26

KHYL-FM's new facility brings together split staff, 6/26:22

KJZS-FM gets new studio in Houston highrise, 9/25:25

KOZT-FM: do-it-yourself station upgrade, 5/22:33

KSRR-AM Orem, Utah, moves into former Osmond Studios, 11/20:24

KTNQ City of Industry, Calif., turns tower and transmitter site into an industrial park, 11/6:9

Power 93 moves up, 4/24:21

WIBM-FM's soundproof facility, 10/23:22

WRBA-FM in Panama City, Fla., gets new on-air studio, 7/24:24

WSYR-AM/WYYY-FM move to former factory, 2/20:27

WYHY-FM renovates '70s studio, 1/23:17

FCC

AM improvement package adopted, 10/23:1

annual fees considered, 9/11:7

Class A upgrades clarified, 7/10:32

comparative renewal rules revised, 1/9:11

DAB issues, 2/20:2

EBS technology to be studied, 5/22:11

editorial on FAA-FCC dispute, 4/24:5

editorial on need for periodic review of deregulatory decisions, 1/23:5

editorial on the new year, 1/9:5

FAA, FCC squabble over control of EMI in 1991, 12/25:7

fee options studied on Capitol Hill, 11/6:1

fine changes questioned by consultants, 12/25:11

fine method changes, 9/25:20

FM antenna rule under consideration, 1/9:11

Gammon denied city-of-license move, 12/11:8

issues public notice on modulation, 3/27:1

main studio rule, 7/24:19, 10/23:23

misrepresentation rules clarified, 2/20:25

modulation and the FCC: Cole comments, 5/22:42

modulation rules to be reexamined, 5/22:10, 8/21:12, 12/25:13

notice of proposed rulemaking on increasing multiple ownership limit, 6/12:1

ownership rule revisions planned, 8/7:26

pioneer preference approved, 5/8:8, 6/26:3

Radio 1991 panelists discuss FCC technical regulations, 10/23:17

receiver-induced, third-order intermodulation effect policy, 3/13:19

reference aid offers info to pass FCC tests, 4/10:16

rejects SBE-proposed rulemaking defining congested areas for TV STL users, 11/20:1

Ritter wants engineer on FCC, 11/6:2

rule compliance studied, 5/8:7

S-band for DAB will be U.S.

WARC position, 12/11:1

settlement rules revised, 6/26:8

"Sikesian" model for radio, 4/24:19

Sikes urges Transportation head Skinner not to allow FAA to unilaterally impose EMI rules, 2/6:1

STL action on hold, 1/23:1

STL rulemaking pondered, 4/24:8

vacillation on L-band, 7/10:1

Federal Aviation Administration

avionics specs urged in bid to reduce FAA objections to radio and TV towers near airports, 3/13:1

eases some broadcast restrictions, 5/22:3

editorials, 2/6:5, 4/24:5

FAA, FCC face off planned for NAB, 3/27:45

FAA, FCC squabble over control of EMI in 1991, 12/25:7

filings with FCC support avionics specs, 4/24:1

Furr proposal, 3/27:24

seeks EMI authority, 2/6:1

Sikes urges Transportation head Skinner not to allow FAA to unilaterally impose EMI rules, 2/6:1

Fessenden, Reginald

celebrating the real father of radio broadcasting, 8/7:14

Fiber optics

spectrum auctions bill may hinge on fiber, 6/26:1

Fidellpac Corp.

acquires Broadcast Audio Corp., 2/6:3

Fires

fire safety, 2/20:19
WNTR-AM fire brings out Samaritan ethic, 4/24:10

First Amendment

U.S. Court of Appeals declares 24-hour indecency ban unconstitutional, 6/12:1

Flooding

KBRC-AM Mount Vernon, Wash., survives flood, 4/10:14

FM radio

college FMs oppose censoring, 5/8:10
European FM coverage reveals flaws of European spectrum management system, 4/10:15
extending your construction permit, 4/24:21
FCC clarifies Class A upgrades, 7/10:32
FCC weighs FM antenna rule, 1/9:11
highway FM scheme established in Italy, 3/27:19
KCRW-FM's "War Watch," 3/13:22
20 kHz capabilities, 9/11:9
KTAO-FM Taos, N.M., runs on solar power, 10/9:30
NAB offerings, 5/22:24
NAB session focuses on improvement topics, 5/22:14
new antennas whip multipath, 8/7:10
Radiotechniques' Schober wants freeze on new FM stations and translators to keep band open for DAB, 4/24:6
solid state for FM faces cost concerns, 7/10:17
transmission gear, 7/10:16
U.S. firm ready to launch Moscow FM, 7/10:12, 9/25:7
WHMA-FM 90 denied city-of-license move, 12/11:8
WRIX-FM/AM Anderson, S.C., turns a profit by responding to market, 3/27:10
WRXL-FM uses crane as tower, 3/13:28

FM translators

answers to questions about translators, 9/25:21
build a translator in five steps, 7/24:28
examples of translators in action, 2/20:13
freeze on new applications lifted, 4/10:3
guide to translator coverage, 1/23:22
low power translators, 4/24:14
NAB asks FCC to take tougher stance on use, 3/13:1
protect primary station signals, 10/23:38
in tough terrain, 3/27:28
tracing the path of FM translators,

8/21:31

Fritts, Eddie

NAB speech warns of threats to over-the-air broadcasting, 5/22:1

G**Gannett Broadcasting**

in-band DAB system, 3/13:1

Gentner

Prizm digital audio processor, 6/26:39

Gerstman Software Technologies

WireReady Newsroom Software, 7/24:49

Gorman-Redlich

CEB EBS encoder/decoder, 1/23:38

H**Halland Broadcast**

Rock 'N' Roll Graffiti Library, 12/25:32

Harmonic resonators

a look at, 6/26:28

Harris Corp.

acquiring systems and radio frequency divisions of Midwest Communications, 8/21:1
Gates I, 4/24:32
HT-35 transmitter, 11/20:35

H&E

Micro-Trak 6411 preamp, 3/27:73

Hearing

ringing ears could be tinnitus, 2/20:29

History of radio

call signs; Tedford, 1930's "Master Machinist," 5/8:19
chain broadcasting, 2/6:16
"cooking" technique preserves tapes, 12/11:11
exploring FM history, 12/11:27
a look back at the FCC's study of "public service responsibility of broadcast licensees," 3/13:24
profile of Edwin Armstrong, 10/9:28
radio collectors, 5/8:15
reflecting on radio's salad days, 1/9:33
relying the radio memories of youth, 9/25:29

Hnat-Hindes

Ultramad UM-2000, 6/26:44

Human resources

finding job satisfaction, 5/8:17
handling an ownership change, 1/9:21
mastering your role in the workplace, 4/10:22

I**Imperial Transmitters Worldwide**

FBI probes alleged equipment scam, 10/23:1

Indecency

U.S. Court of Appeals declares 24-hour indecency ban unconstitutional, 6/12:1

In-Flight Phone Corp.

satellite-to-aircraft service planned with USA Today, 12/11:3

Inovonics

Sentinel audio monitor receiver, 5/22:12

Inspections

FCC's AM station crackdown, 4/24:18
FCC self-inspection report, 10/9:14, 11/6:22, 12/11:13
FCC tries inspections by mail, 9/25:9
field inspections on the rise, 11/6:3
history of licensing and rule compliance, 6/12:32
Radio 1991 panelists discuss FCC technical regulations, 10/23:17

Intercollegiate Broadcasting System convention

Alan Peterson: convention panelist, 4/24:13

Interference. See also**Electromagnetic Interference**

FCC decides policy for receiver-induced, third-order intermodulation effect (RITIOE), 3/13:19
filling in interference holes, 11/6:18
microwaves and S-band interference, 11/20:19
mixes lead to spurious signals, 10/9:13
new antennas whip multipath, 8/7:10
protect primary station signals, 10/23:38
technical regulation and interference protection, 7/10:31

International radio

CSIS panel discusses shortwave, 7/10:8
EC rules affect U.S. and Japanese equipment manufacturers, 5/8:14
patchy FM coverage reveals flaws of European spectrum management system, 4/10:15
U.K. radio uses XIS digital, 8/21:14
U.K. uses XIS digital, 8/21:14
U.S. firm ready to launch Moscow FM, 7/10:12, 9/25:7

ITC

Series 2 cart machine, 12/25:27

J**Jampro**

JBBP antenna, 5/22:49

Japan

endorses C-QUAM as AM stereo standard, 5/22:1, 6/12:10
Radio GIGA world's first on-air DAB service, 1/9:9

J.N.S. Electronics

8000 series rack frame, 10/23:50

John Furr and Associates

avionics specs urged in bid to reduce FAA objections to radio and TV towers near airports, 3/13:1
filings with FCC support avionics specs, 4/24:1

JVC

DS-DT900N DAT recorder, 9/25:54

K**Kautz, Jerry**

FBI captures Kautz, 12/25:1
FBI probes alleged equipment scam, 10/23:1

Kingdom Technology

Digital Audio System, 2/20:37

Kintel Technologies Inc.

in-band DAB, 9/25:26

Kintronic Laboratories

phasor/coupling system, 4/24:37

L**Leasing stations**

ins and outs, 6/26:24

Lexicon

300 Digital Effects System, 6/26:15

License renewal

settlement rules revised, 6/26:8
settlements in the comparative hearing process, 1/23:26

Licensing. See also Spectrum allocation

by auction, 2/6:37
auctions debated at NAB's leadership conference, 4/10:3
history of licensing and rule compliance, 6/12:32
pioneer preference, 5/8:8, 6/26:3

Lightning

diverting lightning from the transmitter, 12/11:24
how to avoid lightning strikes, 7/10:20, 8/7:24
protecting yourself at the transmitter, 11/6:23
protecting your tower, 9/11:23
what to do once you're hit, 10/9:15

LinCom

debuts DAB system for NAB task force, 11/20:1

Lindos Electronics

LA100 audio test equipment, 1/23:36

Listeners

it takes all kinds, 3/27:21

LMAs. See Local marketing agreements**Local marketing agreements**

pros and cons, 12/25:13

Lcgittek

Mariner console, 8/21:76

Lcs Angeles, Calif.

ad sales reflect radio market growth, 3/13:8
KCRW-FM's "War Watch," 3/13:12

LPB

installs church drive-in system, 9/11:13
Signature Series console, 8/21:71

M**Madison Broadcaster's Clinic**

agenda, 10/23:2

Management. See also Contract engineering

choosing a business structure, 3/27:33
embracing the New Year's possibilities, 1/23:25
finding job satisfaction, 5/8:17
managing your money, 5/22:34
mastering your role in the workplace, 4/10:22
removing studio hot buttons, 8/21:27

MARS. See Military Affiliate Radio System**Martí, George**

interview, 3/27:43

Mercury Digital

in-band proposal, 10/23:28
proposes FM-compatible "in-band" DAB system, 3/27:1

Mexico

shops for DAB standard system, 4/24:7

Microphones

Fritz II mic shaped like human head, 3/27:32
MS miking methods, 2/6:30
multiple-D microphones, 10/9:27
NAB offerings, 5/22:25
NAB preview, 3/27:47
overview, 3/27:70
Pro-Announcer 500: Swiss Army Knife for microphone processing, 4/24:16
selecting the right mic, 6/12:27
Shure solves open mic woes, 9/25:24
simple circuits solve mic woes, 3/13:16

Microwave Filter Co.

STL diplexer, 10/23:45

Midwest Communications Corp.

Harris Corp. acquiring systems and radio frequency divisions, 8/21:1

Military Affiliate Radio System

GIs radio home via MARS, 3/13:13

Modulation

Cole comments on the FCC and modulation, 5/22:42
FCC expected to tighten rules, 5/22:10
FCC to reexamine modulation

rules, 8/21:21, 12/25:13

Modulation Sciences

ModMinder controversy, 3/27:1
ModMinder DeMod Board, 1/23:40

Moseley

DSP 6000 STL, 10/23:39

Multi-Frequency Modulation

Mercury Digital proposes FM-compatible "in-band" DAB system, 3/27:1

Music libraries

Capitol Production Music, 7/24:29
Rock 'N' Roll Graffiti Library, 12/25:32

N**NAB. See National Association of Broadcasters****National Association of Broadcasters**

AMAX is chosen as AM certification mark, 6/12:12
asks FCC to supersede local regulations on satellite home receiver dishes, 5/8:8
asks FCC to take tougher stance on FM translator use, 3/13:1
considering in-band DAB, 8/21:1
dues increase, 1/23:1
editorial on DAB actions, 9/11:5
editorial on endorsement of Eureka 147, 5/8:5
endorses CEBus remote system, 2/6:3
endorses Eureka 147, 2/20:1, 4/10:8
eyes L-band for DAB, 5/8:10
foreign investment seminars, 6/26:33
in-band tests planned for DAB, 12/11:1
L-band DAB could be NAB's curse, 10/9:5
NAB DAB stand fuels battle, 7/10:14
negotiations with Eureka 147, 7/24:6
opposes performance rights in sound recordings, 5/8:8

National Association of Broadcasters convention, Las Vegas,

AM radio sessions, 5/22:20
cart decks, 5/22:21
computers find niche in radio, 6/12:14
consoles, 5/22:21
consoles preview, 3/27:49
DAB: friend or foe?, 5/22:8
DAB hits big at NAB debut, 5/8:1
Denon to show recordable CD, 3/27:45
digital audio processors, 5/22:19
digital audio workstations, 5/22:15
digital dominates technology, 5/22:28
digital preview, 3/27:11, 46
digital processing session preview, 3/27:44
EBS forum, 5/22:11
editorial, 3/27:5

engineering session schedule, 3/27:38

exhibitor directory, 3/27:52
FAA, FCC will face off over EMI issue, 3/27:45

FM products, 5/22:24
FM radio improvements session, 5/22:14

Fritts warns of threats to over-the-air broadcasting, 5/22:1
international exhibitors, 6/12:14
interview with George Martí, NAB Engineering Achievement Award winner, 3/27:38

Las Vegas tourist attractions, 3/27:50

low-profile technology, 6/12:23
microphones and field gear, 5/22:24

microphones preview, 3/27:47
modulation monitor session, 5/22:10

new technology, 3/27:37
NHK brings version of Open House, 1/9:8, 3/27:44
preview, 3/27:37

RDS technology ready today, 5/22:8
recordable CDs, 5/22:50
record attendance and resurgence of buying attitude, 5/22:1
STL, telco and remote gear, 5/22:18
surviving the NAB, 3/27:22
tape and cart gear preview, 3/27:48

National Association of Broadcasters Radio 1991 convention, San Francisco. See Radio 1991 convention**National Public Radio**

WPR looks to digital production, 11/6:12

National Radio Systems Committee

accepting proposals for automatic format selection system standard, 2/20:9
DAB study group, 2/20:9
examines U.S. Radio Broadcast Data Service systems, 4/10:2
refines RDS draft, 6/26:8
subcommittee recommends RDS as U.S. broadcast standard, 4/24:10

National Religious Broadcasters

convention coverage, 3/13:10

Nautek

AMPFET ND-10, 4/24:26
FM7 transmitter, 11/20:41

Nevin, John J.

Broadcast Electronics names CEO, 1/23:3

NHK

brings version of Open House to NAB, 3/27:44
NAB to host NHK technology Open House, 1/9:8

Nott Ltd.

unipole kits, 5/22:56

NRSC. See National Radio Systems Committee**O****Omnitronix**

OMNI-1000, 4/24:28

Orban

Optimod-FM 8200 Digital, 6/26:41

P**Pacific Recorders**

Micromax, 12/25:36
ProductionMixer console, 8/21:65

Panasonic

SV-3900 professional DAT recorder, 2/20:35, 3/27:29
SV-3700/SV-3900 DAT recorders, 9/25:45

PCBs

information available, 4/24:20

Persian Gulf war

Canada's "radio airlift," 3/13:13
editorial on radio preparedness, 3/13:5
GIs radio home via MARS, 3/13:13
how radio is covering the Gulf, 3/13:13
KCRW-FM's "War Watch," 3/13:12

Phillips

Digital Compact Cassette unveiled at CES, 2/20:8

Phillips, Matt

WRIX-FM/AM Anderson, S.C., turns a profit by responding to market, 3/27:10

Pioneer preference

DAB firms file for preference, 9/11:12
FCC approves, 5/8:8, 6/26:3
Strother Communications and NAB ask FCC to reconsider pioneer's preference, 8/7:1

Piracy

profile of a radio pirate, 2/6:18

Pizzi, Skip

CDRB names chairman, 2/6:1

Plenge, Georg

Eureka's Plenge discusses DAB, 11/20:3

Political advertising

ad tax considered by House committee, 8/7:8

Power multiplexing

principles of, 1/9:14

Preservation

"cooking" technique preserves tapes, 12/11:11

Pristine Systems

Pristine MMCS, 2/20:38

Processing

digital effects processors, 6/26:31
points of processing, 5/8:9

Production

E-Mu Proteus digital sound module, 2/6:15

make friends with a musician, 5/22:43
 a new world of multitracking, 11/20:13
 predicting the future for production gear, 8/21:36
 producing successful radio ads, 10/23:25
 racking up production gear, 2/6:13
 videotape instruction, 2/6:12

Q

QEI Corp.

20,000 B transmitter, 11/20:38
 CAT-LINK STL, 10/23:53

QSound

3-D sound imaging process has problems with mono compatibility, 4/10:1
 points of processing, 5/8:9
 redesigns software in 1991 to guard against mono-compatibility problems, 12/25:7

R

Radio Canada International

shortwave service cut, 5/8:12

Radio Data System

Cue Paging plans hybrid tests, 8/21:1
 European inroads, 7/24:7
 most likely automatic format selections system standard for radio, 2/20:9
 NRSC refines RDS draft, 6/26:8
 NRSC subcommittee recommends RDS as U.S. broadcast standard, 4/24:10
 technology ready today, 5/22:8
 U.S. RDS standard on fast track, 12/25:9

Radio drama

location audio is key to ZBS quality, 8/7:15
 "Selecting a Ghost" uses Fritz II mic shaped like human head, 3/27:32

Radio Free Europe

radio diplomacy cuts urged, 7/10:3

Radio frequency radiation

ANSI and transmission lines, 2/6:20
 a guide to RF rule compliance, 1/9:13
 how close is really safe?, 3/13:26
 understanding RF exposure hazards, 5/8:25

Radio GIGA

Japan's Radio GIGA becomes world's first DAB service to go on the air, 1/9:9

Radio Industry

acquisitions brisk in 1991, 12/25:11
 EC rules affect U.S. and Japanese equipment manufacturers, 5/8:14
 editorial on combining shows, 11/20:5
 editorial on crisis broadcasting, 3/13:5

editorial on top ten news stories of 1991, 12/25:5
 ownership rule revisions planned, 6/12:1, 8/7:26
 resurgence in tube products, 11/6:13
 road tour of radio from the heartland, 9/11:17
 section of FCC's 1992 authorization bill would permit broadcasters to substitute automation for licensed operators, 11/20:1
 the "Sikesian" model for radio, 4/24:19
 top ten news stories of 1991, 12/25:2
 WRIX-FM/AM Anderson, S.C., turns a profit by responding to market, 3/27:10

Radio Liberty

radio diplomacy cuts urged, 7/10:3

Radio 1991 convention

AMAX debuts, 10/23:1
 convention preview, 8/21:49
 DAB demos planned, 8/21:50
 DAB session critical of NAB's stand, 10/9:8
 digital dominates radio 1991, 10/23:8
 editorial, 8/21:5, 10/23:5
 exhibitor directory, 8/21:55
 new radio products flourish, 10/23:9
 panelists say spend now to save later, 10/23:14
 panel on improvement options for stations, 11/6:14
 San Francisco hosts NAB, 8/21:49
 San Francisco market focuses on efficiency, 8/21:53
 sessions cover variety of topics, 8/21:51
 super tuner demo planned, 8/21:53

Radio on Wheels

format guide to radio from the motorist's perspective, 8/7:9

Radio Operators Caucus

withholds Eureka support, 3/13:3

Radio Satellite Corp.

application still pending at FCC, 7/24:8
 MSAT contracts for digital audio car radio service, 1/23:1
 proceeds with plans to provide DAB service on mobile satellite band, 4/24:7

Radio 7

plans continue for Moscow FM, 9/25:7
 U.S. firm ready to launch Moscow FM, 7/10:12

Radio Systems

RS-2000 cart machines, 12/25:35
 RS-700 DAT recorder, 9/25:46
 RS series consoles, 8/21:66

Radiotechniques

DAB proponent wants freeze on new FM stations and translators to keep band open for DAB, 4/24:6

Radio World

introducing *Pilot Tone*, 12/11:4
 60 Years Ago, 6/26:33
 61 Years Ago, 3/13:25
 staff shifts, 2/6:5

Ramko Research

consoles, 8/21:77

RBDS. See U.S. Radio Broadcast Data System

RDS. See Radio Data System

Receivers

EIA hopes to update standards, 7/10:9
 which comes first: production or demand?, 10/9:10

Remote broadcasting

AT&T Switched Digital International Service, 5/22:9
 audio nightmares, 7/10:36
 cellular solutions, 6/12:36
 Comrex offers remote tools, 8/7:27
 Costas' "Coast-to-Coast" radio show, 12/11:7
 dial-up remotes, 5/8:22, 6/26:8
 handling far-out remotes, 4/10:13
 KVNI(AM) offers ski resort a lift, 6/12:34
 Mountain Park remote from Hell, 1/23:19
 NAB offerings, 5/22:18, 25
 setting up a small P.A. system, 11/6:21
 Simon's Central Park concert uses digital link, 9/25:10
 summer remote maladies, 7/10:28
 tips on remotes, 5/8:16
 trends, 7/24:38
 WEBE-FM does show from moving train, 2/6:27
 wiring tip for remotes, 7/24:17

Richardson

MMD Modules, 11/20:40

Ritter, Don, Rep.

wants engineer on FCC, 11/6:2

Rohde & Schwarz

Datencoder, 11/20:44

Russco Electronics

CIA-1 music skimmer, 3/27:78

S

Satellite CD Radio

application still pending at FCC, 7/24:8
 FCC filings object to Satellite CD application to operate digital radio service, 1/9:2
 files for digital audio radio service testing, 5/8:3
 files for pioneer preference, 9/11:12
 seeks DAB carrier role, 11/6:8

SBE. See Society of Broadcast Engineers

Schmid Telecommunication

Short Interval Audio Test (SIAT) System, 1/23:35

Scientific-Atlanta

ABC, CBS select SEDAT digital audio system, 8/7:1

Security

personnel security, 11/6:25
 planning for security on station property, 10/9:26

Sentry Systems

FS12C Format Sentry, 2/20:37

Shannondale Wireless

agreement with Strother to test DAB systems in S-band, 6/12:8

Shortwave radio

CSIS panel discusses effects of new technologies, 7/10:8
 KTWR Guam's shortwave broadcasting, 8/21:15
 vital role during failed Soviet coup, 9/25:1

Shure

FP-410 microphone, 9/25:24
 VP64 microphone, 3/27:72

Sikes, Alfred

"Sikesian" model for radio, 4/24:19

Silver, Art

in memoriam, 7/10:5

Society of Broadcast Engineers

comments on certification study guides, 1/9:33
 convention site-hopping opposed, 8/7:3
 Disaster Planning and Digital Audio conference, 4/10:17
 editorial on efforts to make engineers part of the team, 11/6:5
 editorial on improving conventions, 9/25:5
 FCC rejects proposed rulemaking defining congested areas for TV STL users, 11/20:1
 predicts solid Houston show, 9/25:1

Society of Broadcast Engineers convention, Houston, Tex.

agreements highlight 1991 convention, 11/6:1
 convention preview, 9/25:16
 exhibitor directory, 9/25:18
 exhibitors eye show performance, 9/25:18
 products review, 11/6:7

Somich

DBE 1000 baseband enhancer, 6/26:43

Sony Corp.

debuts Mini Disc in New York, 6/26:9
 PCM-7000 series/PCM-2700 DAT recorders, 9/25:50

Sound Technology

RTA-4000, 1/23:30

Soviet Union

U.S. firm ready to launch Moscow FM, 7/10:12, 9/25:7

Special effects

Lexicon's 300 Digital Effects System, 6/26:15

Spectrum allocation. See also Licensing

Air Force opposes L-band for

BUYERS GUIDE INDEX

A

- Acoustic Technology** — Alphonon FC-100 feedback controller, User Report, 3/27:71
- AKG** — DSE 7000 Digital Sound Editor, User Report, 2/20:32
- Alpha Products** — decoder, User Report, 1/23:32
- Aphex** — Audiophile Air Chain, User Report, 6/26:45
- Armstrong Transmitter Corp.** — special report on AM radio, 4/24:29
- Arrakis** — Series 12,000 console, User Report, 8/21:72
- ATC** — SCM20 monitor, Technology Update, 3/27:71
- Audi-Cord** — DL Series, Technology Update, 12/25:34
- Audio Dynamics** — AD-302 retrofit board, Technology Update, 12/25:31
- audopak** — AA-4 cart, User Report, 12/25:33
- Audio Precision** — Portable One audio test system, Technology Update, 1/23:33
- Audio Technica** — Hi-Energy ATM microphone series, Technology Update, 3/27:70
- Auditronics** — 800 series consoles, Technology Update, 8/21:68

B

- BASYS** — D-Cart, Technology Update, 12/25:28
- BE** — DT-90A cart machine, User Report, 12/25:37
- Belar Electronics Laboratory** — The Wizard, Technology Update, 1/23:36
- Benchmark** — IFA-9, User Report, 7/24:41
4 x 4 + microphone preamp, User Report, 3/27:74
- Bext Inc.** — "T" Series amplifiers, Technology Update, 11/20:42
- Broadcast Automation** — digital workstation, User Report, 2/20:39
- Broadcast Electronics** — Air Trak 90, User Report, 8/21:64
20-B transmitter, User Report, 11/20:37
- BSW** — Amber 3501B, Technology Update, 1/23:39
- Burk Technology** — ARC-16 remote control, User Report, 10/23:40

C

- Computer Concepts Corp.** — Digital Commercial System, User Report, 2/20:40
- Continental** — 816A transmitter, User Report, 11/20:37
314F-1, User Report, 4/24:31
- Corporate Computer Systems** — Micro56, User Report, 10/23:47
- Cortana** — Crows Nests and Stati-

- Cats, User Report, 5/22:55
- CRL** — MBL-100 processor, Technology Update, 6/26:44
- Cutting Edge Technologies** — Unity 2000 digital audio processor, User Report, 6/26:37

D

- Dorough** — stereo signal test set, User Report, 1/23:37
- D&R USA** — Aircom console, Technology Update, 8/21:78

E

- EG&G** — FlashGuard 2000 obstruction warning beacon, Technology Update, 5/22:52
- Electro Impulse Lab** — dummy loads, Technology Update, 11/20:42
- ElectroVoice** — 635A microphone, User Report, 3/27:69
- Energy-Onix** — AM transmitter, Technology Update, 4/24:34
triode-based transmitters, Technology Update, 11/20:45
- ESE** — ES-244, User Report, 7/24:44
- Eventide** — H3000B Ultra-Harmonizer, User Report, 7/24:46
- EZ Hook** — pro audio test cables, User Report, 5/22:52

F

- Fidellpac (Dynamax)** — DCR1000 Series Technology Update, 12/25:33
- Gentner** — Prizm digital audio processor, User Report, 6/26:39
- Gerstmann Software Technologies** — WireReady Newsroom Software, Technology Update, 7/24:49
- Gorman-Redlich** — CEB EBS encoder/decoder, User Report, 1/23:38

H

- Halland Broadcast** — Rock 'N' Roll Graffiti Library, Technology Update, 12/25:32
- Harris Corp.** — Gates I, User Report, 4/24:32
HT-35 35 kW FM transmitter, User Report, 11/20:35
- H&E** — Micro-Trak 6411 preamp, User Report, 3/27:73
- Hnat-Hindes** — Ultramad UM-2000, Technology Update, 6/26:44

I,J

- ITC** — Series 2 cart machine, User Report, 12/25:27
- Jampro** — JBBP antenna, User Report, 5/22:49

- J.N.S. Electronics** — 8000 series rack frame, Technology Update, 10/23:50

- JVC** — DS-DT900N DAT recorder, User Report, 9/25:54

K

- Kingdom Technology** — Digital Audio System, User Report, 2/20:37
- Kintronic Laboratories** — phasor/coupling system, User Report, 4/24:37

L

- Lindos Electronics** — LA100 audio test equipment, User Report, 1/23:36
- Logitek** — Mariner console, Technology Update, 8/21:76
- LPB** — Signature Series console, User Report, 8/21:71

M

- Microwave Filter Co.** — STL diplexer, Technology Update, 10/23:45
- Modulation Sciences** — ModMinder DeMod Board, Technology Update, 1/23:40
- Moseley** — DSP 6000 STL, Technology Update, 10/23:39

N

- Nautel** — AMPFET ND-10 transmitter, User Report, 4/24:26
FM7 transmitter, Technology Update, 11/20:41
- Nott Ltd.** — unipole kit, User Report, 5/22:56

O

- Omnitronix** — OMNI-1000, User Report, 4/24:28
- Orban** — Optimod-FM 8200, Technology Update, 6/26:41

P

- Pacific Recorders** — Micromax, User Report, 12/25:36
ProductionMixer, User Report, 8/21:65
- Panasonic** — SV-3900 Pro-DAT machine, Technology Update, 2/20:35
SV-3700/SV-3900 DAT recorders, User Report, 9/25:45
- Pristine Systems** — Pristine MMCS, Technology Update, 2/20:38

Q

- QEI Corp.** — 20,000 B transmitter, User Report, 11/20:38

- CAT-LINK STL**, Technology Update, 10/23:53

R

- Radio Systems** — RS-2000, User Report, 12/25:35
RS-700 DAT recorder, Technology Update, 9/25:46
RS series console, User Report, 8/21:66
- Ramko Research** — consoles, User Report, 8/21:77
- Richardson** — MMD Modules, Technology Update, 11/20:40
- Rohde & Schwarz** — RDS FM Datencoder, Technology Update, 11/20:44
- Russco Electronics** — CIA-1 commercial skimmer, Technology Update, 3/27:78

S

- Schmid Telecommunication** — Short Interval Audio Test (SIAT) System, Technology Update, 1/23:35
- Sentry Systems** — FS12C Format Sentry, Technology Update, 2/20:37
- Shure** — VP64 microphone, User Report, 3/27:72
- Somich Engineering** — DBE 1000 Base Band Enhancer, User Report, 6/26:43
- Sony Corp.** — PCM-7000 Series/PCM-2700 DAT recorders, Technology Update, 9/25:50
- Sound Technology** — RTA-4000, User Report, 1/23:30
- Studer Revox** — A623 monitor speaker, Technology Update, 3/27:76
A-807 reel-to-reel recorder, User Report, 9/25:48
- Symetrix** — 511A noise reduction unit, User Report, 7/24:48
- Systemation** — Qwik Disk, User Report, 2/20:38

T

- Telos Systems** — phone interfaces, Technology Update, 10/23:43
- TFT** — 9160/9167 STL, Technology Update, 10/23:51
- 360 Systems** — DigiCart, Technology Update, 12/25:32
- Titus** — Composite Audio Monitor, Technology Update, 6/26:42
- T-Tech Corp.** — T1/DS-I modem, Technology Update, 10/23:52
- Turtle Beach** — 56K Hard Disk System, User Report, 2/20:31

W

- Wheatstone** — SP-44 console, Technology Update, 8/21:63

AUTHOR INDEX

A

Alexander, W.C. "Cris"

- Feed Line
 - Filling in Interference Holes, 11/6:18
 - How Will the AM Rules Affect You?, 12/11:16
 - Mixes Lead to Spurious Signals, 10/9:13

B

Bartlett, Bruce

- Guest Overview
 - More Stereo, Higher Output Mics Offered, 3/27:70
- Line Out
 - Airing Radio Horror Stories, 12/11:15
 - The Amazing Multiple-D Mic, 10/9:27
 - Cellular Solutions for Remotes, 6/12:36
 - Comrex Offers Remote Tools, 8/7:27
 - A Course in Couplers, 9/11:24
 - A Handle on Far-Out Remotes, 4/10:13
 - A Line on Audio Nightmares, 7/10:36
 - More on MS Miking Methods, 2/6:30
 - Setting Up a Small P.A. System, 11/6:21
 - Simple Circuits Solve Mic Woes, 3/13:16
 - Ten-Four, Good Buddy!, 1/9:27
 - Tuning In Remote Broadcasts, 5/8:16

Bartlett, Jenny

- Line Out
 - Airing Radio Horror Stories, 12/11:15
 - The Amazing Multiple-D Mic, 10/9:27
 - Cellular Solutions for Remotes, 6/12:36
 - Comrex Offers Remote Tools, 8/7:27
 - A Course in Couplers, 9/11:24
 - A Handle on Far-Out Remotes, 4/10:13
 - Setting Up a Small P.A. System, 11/6:21
 - Simple Circuits Solve Mic Woes, 3/13:16
 - Tuning In Remote Broadcasts, 5/8:16

Bisset, John

- Workbench
 - Avoiding a Short Fuse, 11/20:15
 - Beat Summer's Heat, 5/22:36
 - "Big Guys" and Little Gizmos, 6/26:26
 - Castling Light on LEDs, 8/21:42
 - Digging for Gold at NAB, 6/12:23
 - Dollars and Sensors, 3/27:31
 - Hangers on a Budget, 9/25:31
 - Hot Newsroom and Studio Tips, 3/13:22
 - How to Beat the Surge, 11/6:30
 - How to Hear an LED, 10/23:27
 - Live-Assists In Sync, 2/20:20
 - Planning for Winter, 9/11:26
 - Remote Possibilities, 7/24:17
 - A Short Cut to Redundancy, 10/9:32

Singing the "Ma Bell Blues,"

- 4/10:21
- Solving Telco Woes, 2/6:10
- The Splice Is Right, 1/23:18
- Spraying Away Static, 12/11:18
- The Straight Dope on PCBs, 4/24:20
- Summer Remote Maladies, 7/10:28
- Surplus Can Pay Off, 8/7:26
- Swabs, Screwdrivers and Shorted Stubs, 1/9:28
- A Year-End Wrap-Up, 12/25:18

Burnett, David

- Decentralization in UK Radio, 2/6:8
- EC Rules Affect Stateside, 5/8:14

Butcher, Dane

- Guest Overview
 - Doing It with Digital, 2/20:39

C

Calabrese, Darlo

- Highway FM Scheme Established in Italy, 3/27:19
- Italian Antenna Firms Prosper, 5/22:53

Careless, James

- Interactive DAB: The Next Step, 7/10:11

Chick, Robert E.

- On the Air with KTWR Guam, 8/21:15

Cole, Arthur

- Annual FCC Fees Considered, 9/11:7
- Cheney Opposes L-Band Use, 9/11:3
- New Fees for Towers, 7/10:12
- WARC Group Endorses L-Band, 6/12:7

Cole, Harry

- Cole's Law
 - Defining the Main Studio Rule, 7/24:19
 - EBS: A Little DAB'll Do Ya?, 8/21:23
 - FAA Scheme Makes "Furr" Fly, 3/27:24
 - FCC Refines Its Fines, 9/25:20
 - Ins and Outs of Station Leasing, 6/26:24
 - LMAs: Pros and Cons, 12/25:13
 - The Main Studio Rule Revisited, 10/23:23
 - Settling the Settlement Issue, 1/23:26
 - Taking a Peak at Modulation, 5/22:42
 - The Truth and Nothing, But... , 2/20:25
 - Ways to Extend Your Construction Permit, 4/24:21

Crowley, Steve

- Consultants Corner
 - Air Force Takes Aim at L-Band, 6/26:23
 - Coping with the FCC's AM Station Crackdown, 4/24:18
 - DAB's Competition Heightens, 3/27:25
 - DAB Service by Wireless Cable, 2/20:18
 - Do Microwaves Cook S-Band?, 11/20:19
 - KinTel Initiates In-Band DAB, 9/25:26
 - Looking for a Place in the Band, 10/23:28
 - Understanding Synetcom's DAB, 8/21:25

USA Digital Hopes for In-Band Fit,

- 7/24:12
- Using a Technical Consultant, 1/23:7

Cummuta, John

- Engineering Manager
 - In Business, Cash Is King, 5/22:34
 - Choosing a Business Structure, 3/27:33
 - Convert Leads Into Customers, 11/20:25
 - Embracing the New Year's Possibilities, 1/23:25
 - Making Business Make Money, 4/24:15
 - Marketing: What's It All About?, 6/26:18
 - The Right Advertising Media, 9/25:28
 - Selling Yourself with Letters, 8/21:40
 - The Unique Selling Proposition, 7/24:23
 - On Your Own: Why and How, 2/20:26

E

Enstrom, Howard L.

- Lowpower Lowdown
 - Build a Translator in Five Steps, 7/24:28
 - Can I Put a Translator There?, 9/25:21
 - "Chicken Coop" Workmanship, 6/26:16
 - Four FM Translators in Action, 2/20:13
 - A Guide to Translator Coverage, 1/23:22
 - Remember to Protect Primary Station Signals, 10/23:38
 - Tracing the Path of FM Broadcast Translators, 8/21:31
 - Translators in Tough Terrain, 3/27:28
 - A View of the New World Order, 4/24:14

F

Felker, Lex

- Felker's Forum
 - Dateline: Radio Belgium, 4/10:15
 - FCC Clarifies Class A Upgrades, 7/10:32
 - FCC Decides Policy for RITOE, 3/13:19
 - Licensing by Live Auction, 2/6:37
 - Mind Your P's & Q's with EBS, 5/8:23
 - Ownership Revisions Repeat the Past, 8/7:26
 - Principles of Power Multiplexing, 1/9:14

Ford, Ty

- AES Show Wrap-Up
 - Convention Panel Tests Emperor's New Cables, 11/20:9
 - Products on Parade, 11/20:7
 - SPL Effects Debated, 11/20:11
- Focus on Production
 - Racking Up Production Gear, 2/6:13
- Maturity in Digital Workstation Arena, 5/22:15
- Producer's File
 - dbx's Cost-Cutting Hiss Reducer, 1/23:8
 - The ElectroVoice RE-27N/D,

10/23:26

- Industrial-Strength SV-3900, 3/27:29
- Lexicon's All-in-One Effects Box, 6/26:15
- Making the Switch to Digital, 5/22:44
- The Many Colors of Capitol, 7/24:29
- A New World of Multitracking, 11/20:13
- A Processing Swiss Army Knife, 4/24:16
- Racking Up Production Gear, 2/6:13
- Removing Studio Hot Buttons, 8/21:27
- Ringing Ears Could Spell Tinnitus, 2/20:29
- Shure Solves Open Mic Woes, 9/25:24
- Surviving the NAB, 3/27:22
- Technology Breakthroughs
 - Predicting the Future For Production Gear, 8/21:36

Freeman, Alan

- Buying a Digital Audio System, 8/7:22

Frost, Tim

- U.K. Radio Uses XIS Digital, 8/21:14

G

Gruszka, Mary C.

- BBC Renovates U.S. Studios, 6/12:13
- Future of AM Radio Debated, 6/26:10

H

Hallikainen, Harold

- Insight on Rules
 - ANSI and Transmission Lines, 2/6:20
 - Data 'Til the Cows Come Home, 7/10:31
 - FCC Self-Inspection, 12/11:13
 - A Guide to RF Rule Compliance, 1/9:13
 - A History of Licensing and Rule Compliance, 6/12:32
 - Keeping Towers in Compliance, 8/7:25
 - RF: How Close Really Is Safe?, 3/13:26
 - Shedding Light on Tower Lamps, 11/6:22
 - Shedding Light on Tower Rules, 9/11:15
 - Understanding RF Exposure Hazards, 5/8:25
 - Understanding the FCC Self-Inspection Report, 10/9:14
 - Watch for Tower Burnouts, 4/10:24

J

Jones, Thad

- Special Report
 - Choosing Tower Ice Protection, 5/22:57

K

Kautz, Jerry

- Focus on Transmission
 - Purchasing Used Transmitters, 7/10:18

Keane, William K.
Guest Editorial
L-Band Dream Could Be NAB's Curse, 10/9:5

Kopitz, Dietmar
RDS Makes Inroads in Europe,
7/24:7

L

Lambert, Mel
Digital Domain
The Advantages of Digital Transports, 4/10:20
CD: *A Format Reborn*, 6/12:29
Data Compression Call to Arms, 1/9:20
DAT vs. DCC: *Is It Any Contest?*, 5/8:18
Digital Makes Inroads at AES, 11/6:16
The Ins and Outs of Digital I/Os, 2/6:28
Making the Transition to Digital, 10/9:16
Refining Digital I/Os, 7/10:33
Searching for a Common Language, 12/11:23
Serial-Capable DAT Moves In, 3/13:15
Solutions to Digital Interfacing, 8/7:16
Starting Your Digital Library, 9/11:28
NAB: *Keep an Eye on Digital*, 3/27:11
On-Air Use of Digital Grows, 5/22:28
Technology Breakthrough
Digital Gear Means New On-Air Choices, 6/12:21

LeBow, Gerald
Guest Editorial
Take Part in the EBS Inquiry, 11/6:5

Lewbel, Neil
WEBE-FM Takes to the Rails, 2/6:27

M

M

Martin, Dennis J.
Innovation Marks STL, Telco and Remote Gear, 5/22:18

McGinley, Tom
The "Sikesian" Model for Radio, 4/24:19
Technology Breakthroughs
Solid State for FM Faces Cost Concerns, 7/10:17

McVicker, Dee
Facilities Showcase
KCEV Checks Out For a New Facility, 3/27:26
KOZT: A Real Do-It-Yourselfer, 5/22:33
KSRR Occupies Osmond Legacy, 11/20:24
NY Stations Take Over Plant, 2/20:27
Power 93 Moves with Ratings, 4/24:21
Recession Stops Short of KJZS, 9/25:25
Smokey Performs a Miracle with KATP-FM, 8/21:33
The Sounds of Silence Prevail within WIBM, 10/23:22
Special Delivery Radio Station, 6/26:22
Surf and Sound in Panama City, 7/24:24
WYHY Sheds Its '70s Image, 1/23:17

Offbeat Radio
Kissing KIST's Tower Goodbye, 1/9:29
KTAO-FM Lets the Sun Shine In, 10/9:30
Location Audio Key to ZBS Radio Drama, 8/7:15
LPB Helps Spread the Word, 9/11:13
Pirate Evades FCC's Clutches, 2/6:18
Radio Buffs Collect Memories, 5/8:15
Remote Offers Ski Resort a Lift, 6/12:34
Tape Recipe: Heat and Serve, 12/11:11
Trouble Rains Down on KBRC, 4/10:14
WRXL's Great Crane Caper, 3/13:28
WWWE Relives Deja Vu—Again, 7/10:27

Mishkind, Barry
Computers Find Niche in Radio, 6/12:22
Contract Engineer
Keeping On Top of Paperwork, 6/12:30
Eclectic Engineer
Be Aware of Personal Safety, 12/11:12
Coordinating Product Delivery, 4/10:25
The Erosion of Engineers, 1/9:16
"How to Find a Big Paying Radio Job," 7/10:30
Make Your Studio a Safer Place, 8/7:21
Plan for Equipment Deliveries, 3/13:14
Planning for Security On Station Property, 10/9:27
Reduce Costs, Not Engineers, 5/8:24
Safety (First) Can Save Lives, 9/11:18
Security Should Come First, 11/6:25
Straightening Out the Radio Learning Curve, 2/6:17

Keyboard Connection
An Effective D&A PC Program, 2/20:16
Computer Programs on a Budget, 8/21:32
Cures for Computer Viruses, 3/27:23
DOS 5.0 Signals New Era for PCs, 7/24:18
Exploring Computer Software, 11/20:20
Fax.Modems Connect the World, 9/25:32
How to Treat a Computer Virus, 6/26:21
A Picture Window to Your PC, 5/22:46
Playing the PC Name Game, 1/23:20
The Power of Word Processing, 10/23:31
Program Sees STL Paths in 3-D, 4/24:17

Montgomery, Ed
Amplifier Fundamentals
Understanding RF Amplifiers (part IX), 1/9:19
Understanding RF Amplifiers (part X), 1/23:15
Radio Frequency Amp Design

Considerations (part XI), 2/6:33
Klystrons, Tubes and Downlinks (part XII), 2/20:15
Book Review
A Guide to Making the Grade, 4/10:16
DC Fundamentals
Current Flow Begins with Electronics (part I), 10/23:24
Coming to Terms with Circuits (part II), 11/6:28
The Principles of Ohm's Law (part III), 11/20:13
A Guide to Understanding Watt's Law (part IV), 12/11:14
Understanding Primary and Secondary Cells (part V), 12/25:14
Morrill, Geary
Adapting to the New Age of Digital Effects, 6/26:31
Processing Enters Digital Age, 5/22:19

O

Osenkowsky, Tom
Better AM Array Performance (part II), 1/23:10
A Closer Look at AM Antennas (part III), 2/6:22
Guest Editorial
Art Silver: In Memory of A Silent Key, 7/10:5
NAB Addresses AM Concerns, 5/22:20

P

Peterson, Alan
Focus on Production
E-Mu Proteus Adds to the Mix, 2/6:15
From the Trenches
"Ayl You 'Ungry?," 10/23:25
DADs from the Field, 8/21:22
Dead Air Dreams: Dealing with Dread, 6/26:29
Fires Spark Action, 2/20:19
Great Grumbyisms, 11/20:22
It's Hard to Believe Hard Disk Progress, 7/24:13
Meet My Listeners, 3/27:21
My Side of the Podium, 4/24:13
Reliving the Radio Memories of Youth, 9/25:29
A Remote from Hell, 1/23:19
Use Musical Contacts, 5/22:43

R

Rebmann, Paul
Florida FM Faces Tower Move, 10/9:12
Reist, Nancy
Improvements List Eyed, 11/6:14
Know FCC Technical Regulations, 10/23:17
Spend Now, Save Later, 10/23:14
Riggins, George
Latest in Cart Decks, 5/22:21
New Console Products Offered, 5/22:22
Old Timer
Are You Ready for Disaster?, 4/10:17
Exploring the History of FM, 12/11:27
A History of Chain Broadcasting, 2/6:16
Life and Times of Major Armstrong, 10/9:28
The Name's Tedford; Call Me Ted,

5/8:19
Nashville AM Keeps the Beat, 7/10:26
A Road Tour of Radio From the Heartland, 9/11:17
SBE and Old Friends Revisited, 1/9:33
Why Was the Blue Book Blue?, 3/13:24

S

Sepmeyer, Bill
Know Dial-up Remote Risks, 5/8:22
Shepler, John
Focus on Transmission
How to Avoid Lightning Strikes, 7/10:20

Q-Tips
Designing for Versatility, 3/13:23
Diverting Lightning From the Transmitter, 12/11:24
How to Handle an Ownership Change, 1/9:21
How to Select the Right Mic, 6/12:27
Protection from Thunderstorms, 8/7:24
The Right Amount of Clipping, 2/6:34
Rites of Passage on the Job, 4/10:22
Static Protection for Towers, 9/11:23
Staying Alive at the Transmitter, 11/6:23
Treading the Path to Job Satisfaction, 5/8:17
What to Do Once You're Hit, 10/9:15

Starling, Mike
CCIR Agrees on Spectrum, 1/9:1

T

Talbot, Daniel B.
Guest Editorial
Multiplexing Problems, 11/20:5

V

Vernon, Tom
Station Sketches
Appreciating Grid Dip Meters, 9/25:39
How Long Will Batteries Keep?, 10/23:22
The Inside Track on Off-Air Monitoring, 2/20:17
A Look at Harmonic Resonators, 6/26:28
Maintenance of Drive Systems, 8/21:35
PC Programs Prioritize Projects, 5/22:41
Use HyperCard to Drill New Radio Operators, 7/24:15
Using a Function Generator, 3/27:34

W

Watkins, Pamela
Engineer Finds Niche Out West, 8/21:18
Market Update
San Francisco Market Focuses on Efficiency, 8/21:53
Mixing Business with Towers, 11/6:9
WPR Looks to Digital Production, 11/6:12

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 re-useable 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 con-



The FC-100 cuts the feedback while bringing out quiet voices.

sole to the point of feedback. I marked this position while Groh put the FC-100 in line between the microphone and the console.

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 la-

pel 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 Alphon 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 be-

long 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.

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.

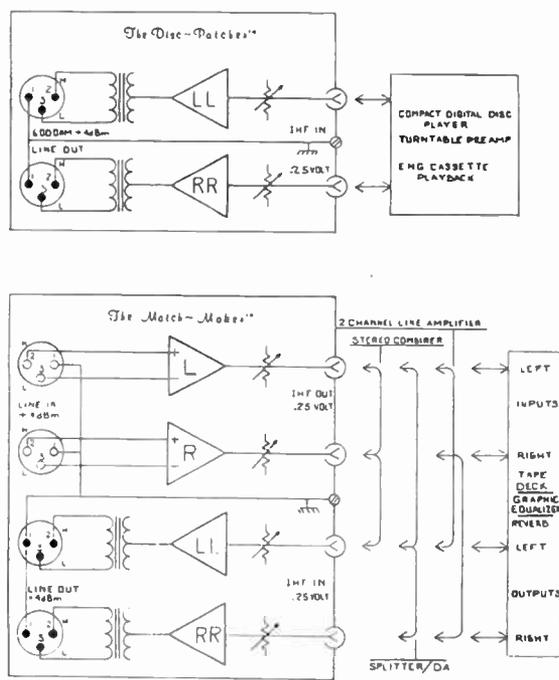
We will immediately:

- 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.

Figure 1.

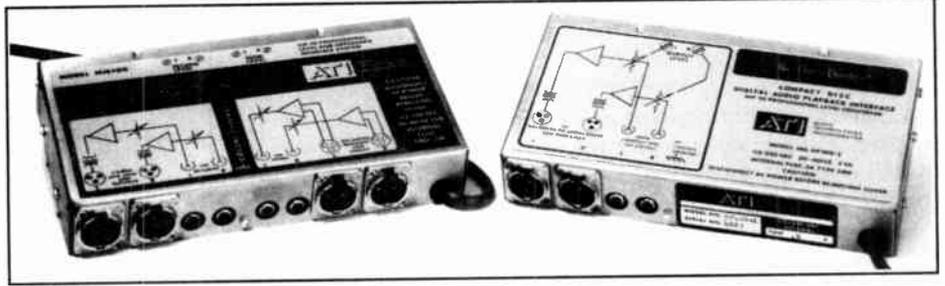


we will refer you to this article for the solution.

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 feed, for example, the record inputs of a consumer cassette or reel-to-reel tape



ATI's Match-Maker (left) and Disc-Patcher

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."

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

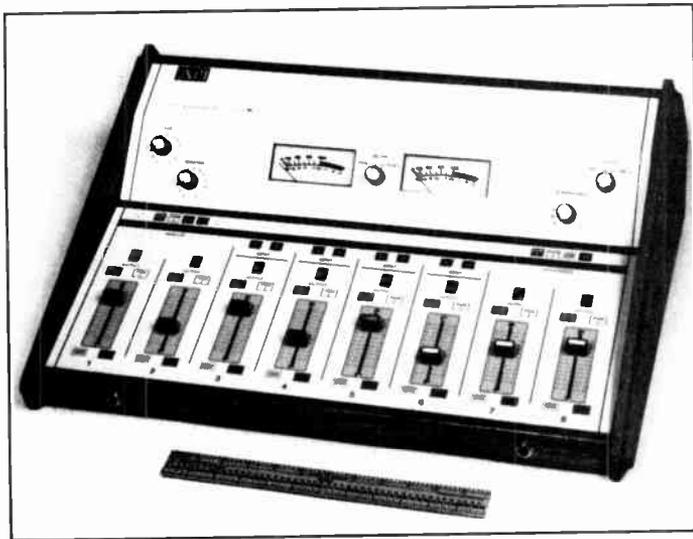


Figure 1: The ATI Vanguard Series, BC8DS, 8 mixer dual stereo Broadcast Console with linear faders. This model is also available with rotary faders. The Vanguard 12 mixer console is available with linear faders.

being marketed and we had found our marketing niche.

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 thought 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

Our objectives were reached by using innovative technology.

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.

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

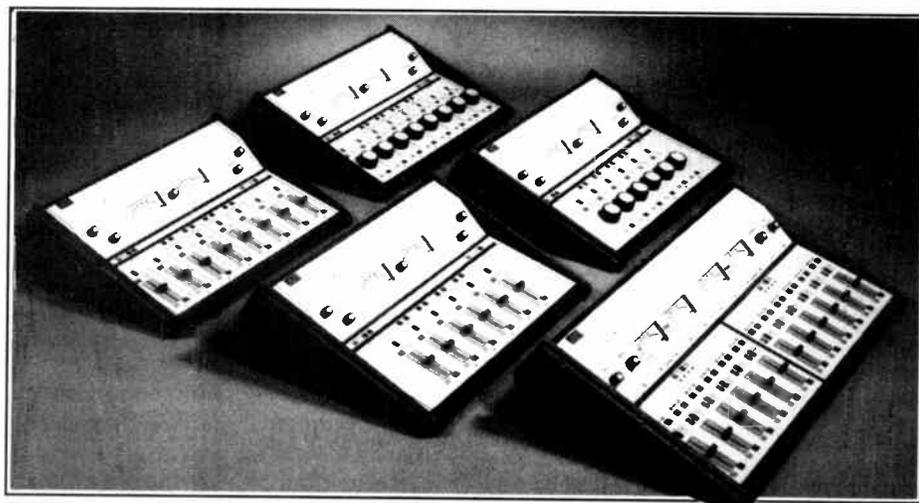


Figure 2: The complete ATI Line of Vanguard Series of Broadcast Audio Stereo Consoles; 6, 8 and 12 channels.

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.

DL Series Aims to be Best Buy

by **Andy Rector**
President
Audi-Cord Corp.

NORMAL, III. 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 phi-

losophy trends.

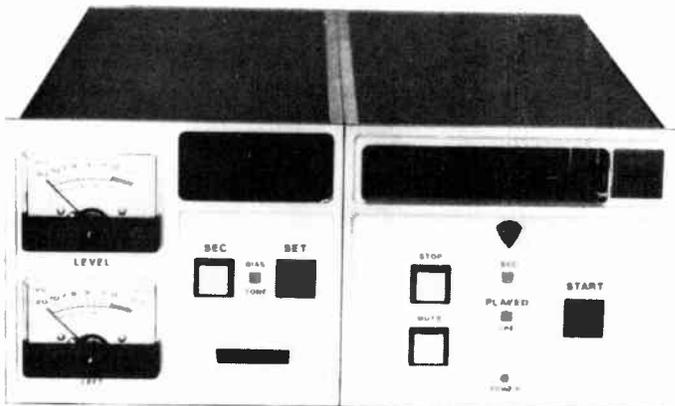
Martin saw several things happening in broadcasting in the mid-1980s that led him to see the need for change. He felt it was time to reverse the trend of more features for higher cost and design instead for cost reduction.

Audi-Cord launched an 18-month program to design a basic cart machine that

TECHNOLOGY UPDATE

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

Today, Audi-Cord buys few parts from outside vendors, instead preferring to manufacture mechanical parts in our in-house machine shop.

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.

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.

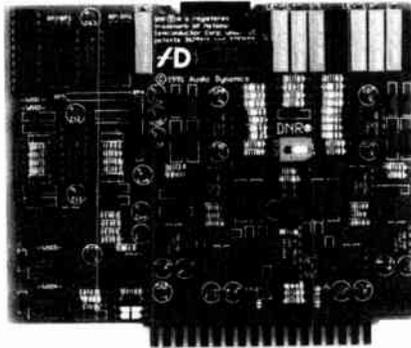
Reprinted from Radio World December 25, 1991.

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

TECHNOLOGY UPDATE

technique that exploits the psychoacoustic noise masking properties of high frequency audio material.

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 audiopak AA-4 cart

the same dynamic range and frequency response from all our carts.

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 multifunction 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 alphanu-

meric 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

Eight different time constants of a peak weighting function may be selected from the front panel.

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.

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.

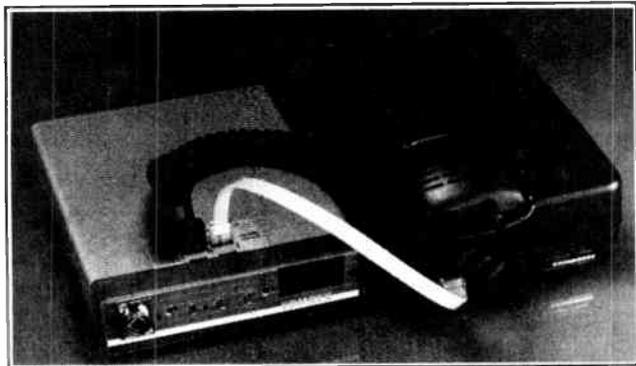
To interface your mixer with telephone lines, you need a telephone coupler such



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 pro-



Comrex PLX cellular interface

gram 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.

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 multi-line 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

Comrex makes frequency extenders for one, two or three phone lines . . .

press box. It accepts both program and cue signals and sends these to the LPQRA pocket receiver. Cue instructions automatically duck the program.

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.

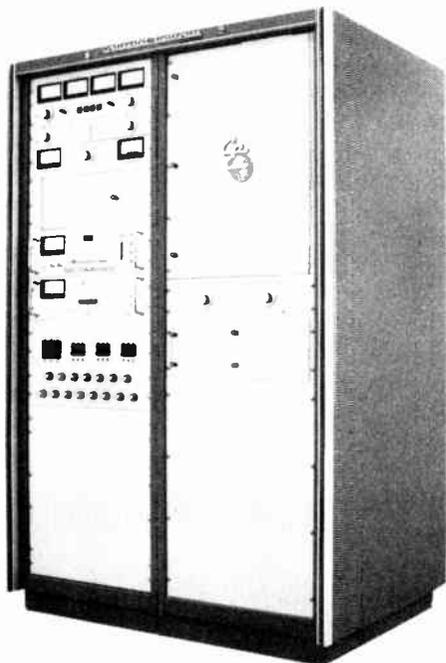
USER REPORT

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

The 816A uses a 4CX15,000A power tube.

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.

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

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.

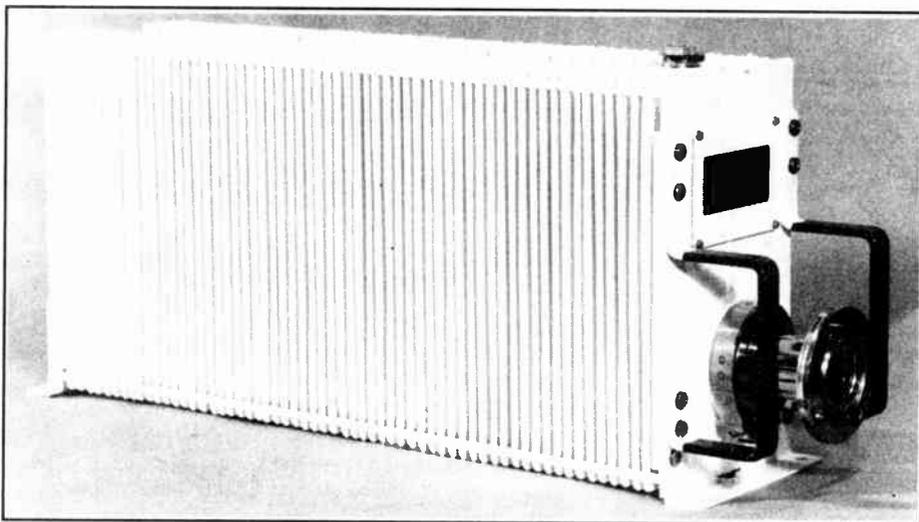
A device to measure RF power is normally installed with the dummy load. This device, depending on the frequency

TECHNOLOGY UPDATE

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.

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 volt-



Electro Impulse Lab makes a wide range of dummy loads.

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 over-heat.

Loads are normally fitted with an interlock circuit, which provides for a set

age 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.

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.

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.

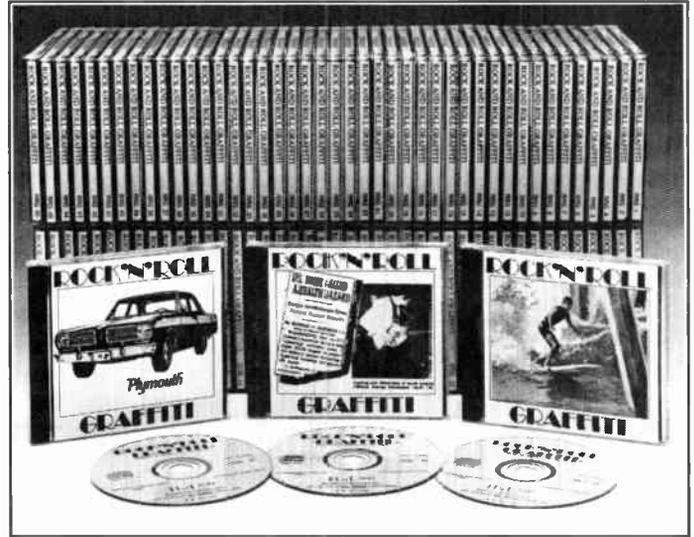
This usually was the lead vocal, because human voices sound very non-human when heard with the comb filter effect of phase error. Instruments are much more tolerant in this regard. The phase-correction device we used contained a combination of time-shift and phase-shift capability, and it too was calibrated 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 mas-



The Rock'N' Roll Graffiti Library is used by more than 300 stations worldwide.

ter. 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.

"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.

TECHNOLOGY UPDATE

ITC Excels in Analog Domain

by Lane Lindstrom
CE, WJEZ-FM

PONTIAC, III. 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 micro-processor-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,

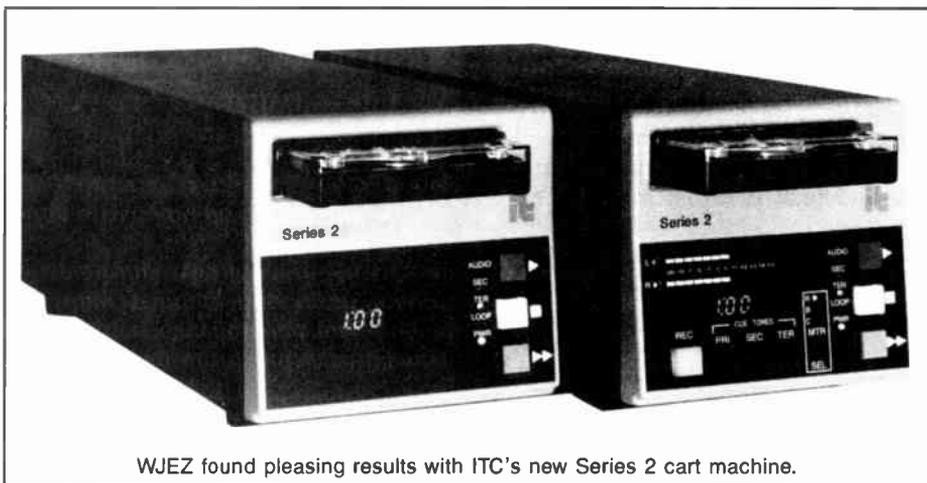
When unplugged, the entire motor/deck assembly lifts right out in one piece for service.

The Record Logic, Record Amp, Play Logic and Play Amp PC boards (two

ITC came up with a winner in its solenoid and pressure roller linkage design.

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.

Although its Series 1 heritage is evident in the outer package, the Series



WJEZ found pleasing results with ITC's new Series 2 cart machine.

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.

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.

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. Interconnection 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.

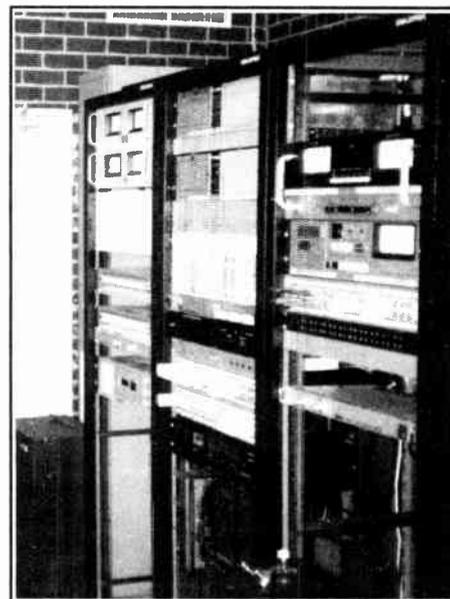
With the availability of frequencies being greater than in the U.S., 3MMM has the luxury of the two STL systems operating on separate, different frequencies.

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



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.

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.

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.

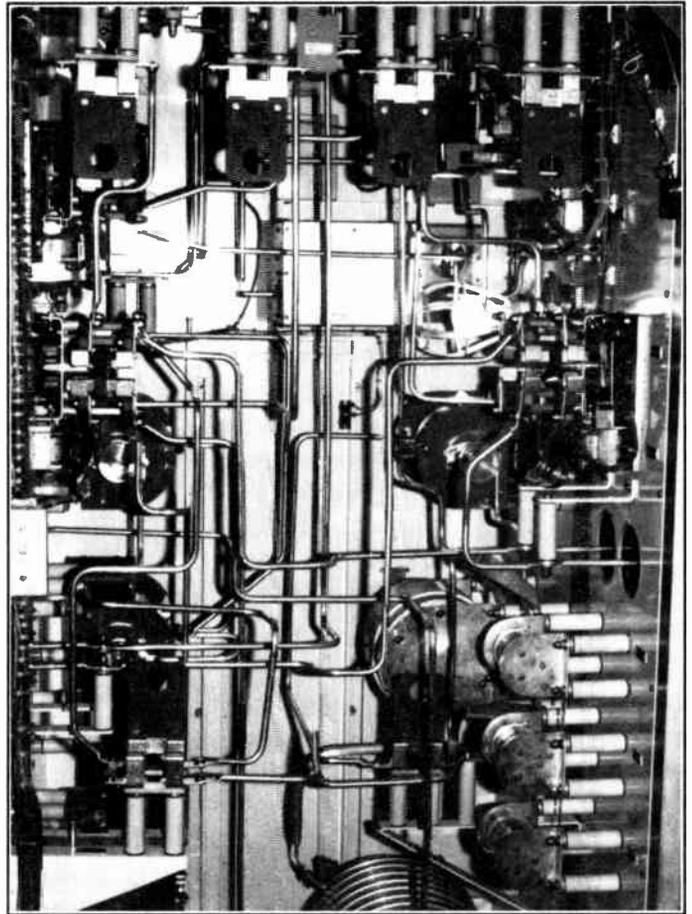
RF plumbing was as easy as it could be. The cable clamps, which are manufactured by Kintronic Labs, were much easier to deal with than EIA flanges, "spark plugs" or other common line terminations.

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.

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



A view from inside KPBC's Kintronic Laboratories' phasor.

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

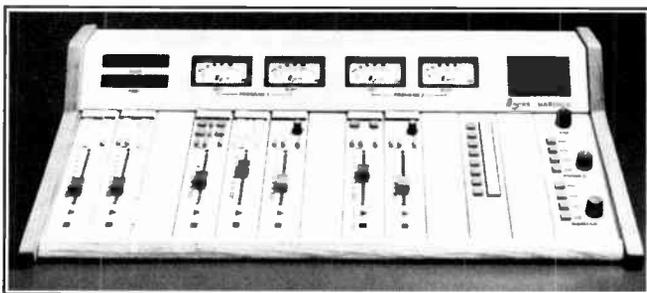
HOUSTON The Mariner console series was introduced at the NAB show in Las Vegas this year as a ground-up redesign of Logitek's popular Perfectionist on-air consoles.

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.

The electronically balanced inputs have an adjustment-free

TECHNOLOGY UPDATE

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.

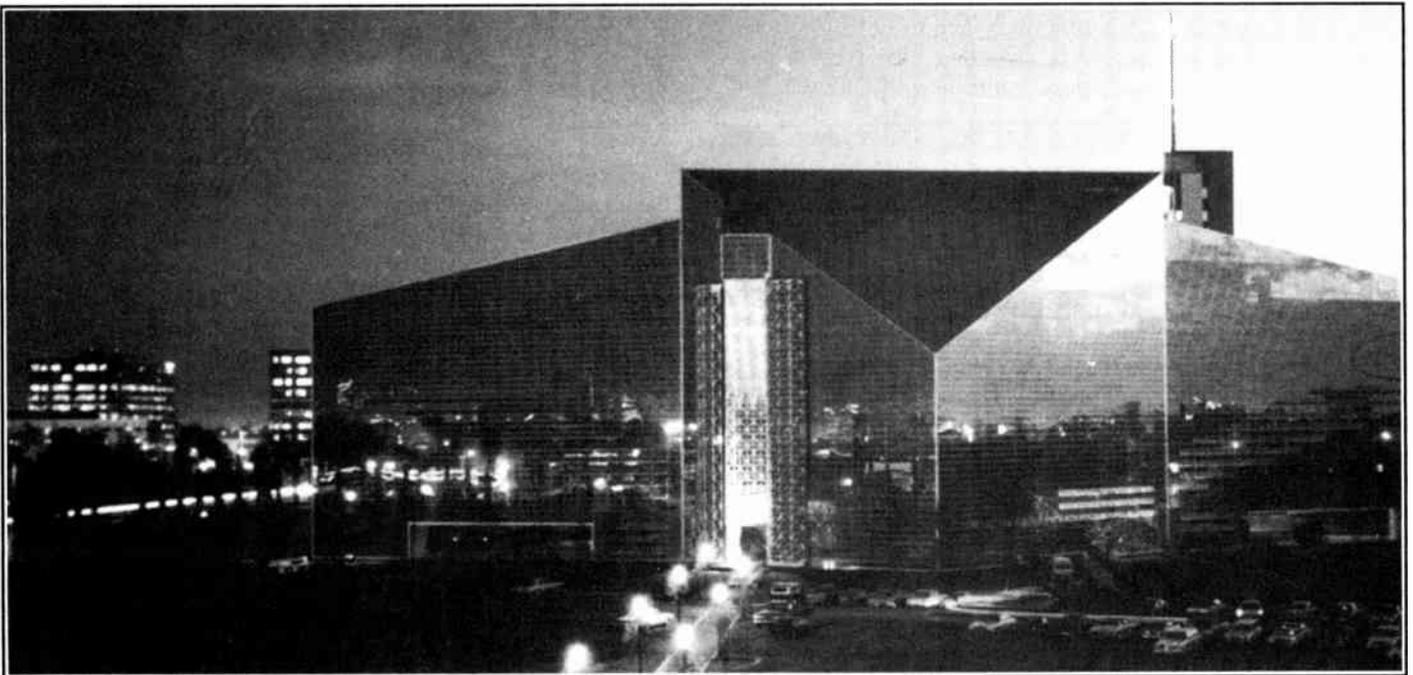
Again using leaky cable and a low-powered AM transmitter, typically less than 5 W, this service offers parishioners the ability to hear sermons more easily on their AM receivers. To radiate the signal, LPB's exclusive RADIO-AIDE leaky cable, which runs approximately 300 feet, is looped overhead—or underfoot, 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

ALLENTOWN, Pa. There are many advantages to operating several radio stations, including the ability to standardize on certain pieces of equipment.

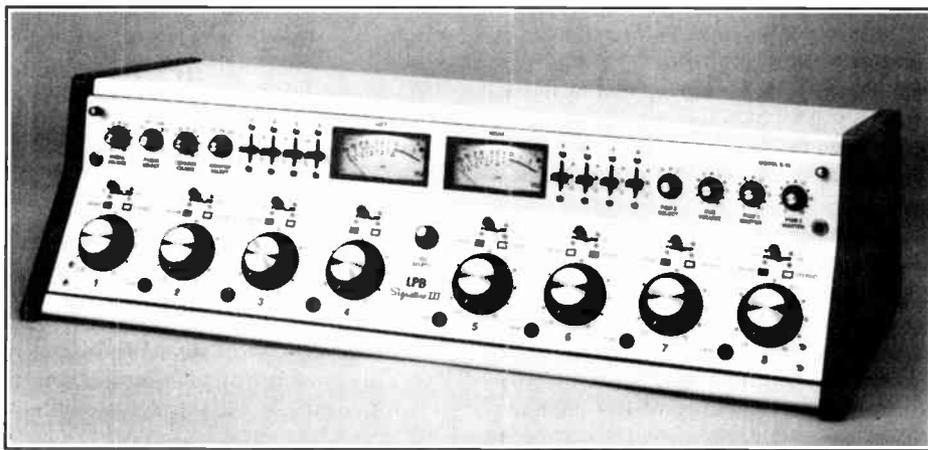
This standardization helps keep your

much easier for me.

We currently have 21 consoles in the group. Thirteen of those are LPB con-

USER REPORT

soles, with 11 of them being Signature II or Signature III Series consoles. I am



The Signature III is among 13 LPB consoles owned by HGF Media Group.

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

These consoles can take all of the abuse, misuse and daily wear and tear that can be imagined . . .

which equipment you "inherit"—you deal as best you can with the equipment that comes with the license.

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

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-telephone" 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.

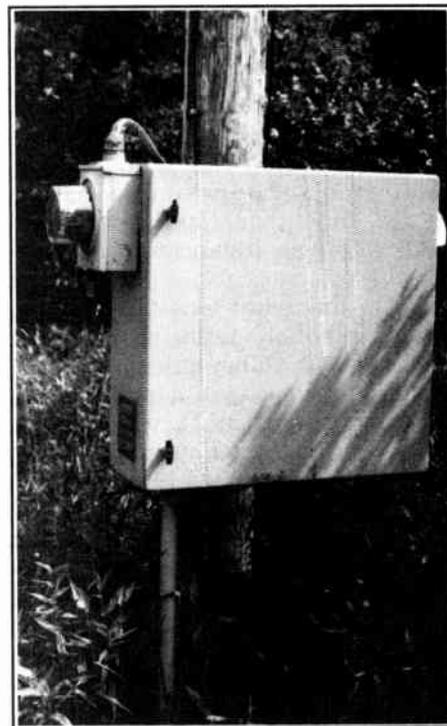
Unlicensed applications

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

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

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

The Micromax has a fixed tape guide arrangement machined to maintain the exact tolerance of the tape you are using.

and made them factory preset.

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.

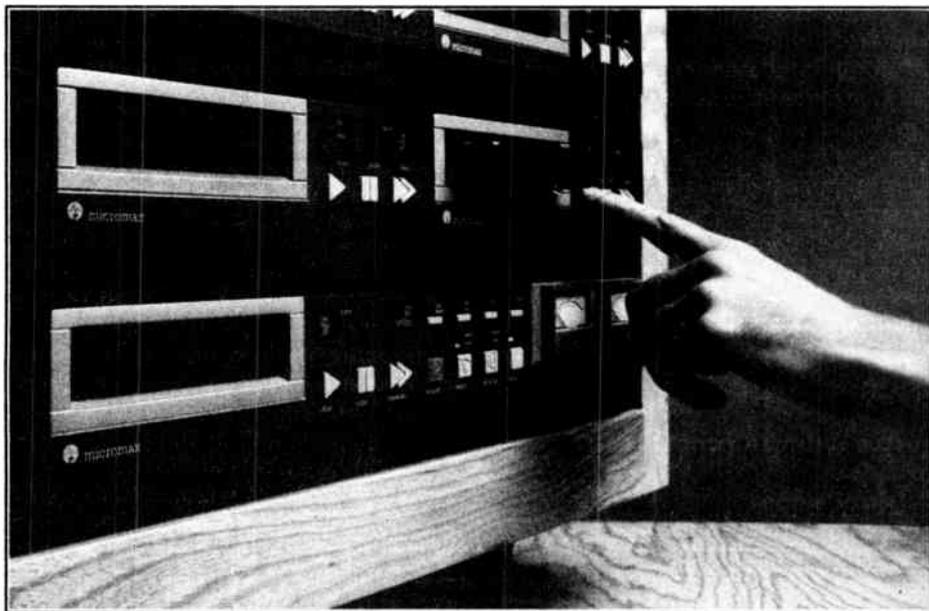
Deck numbering

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.



The Micromax from Pacific Recorders is used in 40 NewCity Communications' facilities.

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

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.

Accessible service

All electronics in the Micromax are laid out horizontally on top of the machine,

ProductionMixer Excels at KPBS

by Christopher Durso
CE, KPBS-FM

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



Pacific Recorders' ProductionMixer can add a competitive edge with 20- and 28-input boards.

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

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-

The engineering department will appreciate the layout and construction of the circuit cards.

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 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

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 Production-Mixer, 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,

Space limitations of doorways, hallways, stairs and elevators need to be considered before the furniture arrives.

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

TECHNOLOGY UPDATE

paging, emergency alerting, remote control and many other services.

RDS was introduced at the 1987 International Radio Show in Berlin and is used according to the CENELEC 50067 standard developed by the European

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

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.

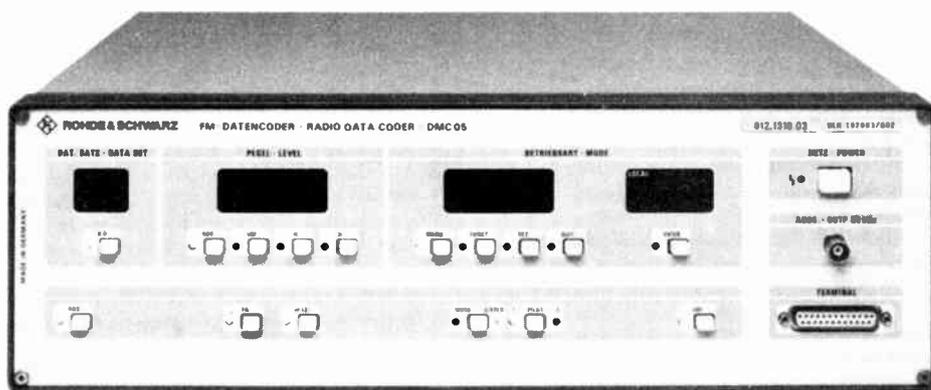
The data is transmitted in a baseband coding structure called "groups" and different types of groups are specified to cover the various applications of the RDS system. Each of the 15 groups consists of 104 bits. Each group comprises four blocks of 26 bits. Each block comprises an information word and 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.



The Rohde & Schwarz RDS FM Datencoder.

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.

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

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 biphasic coded data signals. During stereo broadcasts, the subcarrier frequency will be locked to the third harmonic of the 19 kHz pilot tone.

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

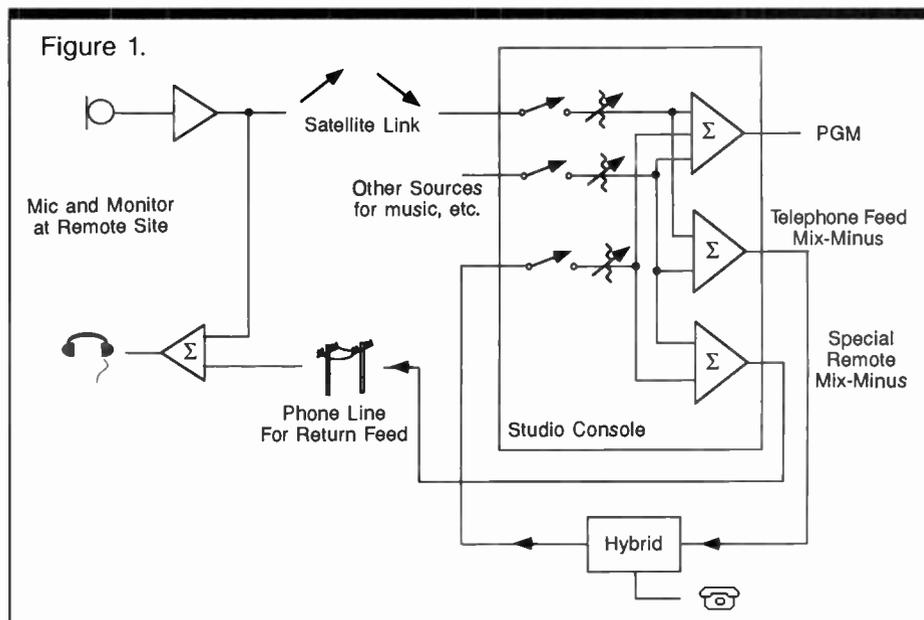
At the nearest, our earth-bound satellite transmitting and receiving dishes are 22,300 miles from the orbiting "repeater." At 186,000 miles per second, an up-and-down trip takes about 300 ms, a delay

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 ac-



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-

complishing 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

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,

switches for easy playback of completed two-track recordings. Master output level controls (stereo program, stereo audition and program mono) all are conductive plastic. Front panel trims are included for easy level calibration. A control room monitor module is standard with built-in head-



The new SP-44 offers multitrack production and on-air capabilities in one package.

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.

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.	Page No.	Advertiser	Reader Service No.
64	Amp Services	79	14	Henry Engineering	77
34	ATI	84	23	Henry Engineering	87
116	ATI	115	53	Henry Engineering	62
23	Altronic Research	2	58	Henry Engineering	25
45	Aphex Systems	56	43	Holiday Industries	81
11	Audio Animation	151	19	ITC	16
64	Audio Dynamics	32	21, 22	International Broadcast Supply	89
12	Audiopak	29	24	Inovonics	51
27	Audiopak	33	39	Inovonics	93
9	Auditronics	10	10	Intraplex	76
63	Autogram	75	117	JNS Electronics	83
61	Broadcast Devices	91	114	Kintronic	26
110	Broadcast Electronics	92	38	Motorola	17
16	Broadcast Equipment Sales	100	112	Multiphase	45,109
20	Broadcast Services	15	63	Murphy Studio Furniture	94
64	Broadcast Software Ltd.	103	29	Myat	122
4	Cablewave Systems	54	55	Nautel	119
13	Capitol Production Music	67	63	Northern Technologies	55
111	ComStream	141	61	Nott Ltd.	4
41	Comtech Antenna	60	17	Pacific Recorders	—
42	Crouse-Kimzey	41	52	Peter Dahl	124
15	ESE	72	46	+4 Audio	131
62	Econco	137	16	QEI	3
54	Electro-Impulse Lab	111	28	QEI	46
115	Elenos	98	36	QEI	147
2	Eventide	50	44	QEI	36
7	Flash Technology	22	50	QEI	143
64	Focal Press	150	56	QEI	128
25	Gepco International	12	26	RF Technologies	105
47	Hall Electronics	152	35	ROHN Towers	113
49	Hall Electronics	9	33	SMARTS Broadcast Systems	6
51	Hall Electronics	96	113	Sailors Audio	71
30	Holland Broadcast Services Inc.	23	62	Sontec Electronic	73
62	Hallikainen & Friends	114	3	Studer Revox	19
155	Harris-Allied	126	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

Advertising Sales Managers:

In the U.S.:
 East & Midwest: Art Constantine
 800-336-3045 FAX: 703-998-2966
 West Coast: Jack Ducart
 916-962-2240 FAX: 916-962-2194
 Station Services: Dale Tucker
 510-935-1470 FAX: 510-937-2280

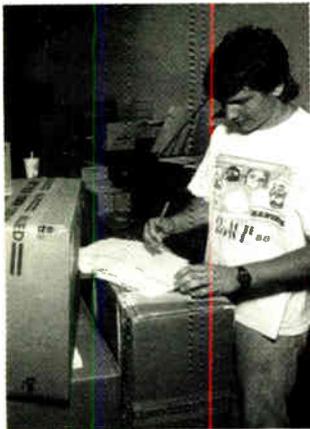
Outside the U.S.:
 Europe (excluding Italy): John Tilly
 +44 (0)-71-9162926 FAX: +44 (0)-71-9110614
 Italy: Dario Calabrese
 +39 (0)-2-7530274 FAX: +39 (0)-2-7532697
 Other regions: Steve Dana
 +1-703-998-7600 FAX: +1-703-998-2966

**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

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

World Radio History