

BE *Radio*®

September/October 1997/\$10.00

An INTERTEC®/K-III Publication

...from the Editors of **BROADCAST**
ENGINEERING

TALK RADIO

Being the talk of the town

AUDIO PROCESSING

Your sound is
your image



Pristine mic preamps, natural EQ, beaucoup exclusive features, astonishing headroom, an extra stereo bus... and tens of thousands of enthusiastic owners.

MS1402-VLZ

■ **"Great mixer. Really cleaned up the sound of my recording and has done a great job live mixing keyboards with the band and as my main mixer on solo and duo gigs."**
(J.S., Martinez, GA)

■ **"Finally, a lightweight/compact mixer loaded with practical features that delivers clean, no-noise sound!"**
(R.B., Franklin, WI)

■ **"Beautiful layout and the smoothest faders I've ever seen in a compact mixer."**
(B.L., Cedar Hill, TX)

■ **"Great product. Clean sound. Live recordings are great!"**
(D.L., Denton, TX)

■ **"I really like the Control Room mixing and Alt 3-4."**
(R.P., Fort Lee, NJ)

■ **"I am greatly impressed with the very low noise of the mic preamps."**
(T.T., Belair, SA)

■ **"I really dig all the features you pack into such a small price. My 1402 was really easy to get into and use."**
(R.R., Murray, UT)

■ **"I didn't believe the hype until I bought an MS1402-VLZ. NOW I believe the hype."**
(J.C., Toronto, ON)

■ **"Sure like that 'stereo solo in place' feature. Also, headroom is great with lotsa presence."**
(L.S., Forest Grove, OR)

■ **"You've heard it all before, I'm sure. Great product. Great price. Options and versatility out the wazoo, from hardware design right down to panel labeling."**
(J.H., Ithaca, NY)

■ **"I really like the EQ points you've chosen and the EQ curves."**
(B.M., Lanseshore, MA)

■ **"Plastic mixers can break easily. The MS1402 is made of metal!"**
(M.S., Shorewood, IL)

■ **"I will be using the MS1402 to track all keyboards on MANDBWDWTWEL* for Atlantic Records."**
(R.H., New York, NY)

*Major act, name deleted because we don't want to tangle with entertainment lawyers.

■ **6 mic preamps.** The same high headroom, ultra-low noise (-129.5 dBm E.I.N.) preamps used in our 8-Bus studio consoles.

■ **6 mono and 4 stereo line level inputs.**

■ **2 aux sends per channel.**

■ **Low Cut Filter** lets you use LF EQ without boosting mic thumps, room rumble, and P-pops, or losing audible low bass. Exclusive Mackie circuitry.

■ **Trim with -10dB "virtual pad"** and 60dB total gain range.

■ **EFX to Monitor switch** folds reverb or other effects back into the Aux 1 stage monitor feed. Another Mackie exclusive.

■ **"The Alt 3-4/Mute is ingenious!"**
(B.L., Cedar Hill, TX)

■ **"On my test run — a live acoustic show — I was impressed by the quiet and user friendliness of the MS1402-VLZ. The audience was also impressed with its crystal clarity."**
(F.A., Bloomington, IL)

■ **"The 'RUDE' solo light is certainly that, but you never have to worry about leaving it on by mistake."**
(L.B., Winnepeg, LB)

■ **"The Low Cut button is a big help in cutting boomy stuff when running a big bass and arch-top guitar live."**
(G.S., Kirkland, WA)

■ **"The quality of the EQ is amazing! I was blown away by the tone and clarity."**
(J.D., Pomeret, CA)

■ **"The MS1402-VLZ is great — excellent specs (I teach audio engineering) and really clever routing options."**
(J.P., Los Angeles, CA)

■ **"What I heard when I hooked up my MS1402-VLZ was exactly what I wanted to hear. Nothing. Cleanest mixer I have ever worked with."**
(R.S., Fergus Falls, MN)

■ **"The 1402 RULES! People all the time come and tell me how wonderful the sound is."**
(P.F., Cincinnati, OH)

■ **"It survived and played through a glass of iced tea spilled all over it at a fashion show for a very important client of mine. Show was perfect. Client paid. I'm buying more Mackie."**
(H., Houston, TX)

■ **"I do work as a Senior Executive Producer for [major classical music label]. The MS1402 was highly recommended by several studio engineers."**
(S.E., NY, NY)

■ **"Great product!"**
(C.B., San Francisco, CA)



■ **Pre/Post Aux 1 mode switch.**

■ **2 master aux returns.**

■ **Balanced XLR outputs switch** between mic & line levels. Bal/ unbal. 1/4" TRS outputs, too.

■ **3-band EQ.** Others may have copied our EQ band centers but not the clean, musical sound of our unique circuit design.



■ **Solid steel chassis.**

■ **Easy level setting via LED display; in-place stereo solo feature** maximizes headroom & minimizes noise.

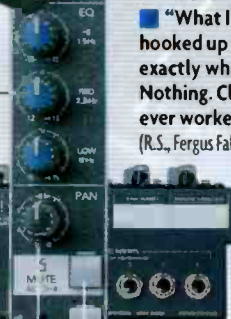
■ **Control Room/Phones switching matrix** and separate volume control lets you submix, feed multi-track tape machines, create separate monitor mixes, preview channels, and much more. A Mackie Designs exclusive.

■ **AFL/PFL solo mode switch.**

■ **Constant loudness pan control** for precise stereo mixes.

■ **Alt 3-4.** The MS1402-VLZ's Mute button is really a second stereo bus in disguise. A Mackie exclusive.

■ **60mm faders** with true log taper for accurate fades throughout the controls' travel.



MACKIE

All products made in Woodinville USA by certified Mackoids
Toll-Free in the US, 800/898-3211 • Int'l. 206/487-4333

E-mail: sales@mackie.com • www.mackie.com • NASDAQ: MKIE

Circle (1) on Free Info Card

Below: A few of the 400+ folks who work at Mackie Designs in Woodinville, WA, 30 miles north of Seattle.



Harris DIGIT[®] Digital Exciter



World Standard Digital FM Exciter

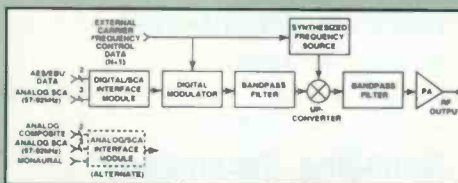
When we introduced the DIGIT[™] we knew it was going to be a world class FM exciter. In a little over a year the DIGIT[™] has proven to be the world standard with over 500 DIGIT exciters shipped.

The DIGIT[™] FM exciter can convert studio standard digital audio (AES/EBU) directly to FM stereo with no analog steps. Additionally, an analog input module is available to accept analog composite stereo for those who have not yet upgraded to digital.

Direct Digital Synthesis is accomplished with a numerically controlled oscillator. This digital implementation of FM assures you of the highest quality sound that

your station is capable of producing.

Included with the DIGIT[™]'s digital input module is a DSP based digital stereo generator which provides lower distortion and greater separation than any competing exciter. Also, included is a digital composite limiter (DCL) which is an implementation of the WAVES L1 Ultramaximizer[™], used by digital recording studios. Harris exclusive DCL allows DIGIT[™] to sound louder than competing FM exciters without over-modulation. The DCL uses "look ahead" circuitry to predict and correct overmodulation peaks before they can occur.



Harris DIGIT[™] Signal Blocks shows that although DIGIT[™] is revolutionary, its technology is easy to understand.

The DIGIT[™] FM exciter is capable of N+1 operation and is completely frequency agile with modulation level and linearity independent of carrier frequency.

Besides the DIGIT[™], Harris has a wide range of "Clearly Digital[™]" products for all your broadcast needs.

FEATURES:

- Proven Reliability backed by a 3 Year Warranty
- Digital FM Generation for 16 Bit Sound Quality
- Drift Free Digital Circuits
- Immunity to Subsonic Transients
- Compatible with all RDS/SCA requirements
- Full N+1 capability



Harris Corporation Broadcast Division

U.S. and Canada
TEL: 217-222-8200
FAX: 217-224-1439

Elsewhere:
TEL: 217-222-8290
FAX: 217-222-2764

<http://www.broadcast.harris.com>



©1996 HARRIS CORP.

FEATURES

24 Talk Radio

By *Chriss Scherer*

Talk shows require unique elements in areas ranging from physical design to equipment selection.

46 Audio Processing

By *Jeff Keith*

The battle of the ears: What sounds good and why. What to keep in mind and what to avoid when going for that 'perfect' sound.

72 Field Report: Orban 9200



24

DEPARTMENTS

6 Editorial

By *Skip Pizzi*

Getting to know your TCO.

8 Viewpoint

By *Chriss Scherer*

Road trip!

10 Contract Engineering

By *Kevin McNamara*

LAN basics, part 2 of 2. Putting it all together to make a LAN work in your station.

14 Managing Technology

By *Dave Maxson*

Datacasting: What are the business issues involved? Is this a sell-your-soul arrangement or a good deal?

18 RF Engineering

By *John Battison*

Proofs of performance: We still do them like in the old days.

22 FCC Update

By *Harry C. Martin*

Congress authorizes broadcast spectrum auctions.

71 Preview

76 New Products

84 Business/People

85 News

92 Classifieds

93 Ad Index

94 The Last Byte

By *Skip Pizzi*

Satellite DAB.



46



72

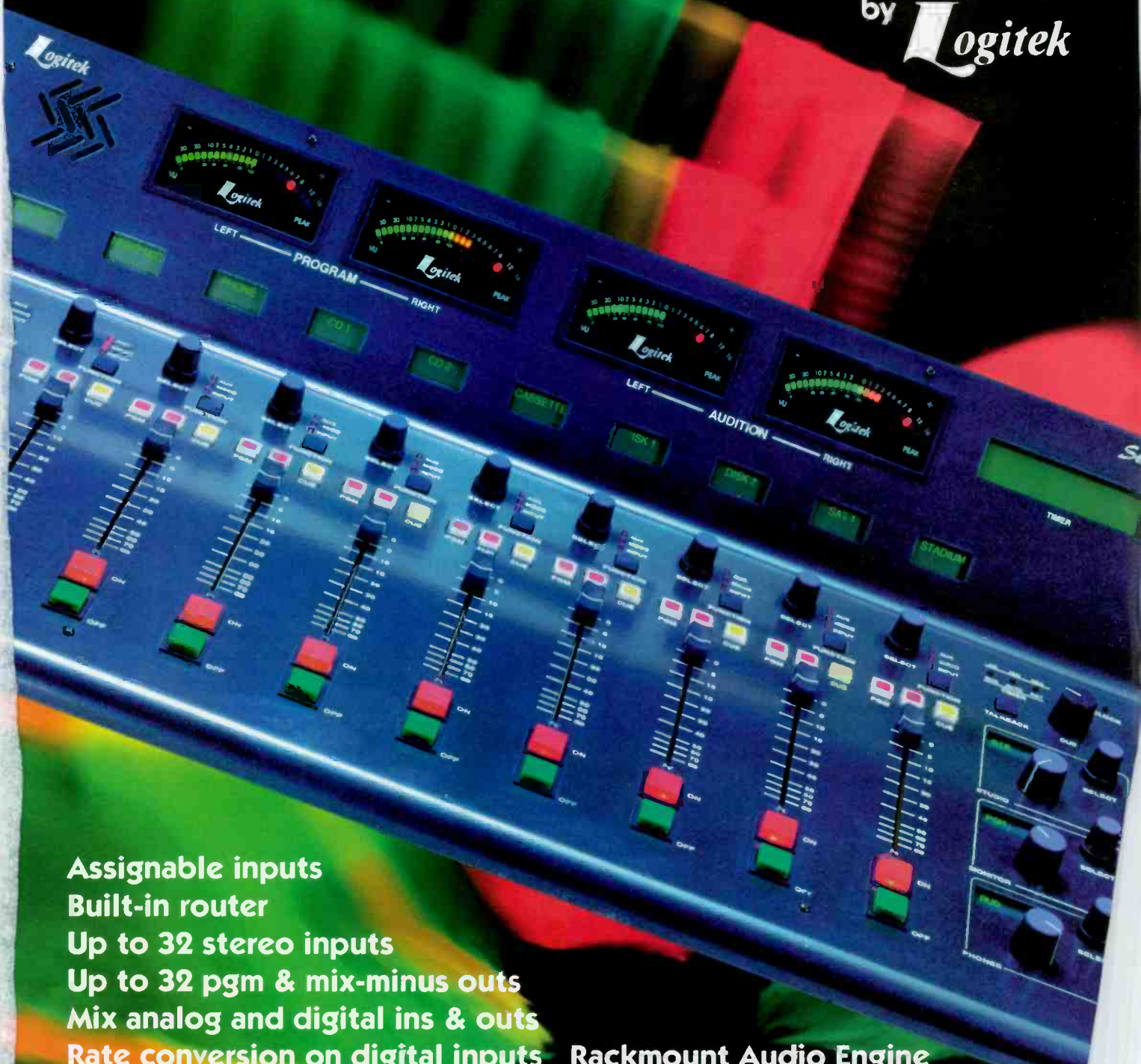


18

ON THE COVER: Light up the phones and stir up the conversation. Talk Radio is a unique format that presents its own special challenges. "Go ahead caller, you're on the air..." (Cover design by Stephanie Masterson, *BE Radio* art director.)

The Missing Link in your Digital Air Chain

Serial Sound
Broadcast Consoles
by **Logitek**



Assignable inputs
Built-in router
Up to 32 stereo inputs
Up to 32 pgm & mix-minus outs
Mix analog and digital ins & outs
Rate conversion on digital inputs
20-bit analog I/O
16 to 24 bit digital I/O
Machine control interface
16 MByte delay & reverb memory

Rackmount Audio Engine
32-bit floating point DSPs
Run two consoles from one engine
Easily connect automation systems
Direct factory support via modem

Getting to know your TCO

From my new vantage point in the Silicon Forest, it's easy to keep track of all things computer-based. So, when a new report crossed my desk the other day, I realized it had strong implications for radio broadcasters.

The subject was *total cost of ownership* (TCO) for Windows-based PCs, a hot-button issue in the computer industry right now. TCO studies are intended to help an organization understand and manage the costs of owning and operating PCs and related equipment. This new report was developed by Interpose, Inc. (a leading TCO analyst based in Orlando, FL), in cooperation with Microsoft for its Windows operating system.



The report first divides TCO into direct and indirect costs. Items considered as direct costs include hardware and software purchases, plus system management, support, development and communications. Indirect items attempt to quantify the "opportunity costs" of lost production due to downtime and other computer-related problems.

The first thing that jumped out at me was the fact that total hardware and software expenses amount to only 11% of TCO. That means that the true cost of operating a PC is nearly an order of magnitude (i.e., one decimal place, to the bean counters) greater than the initial purchase price of the machine, including its software. A recent ad by Hewlett-Packard addressed this issue nicely, using the visual metaphor of an iceberg. You get the picture.

The next important fact showed that fully 18% of TCO is attributed to indirect costs of "user downtime." This means that the system is up, but users can't do their jobs due to lack of training or understanding of the computer system's proper operation. So, they spend time unproductively by "futzing" with their PCs. In some cases, this is the fault of poor user-interface design or steep learning curves, while in others it stems from insufficient support — either from the software vendor or the computer owner's IS department.

Also interesting was that the single biggest item (at 24% of TCO) was spent on support. Combined with system management (at 19% of TCO), this shows that nearly half of a company's computer costs — or more than four times its hardware/software expenses — go to the personnel, either inside or outside the firm, who keep the computer system running. Yet, even this may not be enough, given the 18% futz-factor noted above.

Summarizing these expenditures, the report concludes that the average Windows-based networked system costs

a company \$7,251 per desktop per year. (Other reports have placed this figure as high as \$12,000.)

For general administrative applications, there's got to be more to the equation than this cost analysis, otherwise it would make more sense to go back to typewriters and adding machines. Indeed, those other elements are the productivity, quality and creativity that computer-based operations allow and encourage — but there's no guarantee these will automatically occur. Management must stimulate the appropriate use of the computer by staff to get its money's worth, along with hiring people with the requisite skills — both among users and support personnel.

On the other hand, computers are used in radio for functions other than word processing and spreadsheets, and TCO should be considered from a company-wide, comparative viewpoint. The computer systems used for audio production and program-stream assembly are often substantially *less expensive* than equivalent traditional audio equipment, so you're in a positive position from the start. Annual support costs for these operations also may not be significantly different from conventional systems (even though the actual support *people* might be). Moreover, the cost of keeping production on conventional hardware continues to go up, while the overall cost-effectiveness of computer-based operations is improving.

The conclusion? Radio has good reason to turn to computers, both financial and creative. But make sure you know what you're getting into. Understanding and applying TCO principles will help you keep long-term computer costs under control. Most important, be sure to budget support levels properly — including user training — and hire the right people or organizations to carry it out. Otherwise, you're better off sticking with carts and reels.



Skip Pizzi, editor in chief

For further information on TCO, check the Interpose web site at <http://www.interpose.com>.



E-mail: beradio@intertec.com
FAXback: 913/967-1905

UNBEATABLE SOUND

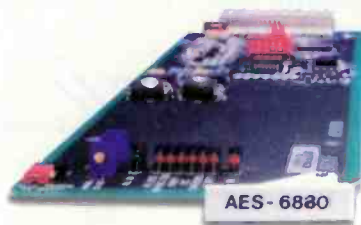


Digital Audio Champion

LEITCH®

The winning Digital Glue team now includes digital audio. The range consists of AES/EBU distribution, audio synchronization, audio multiplexing and analog to digital and digital to analog conversion. And all for the same convenient frames as the Leitch digital video products.

Check into Leitch's Digital Audio Glue. Now that's sound advice!



Canada / International
Tel : + 1 (416) 445-9640
Fax: + 1 (416) 445-0595

U.S.A
Tel : + 1 (800) 231-9673
Fax: + 1 (757) 548-4088

Europe
Tel : +44 (0) 1256 880088
Fax: +44 (0) 1256 880428

Eastern Europe
Tel : +49 (89) 4900-2042
Fax: +49 (89) 4900-2043

Japan
Tel : + 81 (3) 5423-3631
Fax: + 81 (3) 5423-3632

Australia
Tel : 011-61-2-9999-2355
Fax: 011-61-2-9999-2366

Brazil
Tel : + 55 (11) 867-0218
Fax: + 55 (11) 867-0408

<http://www.leitch.com>

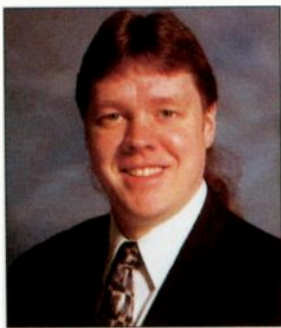
Circle (16) on Free Info Card

Road trip!

Labor Day has passed and the tradition of summer radio remotes is behind you. As you prepare for the fourth quarter of 1997, there is only one thing to do: take a road trip.

Being able to take a break and get away from the normal routine is always healthy. It helps clear your mind and can give you a fresh perspective when you return.

With the fall comes the NAB Radio Show in New Orleans. Now that the World Media Expo is gone, the show returns to its original format. Although the spring show is a great event, it covers so many areas that it is easy to miss certain aspects. This four-day fall event has one big advantage over the spring NAB: *it's just radio*. BE Radio will be there to cover all the news and new technology presented.



One of the myths about the fall show is that it is a programming-only event. This is simply not true. Although there are sessions for programming, there are also sessions for management, owners

and engineers. Three technical workshops are being offered that cover AM directional arrays, radio frequency radiation and AM/FM transmitters. If you can attend any of these, I recommend it. The sessions are a great opportunity to learn more or maybe just get a refresher course. There is no such thing as too much education.

The exhibit hall is also the best way to go for a test drive or to at least kick the tires on all of the new equipment. There is still plenty of information on the exhibit floor to keep you apprised of the current trends.

One week after NAB Radio is the 104th AES convention in New York City. The main focus of this show is generally geared toward studio recording and live sound, but there are plenty of attractions for radio as well. On Friday, Sept. 26, there will be a forum on DAB. Representatives from the leading proponents of the various DAB systems will be there to discuss the current trends and research. The recording studios know it's coming, and they are getting ready for it. This is the one forum that I most want to attend to see how the allied audio fields are viewing this upcoming technology. A digital standard and deadline has been given to television, and you need to be aware of what is happening in DAB so you can be prepared for it when it's our turn.

The AES has four full days of sessions planned on a

variety of topics, including digital audio encoding, ISDN and, of course, Internet audio delivery. There are also several tours planned, including a visit to WQHT/WRKS, New York, for a facility tour of the first all-digital air chain from CD to transmitter.

With the face of change constantly looking at you and your facility, the trade conventions are an increasingly better way to learn about and see the technology that is coming and how it will affect your professional career. It may not always be in the station's budget (or your own budget if you are a contractor) to go to the larger conventions, but there are alternatives. Several regional SBE conventions and equipment vendor expos often offer informative sessions and workshops that provide an excellent opportunity to advance your knowledge and, hopefully, your career.

As more stations consolidate, the need for qualified engineers will only grow. There may be fewer at a given facility, but the responsibilities will not decrease at all. Look at the impact computers alone have made to the job of the broadcast engineer. The technical ability of the average station employee is not increasing to keep up with the new technology being implemented, so your ability must increase. Greater ability means more value to the station and hopefully more security to your career. As the pool of new recruits continues to dry up, attending conventions is one way to keep yourself up-to-date and in demand. Be sure to stay on top and aware of the changes that are affecting us every day.

The consolidation of duties of station personnel is everywhere. Engineers need to pick up on some of that by becoming their own marketing department. Add to your arsenal of tools with knowledge and understanding. Make the effort to become certified or trained to show a higher proficiency in some relevant area, be it computers, RF or audio. If you don't toot your own horn once in a while, no one else will.

Chriss Scherer

Chriss Scherer, editor



READER
RESPONSE

E-mail: beradio@intertec.com

FAXback: 913/967-1905

Is your **remote gear** weighing you down?



Actual size: 11.25" W x 11.5" D x 4.5" H
Weight: Less than 8 lbs.

You need a Buddy!

If you're tired of lugging half a studio out to your remote broadcasts, lighten your load by taking a Buddy instead. The Buddy handles your program mix, headphone feeds, communications, codec return and PA feed. It works well with any ISDN codec, POTS codec, RPU, cellphone or telephone line—and even has a built-in frequency extender.

COMREX

Call us for details
800-237-1776
<http://www.comrex.com>

COMREX Corporation, 65 Nonset Path, Acton, MA 01720 USA Tel: 508-263-1E00 Fax: 508-635-0401
email: info@comrex.com Fax-on-Demand: 508-264-9973 Toll-free: 800-237-1776 in North America

Circle (17) on Free Info Card

LAN basics, part 2

By Kevin McNamara, CNE

Last month, in part 1, we looked at the *open systems interconnect* (OSI) model and some of the basic LAN building blocks, including channel access methods.

Topologies

Of all the layers defined by the OSI, we should be most interested in the *physical layer*. This is the level that we, as engineers, will have the most involvement with. The physical layer deals with the cabling, connectors and interfaces required to physically attach the computers on the network. The types of topologies that you will most likely run across are:

- **Bus.** Consists of a linear section of media, such as coaxial cable, terminated on each end and are connected through a "tee" connector.
- **Ring.** Similar to the "bus," except the ends are joined, hence the name. In practice, the ring configuration actually consists of dual counter-rotating concentric rings. Devices attached to a ring network will have "in" and "out" ports.
- **Star.** More commonly referred to as a hub configuration. The signals are carried from each device on the network to a central point (the hub). These hubs can be passive or active.

Network protocols

By definition, *network protocol* refers to the rules that govern how any two or more elements on a network communicate. The OSI is defined by seven protocol layers. Working committees of the IEEE are responsible for defining and ultimately standardizing the various LAN protocols at the datalink and physical layers. For our purposes, the primary differences of these standards relate to data throughput, transmission media (cabling) and channel access method.

Currently, the 100Mb/s Ethernet protocol has become the LAN protocol of choice for most new installations. Keep

in mind that standards are currently in development for 1,000Mb/s Ethernet.

Three types of media have been specified to transmit 100Mb/s Ethernet signals:

1. **100BASE-TX** (Fast Ethernet). Essentially a faster "contention"-type access method.
2. **100BASE-T4** (100VG-AnyLAN). Uses a new approach to access the network called *demand priority*. This system supports *token passing*. One of the real advantages of this method is that it uses four pairs of telephone voice-grade cable. The VG stands for voice grade.
3. **100BASE-FX**. Fiber-based "Fast Ethernet" similar to FDDI.

Here are a few more high-speed protocols you should be aware of:

- **Asynchronous transfer mode (ATM).** A technology based on high-speed packet switching, ideal for multimedia and other complex applications. ATM is capable of data rates from 51Mb/s to 622Mb/s.
- **Copper data distribution interface (CDDI).** FDDI using copper-based media instead of fiber.
- **Fibre Channel.** Developed jointly between Hewlett-Packard, IBM and Sun Microsystems. Fibre Channel requires the use of fiber cabling and is capable of passing data at a rate from 266Mb/s up to several Gigabits/s.

These are some of the high-performance protocols available. All of these offer data throughputs of 100Mb/s or more, however, most of the PC-based networks in existence today are still using protocols that pass data at approximately 10Mb/s. In terms of performance, these will work just fine for many business-type applications, but generally are not suitable for installations requiring high throughputs or passing real-time information. Some of the 10Mb/s Ethernet standards are:

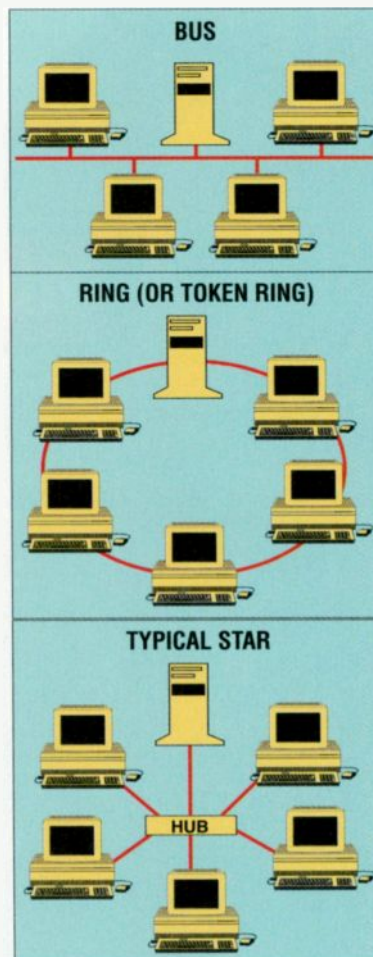


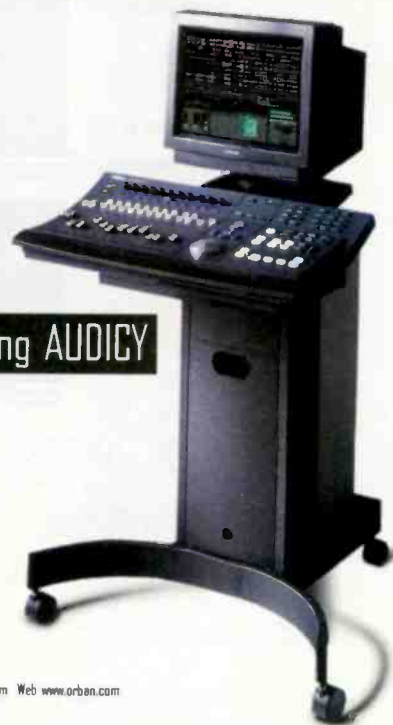
Figure 1. The three standard network topologies (bus, token ring and star).



Plug into the smartest audio workstation ever created.

The new AUDICY® was designed from the ground up to do what no other broadcast audio workstation has done: plug directly into the creative mind. Unlike complex workstations, it treats the editing process like an "inspiration with a deadline." If you've ever watched an editor sit down and try to read a manual under pressure, you'll understand why the new AUDICY is a study in "see it, get it, do it."

The clean, uncluttered control surface was specifically designed to look smart, feel good, and be instantly productive. The screen interface combines simplicity with a brilliant use of "virtual hardware" graphics. And to keep pace with the endless rush of ideas and deadlines, AUDICY offers unrivaled speed and power. With RAM-based editing and mixing, you edit in real time—by ear—working on up to 24 tracks. Access to audio is instantaneous, even when using the complete suite of built-in effects including compression, EQ, and reverb. AUDICY even lets video people plug into advanced audio production with flexible SMPTE features. All of which means that creative minds can spend less time learning, more time creating, and still get on-air, on time. The genius of AUDICY is in making power simple.



Introducing AUDICY

orban®

A Harman International Company

AES/EBU?

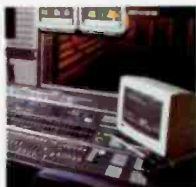


....DSA-1

The Prism Sound DSA-1 AES/EBU interface test system provides *unique generator and analyser capabilities* enabling the *most comprehensive* assessment of AES/EBU interconnections.

For example, the DSA-1 can measure differences between *source and cable jitter*, or it can *simulate* either sort with its *signal generator*.

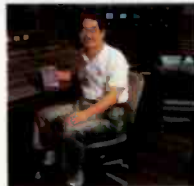
To find out more, call or fax us now for a full information pack, or look up the latest DSA-1 V2.0 specification at our web site.



BAYERISCHER RUNDFUNK, MÜNCHEN, GERMANY



CHANNEL 4 TELEVISION, LONDON, UK



TOKYO BROADCASTING SYSTEMS TOKYO, JAPAN



SPACE FACILITIES, LONDON, UK



PRISM MEDIA PRODUCTS INC
115 ROUTE 46, B-16
MOUNTAIN LAKES
NEW JERSEY 07046
USA
TEL: (201) 299 7790
FAX: (201) 299 7759

WEB: <http://www.prismsound.com>
e-mail: sales@prismsound.com

- **10BaseT.** Uses UTP cabling in a hub arrangement.
- **10Base2.** Uses "thin" coax (RG-58), arranged in a bus configuration.
- **10Base5.** "Thick Ethernet" uses heavier coax (RG-8), allowing longer line distances.

Although not considered a high-speed protocol, *wireless Ethernet* is becoming a popular media for connecting portable workstations (laptops) to a LAN or for connecting LANs between different buildings where cabling is impractical. The FCC has permitted unlicensed operation of these systems at 902-928MHz and 2.4-2.483GHz using spread-spectrum modulation. Most of these systems will provide data rates from 2Mb/s to 10Mb/s, at distances of approximately 30 miles with directional antennas.

For high data rates via a wireless media, consider using a standard point-to-point T1 microwave system. This approach is typically more expensive and requires FCC licensing.

The LAN infrastructure

Proper planning and installation of the *LAN infrastructure* is the single most important task in the building of a reliable and upwardly expandable LAN. Given the current pace of technology, this is the one area that probably won't need to be replaced in the next five years if the wiring and power systems are designed and constructed properly. Strangely, many companies (particularly broadcasters) skimp on this phase and, consequently, spend a great deal of money and time resolving related problems.

Coaxial cables, once the de facto standard to connect devices on a LAN, are becoming less common. Unshielded twisted pair (UTP) and fiber cables are currently the most popular transmission media. Depending on the size of your LAN and the distance it must cover, the cabling and installation costs will represent a significant portion of the project. Each type of media has pros and cons. Let's take a look at each cable type and the connectors for it.

The typical fiber media used for

LANs consists of a graded index multimode fiber-optic cable with a 62.5 micron fiber-optic core and 125 micron outer cladding. The light source used to drive the fiber media operates at a wavelength of 1,350nm. Single-mode fiber is used in applications requiring wider bandwidths and longer distances.

Three types of connectors may be used to connect the fiber cable to an interface:

1. **FDDI media interface connector (MIC).** These connectors are keyed in various ways and care should be taken to identify the proper keying arrangement. Connectors push in to the mating receptacle.
2. **Duplex SC connector.** Designed for simplicity, the connector is just pushed onto its mating section and the connection is completed.
3. **ST connector.** A spring-loaded bayonet-type connector. Both the outer bayonet ring and inner sleeve are keyed.

The losses on a fiber cable should not exceed 11dB for the entire run. You can expect 1dB to 2dB of loss per 1,000 meters of cable and an additional 0.5dB to 2dB for each connector, depending on how well it was put on. Dust and skin oils will substantially affect the system losses.

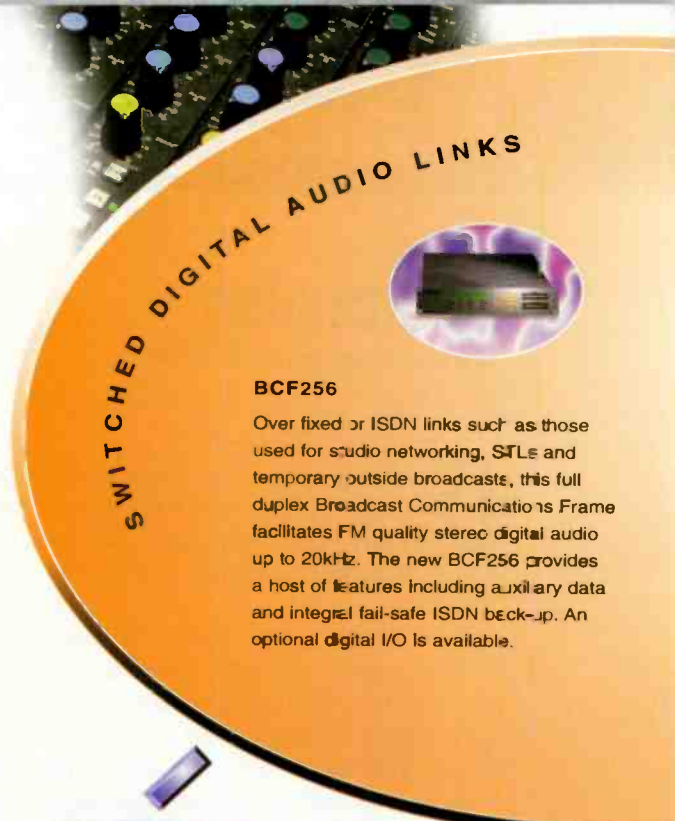
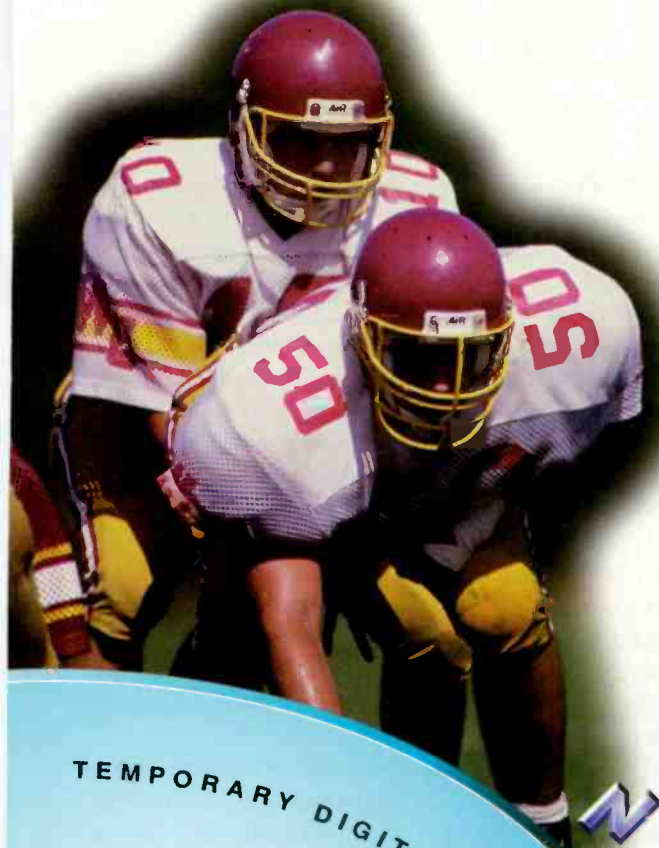
There is a variety of copper-based media to choose from that have advantages in cost, durability and, to some extent, ease of installation. These cable types consist of twisted pairs clad in an unshielded jacket and the primary difference between them is the capacitance between conductors that attenuates higher frequencies. This becomes a critical issue when the goal is to transmit 100Mb/s through long distances of cable.

Care must be exercised in the installation of fiber and copper cabling. Kinks, extreme bends and improper attachment of connectors can wreak havoc on the best-planned installations. Indications of poor installation practices appear as slower throughputs, communication errors and poor reliability. In order to

Continued on page 83

Digital audio links

for broadcasters



SWITCHED DIGITAL AUDIO LINKS

BCF256

Over fixed or ISDN links such as those used for studio networking, STLe and temporary outside broadcasts, this full duplex Broadcast Communications Frame facilitates FM quality stereo digital audio up to 20kHz. The new BCF256 provides a host of features including auxiliary data and integral fail-safe ISDN back-up. An optional digital I/O is available.



THE BEST BITS IN DIGITAL AUDIO COME FROM APT

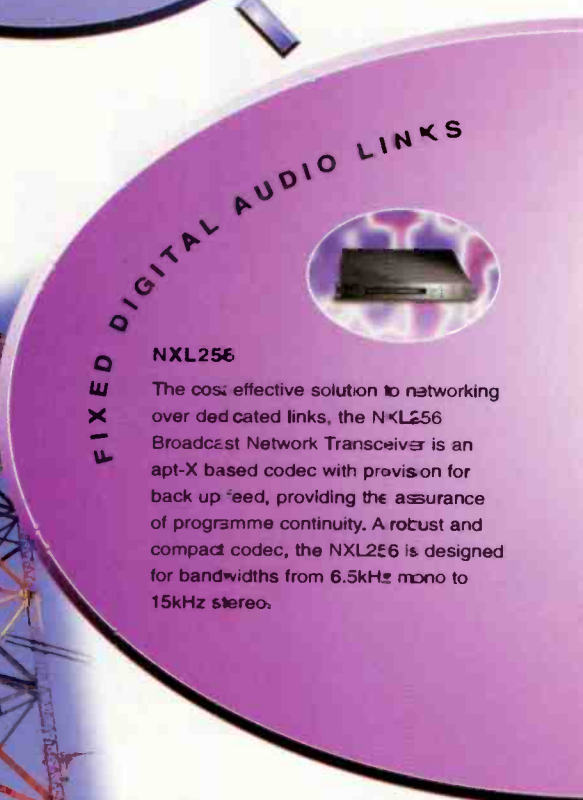
Whatever your broadcast application, only APT provides the most comprehensive, proven and compatible solution to high quality digital audio links. Characterised by the lowest available coding delay - APT codecs provide the most robust and economic audio distribution available in applications throughout your broadcast operation.



TEMPORARY DIGITAL AUDIO LINKS

DRT128

Designed for the reporter on the move, the DRT128 Digital Reporter Terminal enables speedy direct dial connection to the ISDN through an integral terminal adapter for the simultaneous transmission and reception of broadcast quality audio. Robust and lightweight, the DRT128 provides a variety of transmission options - including stereo.



FIXED DIGITAL AUDIO LINKS

NXL256

The cost effective solution to networking over dedicated links, the NXL256 Broadcast Network Transceiver is an apt-X based codec with provision for back up feed, providing the assurance of programme continuity. A robust and compact codec, the NXL256 is designed for bandwidths from 6.5kHz mono to 15kHz stereo.

APT
AUDIO PROCESSING
TECHNOLOGY

Headquarters Tel: +44 0 1232 371110

Japan Tel: +81 3 3520 1020

United States Tel: +1 213 463 2963

URL: <http://www.aptx.com>

Circle (20) on Free Info Card



Datacasting

David Maxson, CBRE

Datacasting is alive and growing in the United States and FM broadcasters have been a part of the industry from the beginning. Where is the business going? What will be the role of the radio broadcaster in datacasting?

Miles Beam's article, "Data Broadcasting: The Next Frontier," in the November/December 1995 issue of *BE Radio* defined datacasting as the transmission of data over a one-way link from a single point to multiple receiving points. This simple definition now encompasses a vast array of communications services. Key players in the datacasting industry are buying up smaller ones to gain market share and distribution channels. Companies, like WavePhore and Data Broadcast Corporation (DBC), are defining just what it is to be a *datacaster*.

A look at some of the datacasting companies will show how datacasting by broadcast radio fits into the overall datacasting picture. WavePhore claims to be "the leading operator worldwide of data broadcasting networks" and

auxiliary TV bandwidth to deliver worldwide web-like functionality to TV set-tops.

Another big datacaster rose from the ashes of the Financial News Network. Through its information services division and its business services division, Data Broadcasting Corporation did \$114 million in business in 1996. It acquired the company that developed the Quotrek stock market data service that is delivered on FM subcarriers. The service provides timely financial data to subscribers with special portable or computer-connected receivers.

DBC provides information services to approximately 40,000 subscribers via 76 FM subcarriers in the United States and Canada, as well as by satellite, TV vertical blanking interval (VBI), cable television, telephone and Internet. Its business services division includes Instore Satellite Network and CheckRite International, a check verification service.

The trend in datacasting is becoming pretty clear. Companies specializing in data acquisition and delivery are taking advantage of a host of different transmission media. Factors, such as cost, bandwidth, immediacy, geography and reliability, affect decisions on what medium to use.

Leasing your subcarrier

What is an FM subcarrier worth? The newly published "FM Subcarrier Market Report/Technology Guide" from the National Association of Broadcasters (NAB) sheds light on the current state of the medium. Surveying a large sample of stations, NAB developed average monthly fees for FM subcarriers in different size markets. In top 10 markets, the first subcarrier leased on a station averaged \$6,195 per month. In markets 11-50, that figure dropped to an average of \$2,913 per month.

The NAB reports that less than 30% of all FM stations in the United States lease any subcarrier capacity. Demand is greater in the larger markets. About half the top 50 market stations lease some subcarrier capacity.

The report goes on to explore why subcarrier penetration remains fairly low. The most reasons given for not leasing subcarrier capacity were related to lack of demand for it. Coming in a distant second were concerns about effects of subcarriers on station quality.

Among those reporting subcarrier use, only half of the subcarriers mentioned are related to datacasting. The other half contain background music, foreign language services and reading services. Of the datacasting subcar-

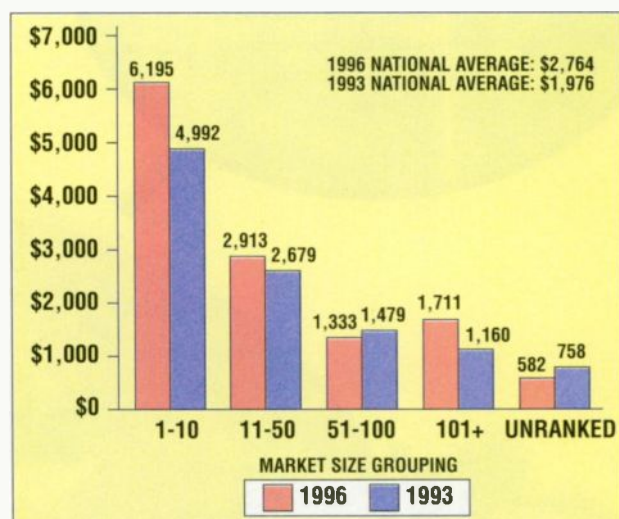
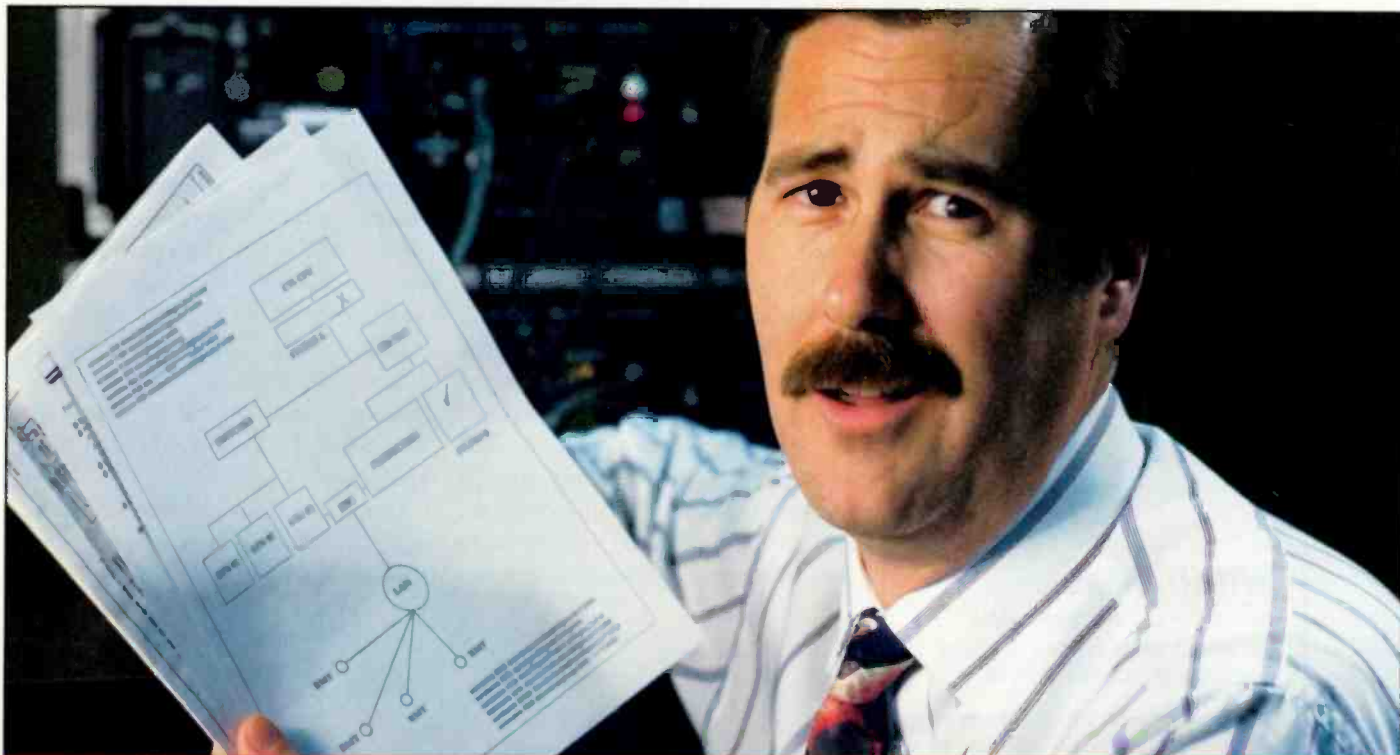


Figure 1. Average monthly lease rate for a station's first subcarrier by market size.

a "provider of proprietary products and services for low-cost, high-speed data broadcasting systems for distributing digital data via the existing worldwide TV, radio and satellite broadcast infrastructures and the Internet."

One of its growth acquisitions was Mainstream Data, which is known to many FM broadcasters as a tenant on their subcarrier spectrum. Primarily providing services to businesses, WavePhore enters the consumer marketplace this fall. This new service, called WaveTop, will use



TRYING TO MAKE SENSE OUT OF DIGITAL AUDIO SYSTEMS?

There is a better way!

It's not easy trying to understand the conflicting claims made by different manufacturers when you're buying a Digital Audio On-Air & Production System, whether a single, multipurpose Workstation or an integrated, multiple studio setup. At one end of the spectrum, you're faced with a wide variety of simple "Cart Machine Replacements," and on the other, products whose complexity confounds even the most seasoned broadcast engineer.

The ENCO DAD^{PRO} Digital Audio Delivery System solves the problem! DAD is simply the most powerful On-Air & Production system available, yet its uncomplicated approach and inherent ease of operation makes immediate sense to any user.

- Intuitive On-Screen displays that are immediately familiar to operators. Optional Touchscreen makes operation quick and easy.
- Complete On-Air flexibility with various "Virtual Machines" for Live Assist, Automation, or Satellite Programmed operations. Interface to other equipment plus scheduling and billing packages. Seamless segue and voiceover transitions sound "Live" in all modes. Script capabilities can be included.

- Full production capabilities, including Graphic Cut & Paste Assembly Editing. Includes analog and digital inputs/outputs. Interfaces with most multichannel editing packages.
- Runs on DOS for proven speed, reliability, and compatibility with other equipment; not an operating system originally intended for multimedia applications. This is a professional tool meant to produce efficiency and profits, not entertain the staff!
- Operates on common off the shelf computers and network architecture. You won't be locked into proprietary hardware that may not be available whenever you need service.
- No monthly licensing fees, DAD is an outright purchase. Software upgrades are free for the first year.
- DAD is proving itself everyday in radio and TV facilities worldwide.



*Call Your DAD Dealer or ENCO
For Complete Information*

 **ENCO**
SYSTEMS, INC.

24555 Hallwood Court, Farmington Hills, MI 48335 USA
TEL: 800-362-6797 or 248-476-5711 FAX: 248-476-5712

Problem:

I need the competitive Quality Sound of a Digital Exciter but I can not afford Digital Prices!



Solution:

Stealth Exciters

Utilizing the Latest in technology The Stealth series brings you Digital Quality Sound at Analog Prices.

Stealth exciters put you in the cockpit with intelligent hands-on control of your station!

— IAC —

You control the precise level of your incoming audio with the latest Intelligent Audio Control Technology!

— IAGC —

You custom tailor your stations dynamic range with Intelligent Audio Gain Control!

— IMC —

You control your stations precise modulation with Stealth Intelligent Modulation Control.

Stealth Exciters

- ◆ Digital Quality Audio
- ◆ Complete Station Control
- ◆ LCD Control Panel
 - ◆ Analog Prices
 - ◆ Frequency Agile

Available NOW in 30, 60, and 100 watts.

Great Products Great Solutions!

"The Transmitter People"



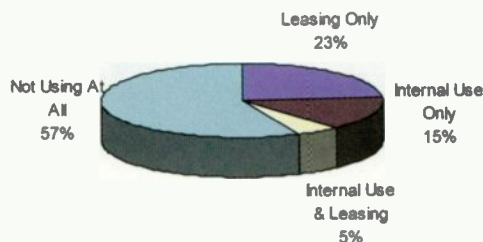
PO BOX 801 ◆ 1306 RIVER ST.
Valatie, NY 12184
Phone 518-758-1690
Fax 518-758-1476
energy-onix @ energy-onix.com

Circle (7) on Free Info Card

Managing Technology

riers, nearly two-thirds are used by paging services. The rest involve the now-familiar financial data and utility load management data, plus the more recent addition of Global Positioning System differential corrections data.

What's keeping datacasting's use of auxiliary FM spectrum so low? It might be because we think of the subcarrier space on FM signals as just that, "auxiliary." Many datacasters have their own proprietary waveforms and/or data protocols. As a result, subcarrier spectrum is sparsely populated and is plagued with incompatible data transmission systems.



Source: 1996 NAB FM Subcarrier Survey

Figure 2. Distribution of FM subcarrier usage.

Two attempts at subcarrier standards setting have been made under the auspices of the National Radio Systems Committee (NRSC), a joint effort of NAB and the Electronic Industries Association (EIA). One standard, RBDS, was adopted in 1993. The other, a high-speed subcarrier standard, is a work in progress.

The NRSC adopted the voluntary Radio Broadcast Data System (RBDS) standard for a low-speed subcarrier capable of transmitting, among other things, data related to an FM station and its programming. It is based on the European Radio Data System (RDS). In 1995, the EIA launched a program to equip stations in major markets with RBDS encoders. According to the NAB, by late 1996 only one-eighth of the stations surveyed were broadcasting RBDS signals. The EIA's objective was to equip stations in major centers of population with RBDS. This would allow most radio-buying consumers to see the benefits of RBDS in the showroom.

The other NRSC effort in support of datacasting is being conducted by its High-Speed Sub-Carrier (HSSC) subcommittee. It is reviewing tests of systems provided by three proponents: Mitre Corporation's subcarrier technology was developed in conjunction with the Federal Highway Administration; Seiko delivers messages to receivers as small as wrist-watches; and Digital DJ transmits menu-based information to hand-held consumer receivers.

The HSSC subcommittee is examining the technologies, not the content. Presumably, if a single technology

is chosen as a standard, entrepreneurs will develop new content and services for it. FM broadcasters may see an increase in demand for their subcarrier spectrum after the subcommittee makes its recommendations.

Of the three proponents, Digital DJ is the only one providing

services today where the host station can get in on the action. Consumer content is provided by Digital DJ. The host station can incorporate its own services and advertiser-supported content into the Digital DJ datastream.

Digital audio radio broadcasting promises to blur the distinction between datacasting and broadcasting. Proposed digital audio technologies may not be fully compatible with data subcarriers. The wise FM broadcaster will include an escape clause in subcarrier leases to provide for new digital broadcast standards when they are adopted.

Blurring the border

The line separating datacasting and other forms of communication is getting fuzzy, too. Paging is perhaps one of the original forms of datacasting. According to Motorola, there are 40 million pagers in use in the United States today. These point-to-multi-point systems work on a variety of

Continued on page 83

ON AIR

When the ON AIR light glows, there's no time for amateurs or pretenders. That's the reason top professional broadcasters choose Neumann. Rich, smooth, sound – warm, silky tone. Neumann microphones have that classic presence which makes any announcer sound their absolute best. And in broadcast, sound is everything.

Neumann has a comprehensive range of microphones to suit virtually any application and budget. Contact your Neumann dealer today and discover the secret of the pros.

Neumann... the choice of those who can hear the difference.



Neumann|USA

PO Box 987, Dept. 149B, Old Lyme, CT 06371 Tel: 860.434.5220 Ext. 149B • FAX: 860.434.3148
West Coast: Tel: 818.845.8815 • FAX: 818.845.7140
Canada: Tel: 514-426-3013 • FAX: 514-426-3953 • Mexico: Tel & FAX: 52-5-639-0956
World Wide Web: <http://www.neumannusa.com>

Circle (8) on Free Info Card



Proof of performance

By John Battison, P.E., technical editor, RF

“We have to do a proof of performance.” These words can strike terror into the heart of an engineer. When uttered by the FCC, it can mean that glaring discrepancies have been found in the pattern or a disgruntled competitor has filed a complaint. It can also be triggered by tower damage and subsequent rebuilding or a station facility change. In the case of an FM DA, it probably means that something has damaged the antenna.

FM proofs

When an FM station is involved, the station engineer's work is usually less rigorous because FM antenna proofs are performed at the manufacturer's facility prior to installation unless required by an occurrence in the field. After antenna construction, it is clinically proven that the radiated signal meets the pattern constraints and the manufacturer's exhibit is accepted as proof.

The commission's rules do provide for making field-strength measurements. They involve a more-complicated procedure than for AM measurements, including a strip recorder for making runs of at least 30 meters with an antenna elevated 30 feet above ground. This last part can be dangerous. Engineers have been injured or killed while making these mobile measurements because they run the monitoring antenna into high-voltage power lines. If you must make this kind of measurement be absolutely sure of the location and height of power lines.

Sometimes, it is necessary to prove to management that the signal is going where it is supposed to. A convenient way to check this is by comparing the questionable signal with a known good one. Take a series of readings in a “good” area and then make similar ones in the “bad” area. If the station is non-directional with a circular pattern, there should not be much difference between them. Take into account circular polarization. It is often necessary to polarize the receiving antenna for local conditions. If there is a major difference between the “good” and “bad” signals, it is logical to go back toward the station on the same radial(s) to see where the discrepancy begins.

In extreme circumstances helicopter measurements are

made. If the problem is great enough to involve such work, it can be performed by a consulting engineering firm that specializes in such work.

AM proofs

AM directional antenna proofs have been a part of the radio engineer's life ever since the early days of broadcasting. Among the pioneers were Carl Smith, the late Andy Ring and Paul Godley. In fact, Andy Ring probably wrote most of the AM proof rules during his tenure at the FCC.

The rules haven't changed much over the years. Computers have helped make a relatively easy task of generating new antenna patterns from what was once a multiweek job of trial and error with scores of pattern calculations. Completely computerized proofs of performance have been proposed by the industry and development continues into ways of avoiding the laborious field proof of performance.

Sometimes, it is necessary to determine the effective field at 1km to establish that an antenna is producing the required effective field. The radial requirements in 73.186 are the same in terms of radial length and point spacing as for a proof of performance. The measurements are plotted and analyzed as for a proof. The effective

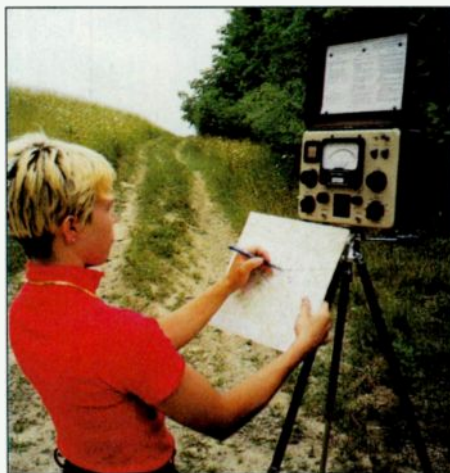
field is then read from the graphs obtained.

Preparing for a proof of performance

The first thing to do is check an up-to-date copy of the rules to be sure that there have been no changes since you last ran a proof. Read 73.151 and referenced paragraphs.

Be sure you have set up enough radials as specified in the CP. There will never be fewer than eight for a non-directional, more will be required for DAs. The more complex the pattern, the more radials will be required. Generally, three radials are needed for a major lobe. Whenever possible, avoid running radials through the side of lobes because it is hard to get accurate measurements on a curved line. Nulls and lobes are the most satisfactory points to measure, but sometimes the FCC requires measurements on a curved section of a pattern.

Be sure that you have enough topographic maps of

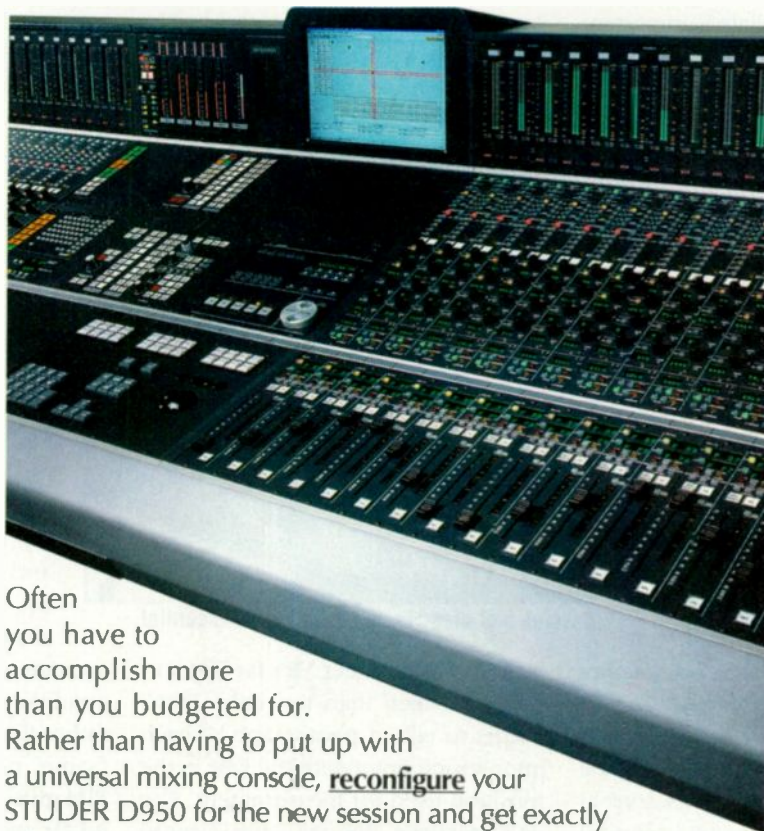


Using a tripod to support the FIM gives a stable mount for multiple pattern readings.

Scaleable Power:

STUDER D950 Digital Mixing System

Have you ever been in a situation where you wished you had that extra eight AUXes you thought you would never need?



Often you have to accomplish more than you budgeted for. Rather than having to put up with a universal mixing console, **reconfigure** your STUDER D950 for the new session and get exactly what you need! With the fully scaleable and configurable DSP-Core of the new STUDER D950 Digital Mixing System you acquire only as much hardware as needed, and configure the desired console using the existing hardware. Just load a new **Session Configuration**, and you are ready to roll! Adding **more DSP power** later on allows even the most extreme console sizes, still preserving minimum space, power and weight. Up to 4 desks can share resources of the same DSP-Core, bringing cost reduction. And of course, the new STUDER D950 has unsurpassed audio performance, integrated digital router, full dynamic automation, and much more...

STUDER
PROFESSIONAL AUDIO EQUIPMENT

H A Harman International Company

STUDER Professional Audio AG, Althardstrasse 30, CH-8105 Regensdorf-Zurich
Switzerland, Phone +41 1 870 75 11, Telefax +41 1 840 47 37, <http://studer.ch/studer>

Direct-Subsidiaries:

Austria: +43 1 866 54-0 France: +33 1 45 14 47 86 Germany: +49 30 72 39 34-0

U.K.: +44 181 207 50 50

Canada: +1 416 510 13 47 Japan: +81 3 34 65 22 11 USA: +1 615 399 21 99

Singapore: +65 225 5115

Circle (9) on Free Info Card

1:24,000 scale. Plot the antenna location *extremely* carefully. Your work will be wasted if you make a mistake here. A single non-directional tower can be located quite easily. In the case of a DA, the *center* of the array is used.

Laying out the radials is important. I've seen engineers fold over the edges of a map section and run a line across the join. At the end of 20 miles the radial is not where it is supposed to be! Don't cut the map margins off either; you may lose valuable data, and you may need the margin later.

I like to lay out my origin and take radials to the map edges. Then I measure off two or three reference points on the first map and locate the same point on the edge of the next (adjacent) map. With the protractor used to lay out the original radials, measure from this point on the edge of the new map to establish the radial direction on the second map. If followed for all maps, this method usually gives satisfactory results.

Some engineers prefer to pick measuring points as they go along because predetermined points don't always work. This is a reasonable argument, but I don't like this method. If points are chosen in accordance with the commission's required spacing and marked lightly on the map, you can adjust them as needed as the radial progresses and still be assured of taking enough readings.

Be accurate with the distance measurements, both when locating spots in the field and when measuring the map back in the office after runs are finished. If you say a measuring point is 100 yards into a field be sure it is 100 yards and not 150. With close-in and low-value nulls, a few yards can make a surprising difference. Monitor points should be picked based on suitable distance and freedom from overhead wires, train tracks and streams that may dry up or may be dry when you measure.

Record distance, time and measured values. If weather is extreme, a brief note may be helpful later

when you are trying to repeat it. It is also absolutely essential to make a complete description of each measuring point location. Without this, it will be impossible to revisit the point and repeat. I've seen far too many older proofs with only a list of distances and no descriptions that had to be redone because it was not known where to measure. "Outside green house" is not acceptable. The house color may change with the next owner. Give the street name and number, for example, "North end of driveway



Careful and clear record-keeping is essential.

at 4523 Green Street." It's far better to say too much than too little. Don't forget to take a photograph of each monitoring point with the FIM in the position used for measurement. The FCC requires this with the License Application Form 302.

Given a choice, it is often advantageous to run a proof in cold weather. Conductivity seems to increase in winter. If a proof is made when all readings are high, you may have a cushion later when the array ages and begins to cause trouble.

It goes without saying that your FIM must be in calibration. A calibration is accurate for about two years. If you are using more than one FIM identify the particular unit used on each radial. You should also record all serial and model numbers of all the meters in use.

Before starting runs check the calibration of all FIMs by measuring at a single point. There should be little difference between meters. In any case, record values measured and make more checks at different values to establish a calibration curve.

If you have to start close-in, you will

need a chain 176 yards long to measure one-tenth-mile intervals. Using a shorter section and "leap-frogging" your distance will certainly lighten your load. Chain is preferred because rope can stretch. A sighting compass is essential to make sure the radials are exactly as planned. Remember, the FCC wants *true* azimuths, so correct your compass reading by applying the local variation to get true directions measured from true north.

A two-person team is best for making field measurements: one to drive, take notes and read the map and another to hop in and out to make measurements and record locations and time. Doing both can be tiring.

Most field engineers hold the FIM on their shoulder to make readings, but a tripod is best for accurate work. This is especially the case when switching back and forth between DA and non-DA to get comparison readings at measurement points. It is more

accurate to get measurements in both conditions at the same time and place rather than go back and recreate the "same" point at another time. If the FIM gives a maximum reading pointed far away from the antenna, try to find out why and consider using an alternate point.

Remember not to make measurements until two hours after sunrise and two hours before sunset. These are the critical hours and the ionosphere is a mess. The sporadic sky-wave can influence the measured fields.

After the field work comes the interpretation and determination of pattern shape and efficiency. Today, computer programs can analyze the measured fields and determine the conductivity and radiation. Otherwise, out comes the old "light table" and the adjusting of plotted radials vs. the FCC groundwave curves.

John Battison owns John H. Battison and Associates, a consulting engineering company in Loudonville, OH.

Photos provided by Tracey Liston, WMIH-AM.

Who has the best Digital System for groups?



Prophet Systems, Inc.

Our Main Offices:

Prophet Systems, Inc., 111 West 3rd St., Ogallala, NE 69153

Sales: (800) 658-4403

Sales & Support Fax: (308) 284-4181

Support: (308) 284-8450

E-mail: sales@prophetsys.com

For International Sales Information:

Broadcast Solutions Pty Ltd, 90 Hotham Parade, Artarmon, NSW 2064

Colin Crowe - Voice: 011-612-9980-2111 Fax: 011-612-9980-1445

Congress authorizes broadcast spectrum auctions

By Harry C. Martin

The Balanced Budget Act of 1997, passed in August, requires the FCC to resolve conflicts among mutually exclusive broadcast applications through competitive bidding or auctions. Congress authorized the commission to conduct auctions to resolve mutual exclusivity among applicants who filed their applications on or before July 1, 1997. Also, Congress suspended the settlement cap rules beginning Aug. 5, to encourage settlements among competing applicants whose proposals were filed on or before July 1. Post July 1 applications will be auctioned, but the settlement caps won't be lifted for those applications.

The auction legislation raises questions that the FCC will have to answer in a rulemaking proceeding. These are some of the unresolved questions: It's unclear whether the FCC will proceed with auctions in any or all cases involving applications filed on or before July 1. The agency is authorized to conduct auctions with respect to these applications, but isn't required to do so.

It's unclear whether the auctions of post-July 1 applications will be open to anyone who wishes to bid rather than only to applicants who have reached cut-off status.

It's unclear whether the FCC will permit settlements among post-July 1 applicants, since the statute mandates auctions and no provision is made for settlements as a means of resolving mutual exclusivity among proposals filed after July 1.

The FCC has developed point-based comparative selection criteria that would have been universally implemented had Congress not approved auctions. Although unlikely, this methodology still could be used to resolve mutual exclusivity among applications filed on or before July 1.

U.S. and Canada amend FM agreement

In July, the United States and Canada agreed to amend their bilateral FM agreement as follows:

- FM translators can now operate with up to 250W of effective radiated power (ERP) and with a 34dBu interfering contour distance of up to 60km.
- Concurrence by the other country is not required for FM translators where the interfering contour (34dBu) does not extend beyond the border.
- A 6kW maximum ERP level for Class A assignments was adopted.

By incorporating these relaxations into the allocations scheme, many translators within 175 miles of the border whose service potentials had been unduly limited, in spite of the non-existence of any interference possibility, can realize the maximum service capabilities for translators

permitted under the FCC rules.

Another benefit is a relaxation in separation requirements to Canada for U.S. Class A FM stations. Until now, 6kW FM station allocation or upgrade proposals required notification as higher-powered Class B1 stations, leading to excessive separation distances, which in many cases, precluded a desired allocation or upgrade. By recognizing the 6kW maximum power authorized by the FCC, Canada's restrictions on Class A FM assignments in border areas have been significantly relaxed.

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Rosslyn, VA.

Changes by grandfathered FMs made easier

The FCC has revised the rules specifying how certain grandfathered short-spaced FM stations may improve their facilities or relocate transmitter sites.

Pre-1964 grandfathered stations are those stations that were short-spaced on Nov. 16, 1964, when the rules establishing minimum distance separations between stations became effective, and have remained short-spaced since that time.

The revised rules permit a co-channel or first-adjacent channel grandfathered short-spaced FM station to modify its facilities if the application demonstrates each of the following:

- There is no increase in the predicted interference area or the associated population.
- There is no increase in interference caused by the proposal to any individual grandfathered short-spaced station.
- Any area predicted to lose service as a result of interference has adequate service remaining.
- In addition, any applicant proposing interference caused in any areas where interference is not currently caused must serve a copy of the application with the licensee of each affected short-spaced station.

The rules also permit a grandfathered station that is short-spaced to a second-adjacent channel or a third-adjacent channel station to change transmitter location or other station facilities without regard to such short-spacing.

Finally, subject to the rules stated for co-channel and first-adjacent channel grandfathered stations, applicants previously required to obtain agreements to implement facility improvements or modifications are no longer required to obtain such agreements.

dateline

On Oct. 1, 1997, radio stations in Alaska, Guam, Hawaii, Oregon, Washington and Samoa/Marianas must file their renewal applications. Commercial radio stations in the following states and territories must file their annual ownership reports by Oct. 1: Alaska, Guam, Hawaii, Oregon, Washington, Samoa/Marianas, Florida, Puerto Rico, Virgin Islands, Iowa and Missouri.

Tower owners in Delaware, Kansas and Washington must register their towers with the FCC between Oct. 1 and Oct. 31.

MASTER CONTROL

The world's finest on-air system.

Live Assist • Voice Tracking • Split Spot Feeds •



Hundreds of Cities Worldwide

Satellite Automation • News & Talk Radio Ready • Novell or NT •



(914) 723-8567 • www.rcsworks.com



TALK RADIO

Talk radio is a proven and popular format regardless of the topic and market size.

By Chriss Scherer, editor

Serve the public interest through information exchange. This is what broadcasting is supposed to be all about. One format that exchanges more information than any other is talk radio. It is the oldest of formats and the way to get the job done has changed significantly over time. It's not just the farm reports on the daytimer, but the format covers signals everywhere with local and syndicated programming.

Talk radio thrives on news and controversy. When big news is happening, the talk stations draw the listeners in. Big elections are one of the more common draws, although more recently other items of war, scandal and crime have dominated the talk scene. On a nationwide average, almost 15% of all stations carry talk radio as their format.

How it 'works'

What does it take to get a talk show on the air? Some studio equipment is common to music and talk formats, but heavier emphasis is naturally placed on higher-quality, better-sounding equipment required for the particular needs of talk radio.

The telephone caller is the best friend of any talk format. Because of this, the on-air telephone system has been given much attention. There are several elements that make up a quality integrated telephone system, and what works well in the office is generally terrible for on-air use. The two main components of an on-air telephone system are the *hybrid* and *interface*.



**YOUR SOURCE FOR
QUALITY AM ANTENNA
SYSTEMS FROM
COAST TO COAST**

KINTRONIC



LABS, INC.



AM DIPLEXER



KRBA / KSML LUFKIN, TX

**NEW WEATHERPROOF AM
DUMMY LOAD RATED FOR
25KW + 130% MOD.**



MODEL: DL-25WP

**NOW DELIVERING
SOFTWARE PROGRAMMABLE
CONTROLLERS**



MODEL: DAC-MOD-2-12

**KINTRONIC LABORATORIES INC.
P.O. BOX 845
BRISTOL, TN 37621-0845
PH./FAX: 423-878-3141/4224
WEB SITE:
<http://www.kintronic.com>
EMAIL: ktl@kintronic.com**

Circle (10) on Free Info Card

TALK RADIO

The interface used is based on several decisions that must be made by station personnel. How many lines will you use? What kind and size of expansion, if any, do you want? Will you want other studios to share the capability or will this be for only one room? These are just a few of the questions to ask when determining the size and type of system to use.

The 1A2 telephone system is one of the oldest multiline telephone system technologies around. It is a mechanical system that routes the raw telephone tip and ring through the facility. Once a controller is installed,



The faithful 1A2 telephone set.

additions and changes are not really that difficult. The use of multiconductor cable makes cabling a headache, but adding telephones or assigning lines is easily accomplished in the phone room. Once a popular system for offices, the 1A2 system has fallen from popularity for more recent digital telephone systems.

The inherent advantage to using a 1A2 system is the theoretically unlimited number of lines that it can handle. The main frame of the system is limited, but more frames can be added as needed, even with separate music on hold feeds. There are many interfaces built to work as add-ons to the 1A2. These also have the expansion capability to support a great number of telephone lines. Interfaces made for 1A2 installations look like a telephone set to the KSU, which makes changes or additions much simpler.

As the popularity of 1A2 systems decreased for business use, other solutions were introduced. Proprietary controllers were developed that handled the telephone traffic as eas-

ily as a 1A2, but with cleaner, quieter and more reliable electronics. These systems did not interface with one another well, if at all, and were limited in their flexibility. The basic idea of those early systems is still used today, but with added features that make them more functional.

The all-in-one solutions range from a few lines and include an internal hybrid, to larger units that are strictly interfaces that feed a hybrid. Again, the choice is made depending on the current and future needs.

So, who has the largest on-air telephone system in use? That is tough to say. Some of the major nationally syndicated shows use systems that handle more than 30 lines. Of course, the systems used on these nationally syndicated programs are not the average, but they do give you an idea as to how large a system can become.

The telephone hybrid has the unique function of splitting a two-wire telephone line into separate send and receive audio lines. This has been done for many years in many forms and some are good at it, while others are not. It is possible to do this function with analog equipment, and there are several hybrids available that do it this way. The next step in caller/host isolation is to use DSP technology. More and more digital hybrids are used every day. The



The call screener position is sometimes located in the control room.

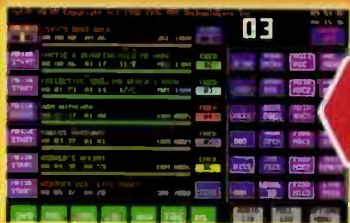
added advantages of automatic nulling during the call and being able to compensate for changes in the telephone line make digital hybrids the cream of the crop.

The audio transmitted over a telephone line is limited to a frequency range of 300Hz to 3,000Hz. Unfortunately, this audio range rarely (if

SUPER REDUNDANCY

GO DIRECTLY TO
MEDIATOUCH
 LINK N' LOCK™
 SYSTEM

"OpLOG"™ Air



"OpLOG"™ Air



"OpLOG"™ Air



MULTI USER USER USER SYNCHRONIZED "ON AIR" TOUCHSCREEN CONTROLLER

- Double, triple, quadruple – "On air" log and audio redundancy
- Gang workstations, studios and remotes together in "synch"
- Take one to a remote – full interactivity with master air studio
- Any workstation can join or breakaway – (one button press)
- Unique master/master/master design – all can operate interactively
- Discrete audio play, mixed or summed – all on user touch
- Multi talent interactive air show – local, remote - wide area



"OpLOG"™ Air

MediaTouch
 A DIVISION OF OAKWOOD AUDIO LABS LTD.

"AMERICA'S DIGITAL ORIGINAL"

Since 1984. Digital Integration for Radio.

TOLL FREE 1-800-636-0123



2480 S.E. 52nd Street
 Ocala, Florida 34480-7500
 Tel: 1-352-622-7700
 Fax: 1-352-629-7000

For more info see our web site www.omt.net

TALK RADIO

ever) presents a "flat" frequency response varying by 2dB or less. An adaptive hybrid will help to keep the null level in check, but equalization will also help in smoothing out the overall sound of each caller for a more consistent sound. Also, because no two telephones and no two callers are alike, some kind of audio compressor or *automatic gain control* (AGC) should be used to compensate

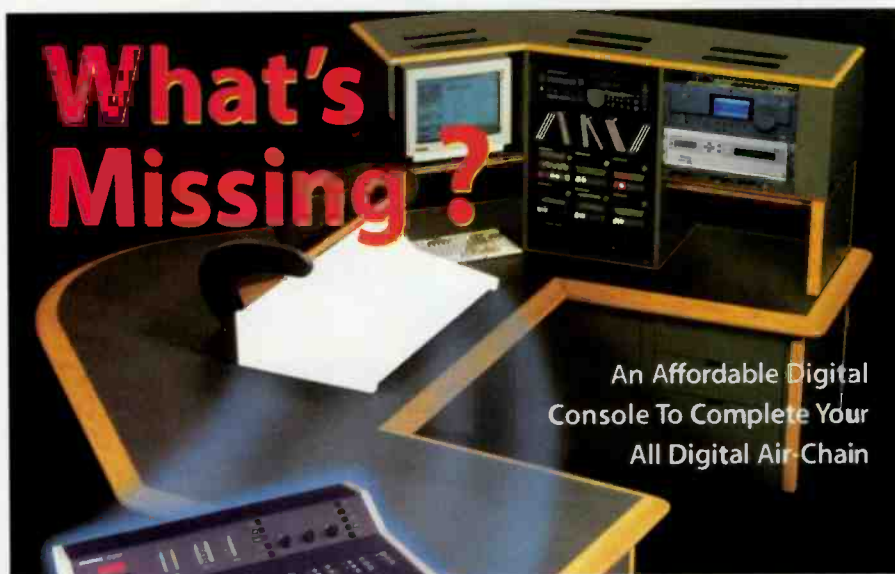
for the differences in level. Some of the more advanced hybrids will do all of this for you. In some cases, this may need to be handled externally from the hybrid.

Who's calling?

Now that you have callers and a way to handle their audio, there has to be a way for the show host and producer to communicate. Although there are many telephone systems available,

there are just as many call-screening programs. Many of these screening programs interface directly with the on-air telephone system for simple routing and information handling.

Having immediate display information about the caller for the host to see is essential. The caller's name, location and topic of interest are the obvious items of interest. With the screener program, however, comes the advantage of creating a caller database instantly. How you use the database is entirely up to you and the marketing department, but additional information like telephone num-



What's Missing?

An Affordable Digital Console To Complete Your All Digital Air-Chain

DYNAMAX MX/D

Digital Audio Console

So your old on-air console needs to be replaced.

Most of your air chain is digital and you know digital

broadcasting is just around the corner. What do you do? The Dynamax

MX/D Digital Console makes perfect sense. It offers pristine 24 bit internal processing to handle both digital and analog inputs and outputs with the familiarity and straight forward operation of analog consoles. A perfect blend of digital sonic quality, performance features and legendary Dynamax reliability, the MX/D is the right console to meet your current needs and take you well into the 21st Century!

- 8 faders controlling 16 total inputs
- Choice of analog or digital input modules
- 3 digital plus 3 analog outputs (stereo PROG and AUD plus mono)
- AES/EBU and S/PDIF digital inputs with sample rate conversion
- Independent A/B channel remote start and stop
- Solid steel construction with excellent RF immunity
- Built-in cue amp/speaker, headphone amp and count up timer

**Complete
Digital On-Air Console
Under \$10,000**



FIDELIPAC®
Broadcast Studio Equipment

Fidelipac Corporation Division of Amplifonix
2707 Black Lake Place, Philadelphia, PA 19154, USA
TEL: 215-464-2000, FAX: 215-464-1234



The host should have a clear view of the call-screener monitor, guests and the control room.

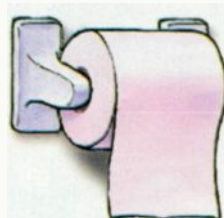
bers, addresses, regular topics of interest, birthday, zip code and occupation can make the database even more useful for other station uses. If for no other reason, the next time that listener calls in, his or her information is already there to pass on to the host.

Caller ID is a service that is available almost everywhere. Several manufacturers have looked at implementing the Caller ID data into their call-screening software for even more flexibility. Before the call is even answered, the screener knows who it is, when he called last, how often he calls and all the other information stored in the database.

Advances in digital telephony have already been realized with ISDN. Remotes that were once noisy and

Circle (23) on Free Info Card

Some things you'd never notice,



unless they're gone.

Some things we take for granted. Gentner telephone hybrids have been a reliable mainstay in the broadcast industry for over sixteen years. You may not even notice the Gentner telephone hybrid because it has been reliably working for years and years. But, take a look at our new product line. We have incorporated the features you asked for.* These telephone hybrids make life easier than ever, and they're just as reliable.

* auto-answer, auto-disconnect, automatic mix-minus, caller ducking control, caller AGC, mic or line level input, caller only mix record output, and more

 **Gentner**

WE PUT THE WORLD ON SPEAKING TERMS™

1.800.395.7486

1.801.975.7200 • <http://www.gentner.com> • Try our Conference Call Service: 1-800-LETS MEET™ • CSA, FCC, CE Approved product

Circle (24) on Free Info Card

TALK RADIO

intermittent now enjoy clean audio with ISDN service and codecs. Some manufacturers are looking ahead to the household use of ISDN for high-quality voice calling by planning on

designs for ISDN hybrids. The use of multiplexed telephone service (where the incoming lines are all fed on a single pair instead of discrete wiring) will lend itself well to these plans.

Many stations use a digital PBX for

the office telephone services and then route the calls to analog single-line ports for on-air use. Although this has cost advantages, most analog line cards were not built for the highest quality of audio, but rather

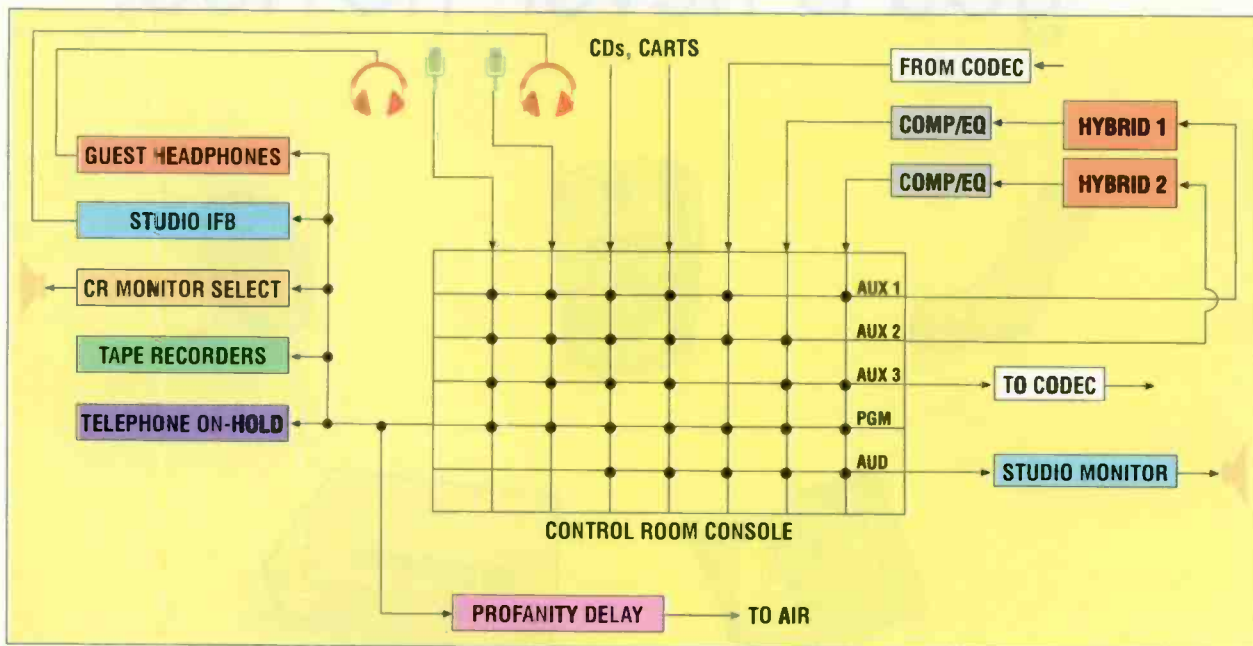


Figure 1. Typical audio signal flow for a talk-radio facility.



Studio furniture is one decision you'll be living with for a long time. If you make it Murphy, you can count on a relationship that will last for years. Durability, deliverability and thoughtful design—all part of the enduring elegance of Murphy Studio Furniture.

MURPHY
STUDIO FURNITURE

▲ 4153 N. BONITA STREET ▲ SPRING VALLEY, CA 91977 ▲ TEL (619) 698-4658 ▲ FAX (619) 698-1268 ▲
▼ (800) 307-1060 ▼ Email dwmurphy@electriciti.com ▼ URL <http://www.electriciti.com/dwmurphy> ▼

Our service goes beyond design and fabrication, to total management of your concept's execution.

Circle (25) on Free Info Card

Welcome to Studio 302

The story can't wait. And while hotels provide ice machines, you won't find an audio studio next to the mini-bar.

Now, you can take your studio with you because the revolutionary PCXpocket™ adds a digital audio workstation to your laptop's other capabilities.

PCXpocket is a Type II PC card that lets you record and edit professional audio on your laptop. It's compatible with a wide range of audio editing software including Digigram's Xtrack. When your field report is finished, just modem the file anywhere.



Performance is outstanding with simultaneous-record and playback; 192K-linear and MPEG audio-compressed modes; two balanced mic/line inputs; and two high quality analog unbalanced outputs at line or headphone level. The new PCXpocket AD* version adds digital SPDIF and time code inputs. It's also a great

way to take your audio and acoustic test and analysis software on the road.

So get a PCXpocket. And tell your travel agent to book you a production room for your next assignment.

*Available Fall 1997



Digigram Inc.
2101 Wilson Boulevard, Suite 1004
Arlington, VA 22201
Phone: +1.703.875.9100
Fax: +1.703.875.9161
E-mail: Input@digigram.com

TALK RADIO

routing of fax or modem data, because most modern PBX equipment is digital. The savings on equipment cost may not be worth the loss in audio quality by routing through this low-quality audio equipment.

In some larger applications, basic intercom systems between the host, producer, screener and engineer will not work. Off-site guests, multiple hosts or even the operational format

of the program may require additional attention to communications behind the scenes. In situations like this only some of the people involved may need to convey an idea without distracting everyone. There are a variety of intercom and routing devices that make this task much easier to handle.

Regardless of the method, any IFB or intercom system must be clean enough to be understood. The fanci-

est switching is worthless if you cannot understand what is being said. The intercom microphone and monitor must be able to faithfully reproduce the audio.

Another technical consideration may be the need for multiple mix-minus feeds. You already create one mix-minus feed for the telephone hybrid. With off-site guests or hosts, additional mix-minus capability may be necessary. With most consoles having only one, or possibly two, additional audio buses, you can run out of space quickly. There are ways around this though. Some interface products are available that can create the added mix-minus capability that you need.

Technology advances

As was mentioned before, the low cost and easy availability of ISDN has made it easy to create a good-sounding remote quickly and easily. When RF remote pickup equipment is plagued with noise and interference, the ISDN codec is clear and clean. Taking a talk show on the road and having to suffer with the noise of a poor RF path or the costs of POTS multiline frequency extenders is rarely worth the effort and the chance of



How to avoid the hidden costs behind every incandescent indicator.



We offer direct replacement LEDs for virtually every incandescent indicator lamp made.

Though inexpensive itself, an incandescent bulb brings with it some very costly baggage.

High maintenance and down-time costs. Incandescents have a short operating life because of the intense heat they generate, the destructive on-off cycling they see and their vulnerability to even minor vibrations.

Poor energy efficiency. Over 90% of the power they consume is actually wasted, producing unwanted heat.

The premature failure of nearby components. Incandescents generate high tem-

peratures which simply fry other components.

Now for the solution—our long-lasting replacement LEDs. They have no filaments, are unaffected by on-off cycling, and tolerate considerable vibration. They also draw 90% less energy and generate almost no heat.

For more information, call (310) 534-1505 or FAX us at (310) 534-1424.

LEDTRONICS
More Choices, More Light.



Studio windows help to open up a room.

listener tune-out grows.

The ISDN codec technology has migrated to plain old telephone service (POTS) lines as well. Take the simplicity of frequency extenders and the quality of digital and get the benefits of both. Although not as wideband as their ISDN cousins, POTS

Circle (13) on Free Info Card

YOUR ONE



FOR SATELLITE SERVICES.

NPR Satellite Services can customize your package to include any of the following:

- ✦ Full-time Service - 24 hour programming capability;
- ✦ Occasional Service - lease according to your need -- whether it's for an hour, a day, or an event;
- ✦ Digital equipment;
- ✦ Uplinking services - either portable or fixed - can get you up and running FAST!
- ✦ Top-notch, 24 hour-a-day troubleshooting and monitoring by our System Technical Center (STC).

STOP Your Search...

Call NPR Satellite Services at (202) 414-2626 for more information on your customized satellite services package today. Link up with us for a one-stop solution to your satellite services needs.



NPR Satellite Services®

Link Up With Us

635 Massachusetts Avenue, NW, Washington, DC 20001
(202) 414-2626

WARD-BECK PROFESSIONAL BROADCAST EQUIPMENT

STANDS ALONE

Legendary design
Legendary quality
Legendary construction



AFFORDABLE BY COMMITMENT



WARD-BECK SYSTEMS LTD.

SCARBOROUGH, ONTARIO, CANADA M1H 2X4

TEL: (416) 438-6550 FAX: (416) 438-3865 TOLL FREE 1-800-771-2556

WEBSITE: <http://www.wbsltd.com> e-mail: wbsltd@istar.ca



The secret to lowering costs, improving performance is knowing with whom to consult. Make Ward-Beck your first call.

Audio Consoles, Digital Audio Distribution Products, Analog Audio Distribution Products, Metering Products, Pods – low cost Audio Problem Solvers. Standard and Custom lines.

Circle (15) on Free Info Card

TALK RADIO

codecs are another option, especially if ISDN service is not available.

Both of these methods give talk shows an advantage on the road. Within the datastream that carries the audio signal, an additional data path is usually present. The auxiliary path can be used to link the remote host to the station for call-screening information, telephone caller control or even just simple switching and tallies.

No matter how you get your remote audio back to the



Any talk studio should be large enough to comfortably seat the host and guests.

studio, the key to its success will be a familiar and easy-to-use environment for the talent. Any remote broadcast presents a challenge, but with a talk show, there is even more to keep in check.

Bleep this

Running a live talk show without a profanity delay is like playing Russian roulette. Someone is going to get it eventually. When the budget is tight, this may seem to be an unnecessary cost, but the price of an inexpensive audio delay is certainly much cheaper than a fine from the FCC. Even if you don't get fined, the time and effort to please an offended listener makes it a wise investment.

Profanity delays originally were magnetic tape loops that delayed the audio by a short time factor. The delay time was determined by the tape speed and the distance between the record and playback heads. The biggest problem with these systems was the tape wear or, even worse, tape breakage, especially in the middle of a show. The next advance came with solid-state versions. The early units suffered from low audio bandwidth and you still had the problem timing to get in and out of delay. Having to "bleep" an offensive word was even more tricky, with the engineer having to switch over to the delayed signal and manually catch the offending remark or play an audio piece to fill the time until it was safe again.

DSP technology again came and added great flexibility to profanity delay designs. The ability to get in and out of delay at the push of a button makes the transition from live to delay and back a simple one. Adding delay time

Scott Studios' Breakthrough: Uncompressed Digital Audio at a Compressed Price!

Your station can make the quantum leap to *uncompressed* digital music from hard drives! *You'll hear the difference* in quality from this superior system!

Best of all, Scott Studios' *killer* new linear audio *costs no more* than compressed systems! Scott Studios is the *only* company playing *four* great sounding *uncompressed* digital stereo streams at 24kHz, 32kHz, 44.1kHz, 48kHz or any mix *with overlap* and *while recording*! *No* other system uses the sizzling hot new Motorola 56301 DSP chip and *32-bit PCI bus* audio cards!

Only Scott Studios' system prevents dueling algorithms and eliminates undesired compression artifacts with linear audio *at no extra charge*! You also get a fail-safe watchdog for *unequaled* reliability, a 6x6 preview switcher that lets you hear ends of spots or songs while the middle is on-the-air, superior headroom, General Purpose Interface, digital ins and outs, optional timing stretch & squeeze, optional MPEG or APT, and more.



Scott Studios exclusive new 32-bit PCI audio card plays up to four true CD quality uncompressed stereo channels while recording!

Good Spot Box



Scott's new digital Spot Box triple-deck "cart" replacement delivers awesome *linear* CD quality sound.

Spot Box is the *easiest* digital system to use! There's only one screen, so your jocks always know what's happening. At the left, three players give you legible labels, countdowns and End-of-Spot signals, with big well-lit buttons that show what's playing. Even though it uses Windows 95 or NT, Spot Box works like carts, *not* a computer. At right, there's a "rotary cart rack" that lets you pick and play any recording by number or name. Or, number keys at the bottom can load your cut quickly.

As options, Spot Box can automatically load logs from traffic by diskette or LAN. You can record spots and edit phone calls at the right of the screen. Starting at \$5,000, Scott's Spot Box is so affordable many stations can even put two in an air studio for redundancy.

Better AXS

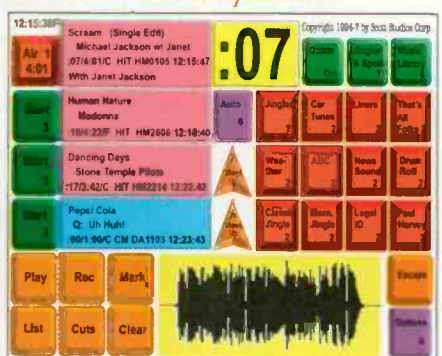


AXS[®] (pronounced ax'-cess) is radio's premier digital audio system for satellite or news/talk formats, CD automation and cart replacement for live jocks. AXS[®] gives you instant play Hot Keys, log editing, music on hard drive, Power Fill, satellite jock substitution, link to NPR's SOSS, an easy-to-use Real Time Scheduler, the industry's simplest and best net catcher, and an optional production or phone recorder and editor in the air studio.

Scott Studios offers AXS[®] satellite systems as low as \$7,500 complete.

With Spot Box, AXS[®] or a Scott System, you can get 24 hour, 7 day support from our 45 person staff - the biggest (and best) in digital audio! With several Spot Box, AXS[®] or Scott systems, any can record a spot once for all! Also, for spot or music on hard drive AXS[®] or Scott Systems with typical playlists, you choose whether to get *uncompressed*, MPEG or APT at no difference in price.

Best Scott System



The Scott System is radio's top-of-the-line for digital music on hard drive. You get instant play Hot Keys, touch screen music libraries for instant requests, log editing, built-in phone recorder, pre-recording Voice Trax in context, and production that imports from any WAV digital multi-track.

Scott also offers an *invincible* seamless redundancy option. It's self-healing, so regardless what happens, your spots and hits just keep on comin'!

Good. Better. Best. Scott Studios' three digital systems can be tailored to *your* needs and budget. Call or E-Mail info@scottstudios.com for details.

Scott Studios Corp.
13375 Stemmons Freeway, Suite 400
Dallas, Texas 75234 USA
(972) 620-2211 FAX: (972) 620-8811
8 0 0 7 2 6 8 8 7 7
(800) SCOTT-77

TALK RADIO

slowly and inaudibly allows the program engineer more time to focus on the show being produced. When an objectionable word or phrase comes along, pressing *dump* clears the audio memory and the delay time begins to rebuild once again. A recent addition to these digital delays is the ability to dump only a portion of the audio memory, giving hosts the ability to get out of several consecutive on-air offenses.

Monitoring

A clean monitor system is critical. The host needs to be able to hear the callers and all the program material. As was mentioned before, sometimes basic IFB systems will not provide enough flexibility for the program being produced. More elaborate schemes may be required if there is more behind-the-scenes work going on.

If telephone calls are an integral part of the program, you may consid-



Convenient placement of microphone and headphone level controls is an important design goal.

er having a separate telephone monitor setup in the studio. It is an added convenience that will give the host some physical flexibility by not always being tied down to a headset. The telephone monitor should be a direct feed from the output of the

hybrid with no other program audio in it to avoid feedback. The added advantage of a telephone monitor is for in-studio guests.

When people that are not accustomed to talking into a microphone are asked to do so, they tend to speak

Program Audio Data ISDN Voice



OutBack™
One-Touch Remotes



IntraLink™
Studio Flexibility



www.intraplex.com

Intraplex, Incorporated

3 Lyberty Way, Westford, MA 01886

Tel: 978 692-9000 Fax: 978 692-2200

Intraplex, the leader in broadcast digital transmission.

Intraplex ISDN.

Broadcasters rely on Intraplex for high-quality, flexible T1 transmission solutions. Now, Intraplex quality and flexibility are available over ISDN.

IntraLink™, the industry's first fully modular ISDN multiplexer, allows broadcasters to combine high-quality program audio, voice and data on a single ISDN circuit. Connect and configure up to six individual BRI's in a single rack unit shelf, and manage multiple channels and codecs from a single PC. Flexible and space-efficient, **IntraLink™** redefines ISDN for broadcast.

OutBack™ ISDN audio codec is the ideal companion for remote broadcasts. Compact and affordable, the **OutBack™** provides "plug and play" ISDN connections, one-touch call set-up and auto-detection features that simplify use, with ISO/MPEG Audio Layer II coding up to 20 kHz.

Maximize your investment. Call us today.

Circle (27) on Free Info Card

It's Small

500 W - 10 kW Solid State FM Transmitter *TFMK Series*



TFMK05 • 500 W

- Broadband power amplifier modules [87.5 - 108 MHz]
- Compact and user-friendly modular design
- Fully controlled by microprocessor
- Remote control and monitoring capability
- N+1 systems available
- Plug-in module for transposer configuration
- RDS and SCA plug-ins (optional)
- Dimensions 480 [W] x 267 [H] x 420 [D] [mm]
- Forced air cooling



DOLP is an Itelco group company. For further details please contact: Dolp headquarters: via B. Pontecorvo, 4 - 00012 Guidonia Montecelio (Roma) Italy, phone +39 774 357400 • fax + 39 774 375445 • E-mail dolp@mail.esinet.it - North America and Canada • Itelco USA Inc., Westminster CO, phone +1 303 431 1699 • fax +1 303 431 2888 - Central and South America • Itelco USA Inc., Miami FL, phone +1 305 715 9410 • fax +1 305 715 9414 - Turkey • Itelco Ltd., Istanbul, phone +90 212 2732365 • fax +90 212 2732368 - China • Itelco Beijing Office, Chaoyang District Beijing CHINA, phone +86 10 4948151 • fax +86 10 6484823
Itelco group web site <http://www.itelco-usa.com>.

TALK RADIO

softly and not focus their delivery. This is normal. Even though we all speak every day, being put in the spotlight, especially where the spoken voice is the highlight, can be a shock. When you take this same person and have him or her wear headphones, the distraction can be even greater with the concentration of sound directly into their ears. If they are in the same room with the host and the telephone monitor, they can be made to feel more at ease by holding a regular conversation without the constant reminder of being on the air.

If the guests must wear headphones, it is advisable to provide a monitor mix that contains no IFB. This is a distraction to many people. Most professionals can conduct an interview or discussion and monitor cues without skipping a beat, but for a guest to

Continued on page 40

What is mix-minus?

The idea of a mix-minus feed is confusing to many people, especially when it is first introduced. In most applications, a program audio mix is fed for monitoring. This works well in cases where all the monitoring positions do not suffer from any time delays or other unique circumstances. The term mix-minus is a shorthand description of what it really means: a program mix, minus some specific element.

The most common use of mix-minus is feeding a monitor signal back down a phone line to a caller. If the caller's audio was sent back down the telephone line, a feedback loop would be created. This mix-minus can be created in a variety of ways. The most common way is by creating a separate mix within the console using an auxiliary send (aux.send) on the audio sources that are needed to be heard by the caller. By using a pre-fader send, the telephone monitoring system can be used off-line from the on-air setup, which most jocks and show hosts find convenient for hands-free use.

Another common way is to use a second program bus (audition or utility) to feed the phone line and de-select the sources that caller need not receive. This method has the advantage of allowing on-air level changes to be heard by the caller. This setup does not work well for off-air applications because of the switching required that usually leads to mistakes that are heard on-air.

Most newer consoles have provisions for telephone modules that enhance the function of the telephone mix-minus by switching the feed to take specific advantage of on-air or off-air use. When the telephone module is turned ON, the phones are fed from a mix-minus of the

Analog & Digital A2-D Audio Measurement System

The affordable instrument
Designed to meet the challenges
of tomorrow's testing needs

- Analog & Digital Generator and Analyzer
- User friendly front panel
- Stand-alone or remote control via RS-232 or IEEE-488
- Portable

We set the standard in making audio testing AFFORDABLE

NEUTRIK AG
Liechtenstein
Tel: 075 / 237 24 24
Fax: 075 / 232 53 93

NEUTRIK Instrumentation
USA / Canada
Tel: 0514 344 5220
Fax: 0514 344 5221

NEUTRIK
Germany
Tel: 0941 98041
Fax: 0941 99 97 72

NEUTRIK UK
Great Britain
Tel: 0983 811 441
Fax: 0983 811 439

NEUTRIK Zürich AG
Switzerland
Tel: 01 734 0400
Fax: 01 734 3891

NEUTRIK®

CONNECTING THE WORLD

Circle (29) on Free Info Card

System Two

A New Standard For Audio Testing



Leading edge performance has been a defining feature of Audio Precision products since the inception of our company in 1984. Thousands of our System One audio analyzers are in use worldwide, selected by design engineers for high performance and by test engineers for our comprehensive programmable analog and digital audio measurement capabilities.

Now our System Two true Dual Domain audio analyzer joins the System One, setting a new standard for performance and flexibility in audio frequency test & measurement.

System Two is a true Dual Domain analyzer. Other test instruments may have both analog and digital inputs and outputs ... but they're not true Dual Domain! They rely on performance-limiting converters to pass analog signals back and forth to a DSP core of digital-only hardware. Passing signals through a/d or d/a converters for every measurement robs the test instrument of performance. System Two includes

separate, independent hardware for direct audio measurements in both domains, plus additional and extensive interface measurement capability including jitter measurements, eye patterns and all other parameters described in AES3, the serial audio interface standard.

The new standard of System Two is represented by performance specifications such as guaranteed analog generator and analyzer residual THD+N of -108 dB, guaranteed analog signal flatness of ± 0.01 dB for the generator and analyzer; and 24 bit digital signal generation with 48 bit FFT dynamic range.

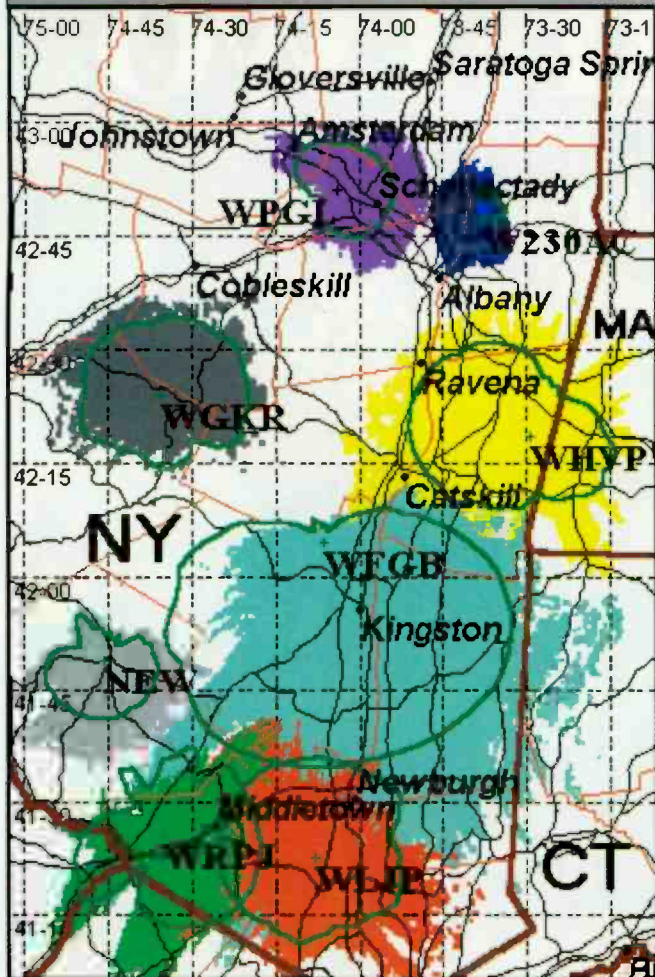
From aircraft to automobiles, satellites to cell phones, headsets to hearing aids, System Two represents a new standard for audio frequency test & measurement applications. Compare for yourself - our worldwide force of representatives will be pleased to provide comprehensive specifications and a true Dual Domain on-site demonstration.

**Audio
precision**

**Audio Precision
PO Box 220E
Beaverton, Oregon 97075-3070
Tel: (503) 627-0832 FAX: (503) 641-8906
US Toll Free: 1-800-231-7350**

INTERNATIONAL DISTRIBUTORS: *Australia:* JRT Electronics Pty. Ltd., Tel: 2 439 3744; *Austria:* ELSINCO GmbH, Tel: (+) 815 04 00; *Belgium:* Trans European Music NV, Tel: 2 465 5010; *Brazil:* INTERWAVE LTDA., Tel: (21) 325-5351; *Bulgaria:* ELSINCO Rep. Office Sofia, Tel: (2) 950 12 45; *Canada:* GERRAUDIO Distribution, Tel: (416) 696-2779; *China, Hong Kong:* F.O.E. (Int'l) Co. Ltd., Tel: 2424-0387; *Croatia:* ELSINCO Rep. Office Zagreb, Tel: 1 69 09 14; *Czech Republic:* ELSINCO Praha spol. s r.o., Tel: (2) 49 68 89; *Denmark:* nan Elektronik aps, Tel: 8657 15 11; *Finland:* Genelec OY, Tel: 77 813 311; *France:* ETS Mesureur, Tel: (1) 45 83 66 41; *Germany:* RTW GmbH & Co. KG, Tel: 221 70913 0; *Greece:* KEM Electronics Ltd., Tel: 1 67 48514 5; *Hungary:* ELSINCO Budapest KFT, Tel: (1) 269 18 50; *India:* Electro Dynamics, Tel: 512 364713; *Israel:* Dan-El Technologies, Ltd., Tel: 3-647 8770; *Italy:* Audio Link s.n.c., Tel: 521 648723; *Japan:* TOYO Corporation, Tel: 3 (5688) 6800; *Korea:* B&P International Co., Ltd., Tel: 2 546-1457; *B&P (Korea Office):* Tel: 546 8273478; *Malaysia:* Test Measurement & Engineering Sdn (Selangor), Tel: 3 734 1017; Test Measurement & Engineering Sdn (Penang), Tel: 4 6422088; *Netherlands:* Heryon B.V., Tel: 485 486 11; *New Zealand:* Audio & Video Wholesalers, Tel: 7 847-2414; *Norway:* Lydconsult, Tel: 47-69-178050; *Poland:* ELSINCO Polska sp. z o.o., Tel: (22) 39 69 79; *Portugal:* Acutron Electroacustica LCA, Tel: 1 9414087 / 5420862; *Singapore:* TME Systems Pte Ltd., Tel: 747-7234; *Slovakia:* ELSINCO Slovensko, s.r.o., Tel: (7) 784 165; *South Africa:* SOUND FUSION MFG., Tel: 11 477-1315; *Spain:* Telco Electronics S.A., Tel: 1 531-7101; *Sweden:* TTS Tal & Ton Studioteknik AB, Tel: 31 52 51 50; *Switzerland:* Dr. W.A. Gunther AG, Tel: 1 910 41 41; *Taiwan R.O.C.:* Double Advance Tech., Tel: 2-596 0696; *Thailand:* Massworks Company, Ltd., Tel: 2-294-4930; *United Kingdom:* Thurlby Thandar Instruments, Ltd., Tel: (1480) 412451

ComStudy V 1.50



Here's a Most Likely Server study of eight FM's

RadioSoft proudly releases *ComStudy V 1.50!*

Over 4 years in the making, it is the hottest, most advanced software ever created for AM, FM, TV, Paging and all Land Mobile applications. It is designed for Site Owners, Networks, Radio Engineers, Managers, Paging, Cellular and PCS Operators, Coordinators, Brokers, Lawyers and Consultants. Easy to Learn! Instant Coverage Mapping! Totally User Friendly! Many Overlays!

- Uses latest tiling techniques for shadowing
- Has correct propagation models for all services
- Directional Antennae and MultiSite plots
- Choose color, label, font, underlay and overlays
- Too many features to fit in this ad!

PRICED TO SELL! DISCOUNTED PRICES FOR ALL USERS OF RADIO COVERAGE SOFTWARE!

Seeing is Believing!

Call anytime for no cost demo or information:

RadioSoft: Phone 888.RADIO95, Fax: 904.423.0821,
109 West Knapp Avenue, Edgewater, FL 32132
email: pmoncure@america.com

... a *Customer Friendly* Company

Circle (44) on Free Info Card

TALK RADIO

program chain, when the telephone module is OFF, the phone is fed from an alternate mix. Manufacturers may refer to this as an *off-line* or *telco* mix.

When an older console is the heart of the studio, the additional buses and aux sends may not be available to create the mix-minus. It is sometimes necessary to create the mix-minus with a differential amplifier. By taking a post-fader feed from the telephone level control, it can be inverted and then mixed to the program feed to subtract it from the mix. Adjusting the level for on-air use automatically adjusts the level to the differential amplifier, constantly nulling the telephone audio from the program mix. This is not as reliable as the other methods mentioned, because any phase shift of the signal will affect the quality of the final mix-minus.

There are telephone hybrids that can perform this function internally, as well. By taking a program mix for the input, it takes the incoming caller audio and does the differential mixing internally. This simplifies installation and the circuitry involved is advanced enough to do the job well.

The creation of these alternate monitor mixes lends itself well to the addition of IFB and other cue audio as part of the monitor feed. Because an alternate mix already exists, adding an audio source for cueing and other information can be easily accomplished.

The use of multiple mix-minus feeds has become more common with the increased use of codecs. Because most of these rely on some kind of data compression to squeeze the data into the reduced bandwidth of the ISDN or POTS line, there is an accompanying time delay through the system. This time delay can range from a few milliseconds in limited bandwidth mono applications to almost half a second for full-bandwidth stereo configurations. Monitoring yourself with a time delay of more than a few milliseconds is confusing. Typically, 35ms is the threshold of a perceived delay, called *Haas effect*. In these applications, a mix-minus feed to the remote site is crucial for a successful remote.

Continued from page 38

hear cues and other info can destroy the conversation and the listener will never know what happened.

In our audience. . .

What about a studio audience? Having a studio audience presents a plethora of new issues and problems to tackle. It sounds like it would be easy to do, but there are plenty of considerations.

If the audience is more than a few people, having each person wear headphones for monitoring becomes impractical. When the audience members are going to be an active part of the program, microphone placement is the first critical issue. The physical layout of the room will determine how you will handle people moving around to the microphone. Find a suitable location that is easy to get to, but also isolated from other noise sources in the room.

Because headphones are not practical, there must be an open monitor or monitors in the room for the audience to hear. The source feeding these monitors cannot contain the microphone audio present in the room to eliminate

Increase Your Footprint



Capture the Audience!

It's your Listeners. Your Viewers.

Make them Stay With You!

The **DBMAX™** Digital Broadcast Maximizer gives you the *impact you need to reach them!*

The **DBMAX** is an innovative no-compromise digital audio processor with excellent sound features, that will interface with all analog and digital broadcast formats.

The **DBMAX** was developed in close cooperation with chief engineers at broadcast facilities world-wide, resulting in a combination of three powerful broadcasting tools in one compact, easy-to-use unit:

Transmission Processor:

- ▶ Transparent multiband on-air dynamics processing
- ▶ Expansion of the broadcast coverage area, by providing better signal to background noise ratio for all receivers
- ▶ Easily adapts to any broadcast standard - all pre-programmed and easy to set up

A Sound Investment!

Inserted as the final audio link in the broadcasting chain, the **DBMAX** maximizes your audio modulation. It provides excellent sound optimization in AM and FM broadcast as well as DAB and digital TV audio transmission. Here the **DBMAX** becomes the optimal Transmission Processor, ensuring a louder and more consistent signal, thereby expanding the actual coverage area. Better coverage means you get better ratings, which in turn makes the **DBMAX** extremely good value!

Outside Broadcast Tool:

- ▶ Louder, clearer and punchier signal
- ▶ Dynamic compression of spot/trouble frequencies (air conditioning etc.)
- ▶ Ensures that dynamic levels are within your station's standard
- ▶ Automatic Gain Control for unattended operation

Reliability You Can Back-up!

Years of research and experience in digital compression and limiting techniques for CD mastering have led TC Electronic to the development of the three-band **DBMAX** processor. Reliability and interchangeability is equally important for Outside Broadcasting, so we made sure the information you store on your PC-card will make any **DBMAX** run 100% according to your specific settings. In turn it makes the PC-card an ideal back-up media for your **DBMAX**.

Radio, TV & Film Post Production Optimizer:

- ▶ Louder, crisper, warmer, punchier, more subtle, more spectrally-balanced production – the choice is yours...
- ▶ Finalizes the material
- ▶ Makes it possible to check what the sound will be like after transmission

Put Yourself in the Place of Your Listener

Used as a Post Production Tool the **DBMAX** gives the production engineer the ability to hear exactly what the program material will sound like as received by the listener. The **DBMAX** allows transmission-settings to be copied to the production suites, enabling engineers with a **DBMAX** to listen to the final transmitted signal during the production phase. This way you can make sure your listeners receive the signal you intended them to receive!

t.c. electronic
ULTIMATE SOUND MACHINES



TC Electronic Inc., 790-H Hampshire Road, Westlake Village, CA 91361, USA • Telephone: (805) 373 1828 • Fax: (805) 379 2648

Email: info@tcelectronic.com • WWW: <http://www.tcelectronic.com>

TC Electronic A/S, Sindalsvej 34, DK-8240 Risskov, Denmark • Telephone: +45 8621 7599 • Fax: +45 8621 7598

Circle (45) on Free Info Card

TALK RADIO

the possibility of feedback. Here is another application for a separate audio mix. The monitor should be run just loud enough for people to hear without letting too much of the audio leak into the microphone. The key to success here is the placement of the monitors compared to the microphone. Use the directional characteristics of the microphone to your advantage.

Use of a cardioid microphone will help with isolation, but be careful. If the mic pattern is too tight, you may end up losing the audience member's voice if he or she moves too far to the side.

If studio feedback is still a problem, there are feedback reducers that can automatically filter out the harmful frequencies. These operate by inserting deep, narrow-Q filters into the audio path as needed, as determined by the processor's circuitry. These products offer a range of capabilities. The basic units have only a few

frequency bands that are set and remain static, while the more complex (and expensive) units have multiple bands up to 10 or more that are inserted as needed. The control circuitry can also be smart enough to sense the presence of the offending frequencies, filter them, and then after a period of time, reset the filters if necessary and re-assign them as needed.

Audio processing

The main processing for the station is optimized for the overall program content. With so many other audio sources being pre-processed before they are put on the air, you need to allow for similar treatment to the mics. A microphone processor is optimized to handle the properties of a voice to give it a smooth, consistent sound. When properly set, it is possible to reduce the excessive peaks that are normal in the human voice and give a more consistent overall level for use in the program mix.

When a mic processor is improperly set, the resulting sound can have an interesting quality that may be suitable for an occasional effect, but an overcompressed, overequalized voice has a greater chance of becoming fatiguing to the listener.

Mic processors usually have a *downward expander* or *gate* built into them. This can eliminate some extraneous noise or assist in isolating open mics from multiple pickup paths. The level of the gate must be carefully set so as to not cutoff at too high of a threshold. When the threshold is too high, the audio will mute abruptly at the end of each sound, making it sound artificial. If it is set even higher, it can affect the audio, cutting off the person's voice in mid-sentence.

If you are using a profanity delay (which is always a good idea), you are going to have to monitor from a point in the program line before the delay. This audio feed will be routed to your control room monitor selector and any other device that needs a

Why *limit* Your possibilities

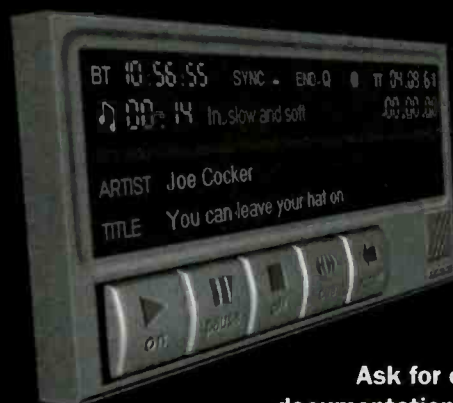
mediatron offers you the complete digital solution for your Radio Station!

Based on mediatron **plug-in** technology, Windows NT 4.0, standard PC- and network- configuration with unlimited audio storage (MPEG) using harddisk.

- Cart replacement, live assist and 24h automation
- Newsroom- and cartwall- systems
- News editing, text and audio
- Multitrack recording and editing
- Notebook recording, editing and communication
- Satellite automation
- Program scheduling
- Traffic integration
- ISDN and Internet
- Archive solutions



**WANTED:
DISTRIBUTORS**



Ask for our documentation or
<http://www.mediatron.com>

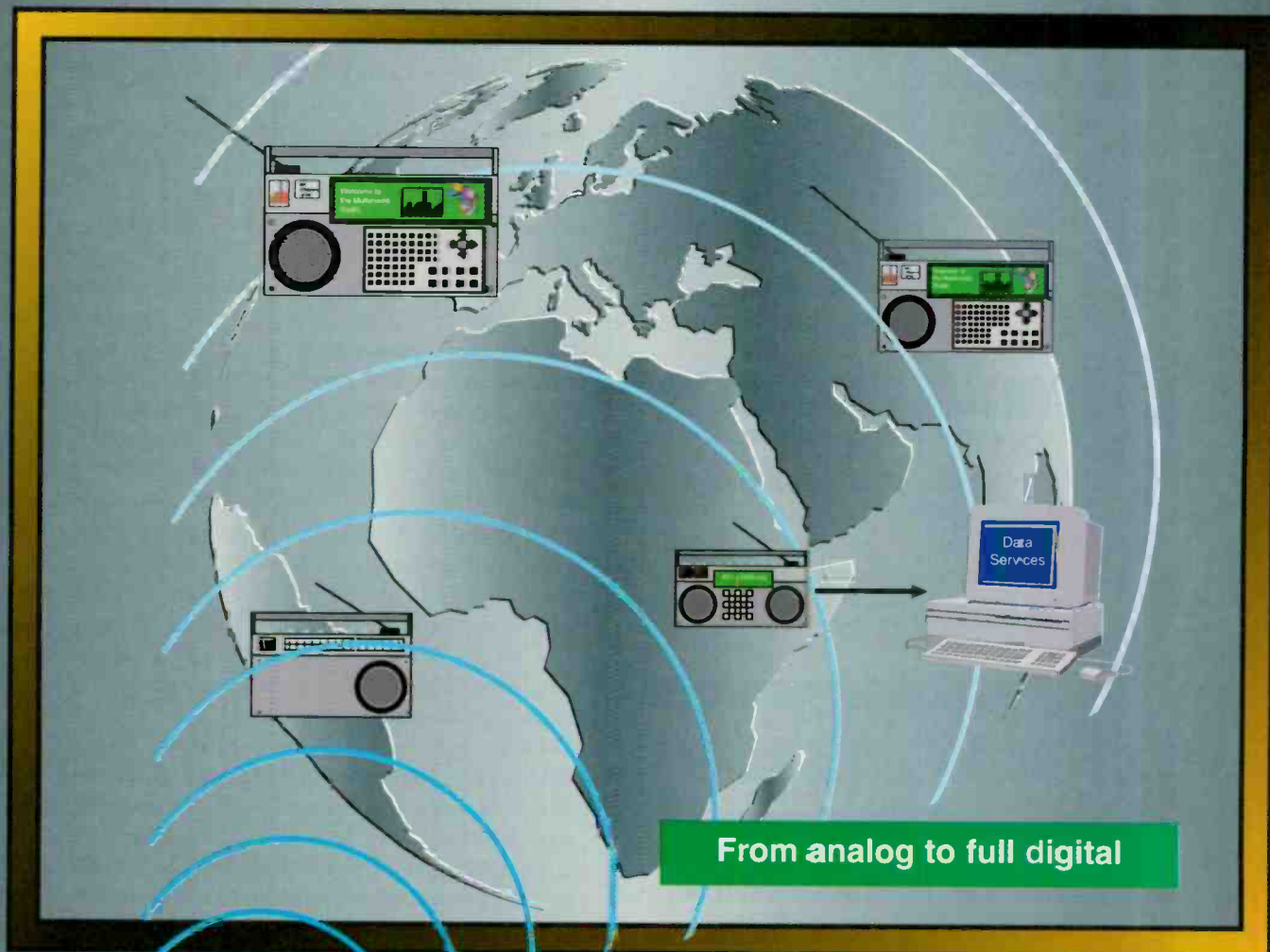
mediatron GmbH
Postbox 43 07 12
80737 München
Germany

Phone ++49-8131-8305-0
Fax ++49-8131-8305-25
e-mail sales@mediatron.com

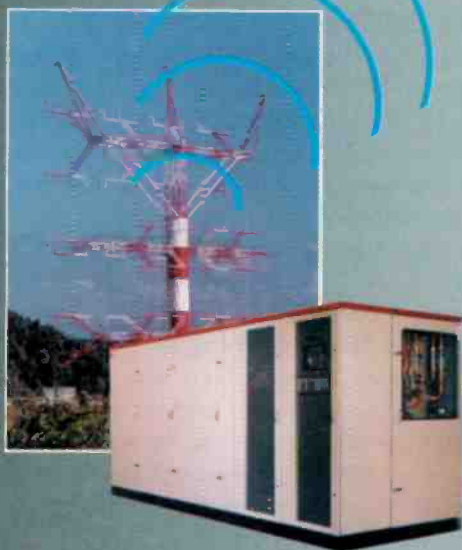
The best, visit us at NAB, booth # 367. mediatron

Circle (46) on Free Info Card

Skywave 2000



REPCO



Short Wave : the Future of International Broadcasting

Presented at major broadcast exhibitions in 1996 **SKY WAVE 2000** might be the biggest leap forward since the birth of Short Wave Radio.

SKY WAVE 2000 will give International Broadcasters the capability of Digital Broadcasting through their existing stations. Improved sound quality, unsurpassed reception stability and all the extras of digital transmission as well as DX-ing analog broadcasts. The future of shortwaves is bright!

 **THOMCAST**

1, rue de l'Hautill, 76700 Conflans-St Honorine, France. Tel. : (+33) 01.34.90.31.00 - Fax : (+33) 01.34.90.30.00

Circle (47) on Free Info Card

Coaxial Dynamics'

NEW Line of
Liquid/Air
Terminations
are quickly becoming
the choice of
"Chief Engineers"
for testing, adjusting
and alignment of
R.F. Transmitters.

The NEW design
of the Coaxial
Liquid/Air Cooled Loads
gives you the capability
to handle requirements
from 1 Kw to 10 KW.



COAXIAL DYNAMICS, INC.

SPECIALISTS IN RF TEST EQUIPMENT & COMPONENTS

15210 Industrial Parkway, Cleveland, OH 44135
216-267-2233 800-COAXIAL FAX: 216-267-3142
E-Mail: coaxial@apk.net
Web Site: <http://www.coaxial.com>

Circle (48) on Free Info Card

New Survey Results from BE Radio!

The 1997 Salary Survey from *BE Radio's* market research department answers all of your salary and staffing questions, including:

- Salary ranges of station managers, broken down into both the top 50 markets and the rest of the markets.
- Whether SBE certification affects salary and position and by how much.
- The current trends in hiring, raises, and base salaries in all markets.
- The classification of the most common broad casting jobs.
- A comparison of the salaries and job prospects of staff employees versus contract labor.
- An explanation of where both you and your employees fit into the current salary and employment mix.

Order #BERSS97, \$50

To order, call 800-543-7771

INTERTEC
PUBLISHING
A KLUWER MEDIA COMPANY

BE Radio
BER097E

Circle (49) on Free Info Card

TALK RADIO

real-time signal. This audio feed may need to have some kind of audio processing, because most on-air personalities are accustomed to a processed monitor feed off the air. The audio feed taken after the processing but before the profanity delay is often referred to as *pre-delay* and can be routed throughout the facility for use as a monitor feed.

Room layout

The concepts behind studio design can fill an entire book, but some basic ideas should be kept in mind. The room should be large enough to be a comfortable work environment. Because of the constant open microphones, isolation from outside noise sources needs to be addressed. HVAC, traffic and office noise that may be permissible when the mic is open occasionally will quickly become annoying to the listener over time.

The sound of the room is much more important because of the open microphones. There is an economical compromise that must be made concerning acoustic room treatment. Going to extremes for sound absorption is seldom worth the expense. A reasonable compromise can be determined rather quickly. The simplest way is to listen to the room through the microphones over monitors. The most troublesome problems will present themselves quickly. Listen for any coloration of the sound from room reverberations or unusual frequency response from standing waves. Be sure to listen to a variety of sources. Different voices have different frequency content, and sometimes, when one voice sounds great, another might not.

Visibility is also crucial to the room layout. Because radio relies on audio to convey the idea and meaning, the visual cues behind the scenes are an added way to communicate. Clear view from the host to the engineer or producer can greatly enhance the flow of the program. This often puts the guest's back toward the control room, which also helps eliminate some of the visual distractions that can interrupt the thoughts of the guest.

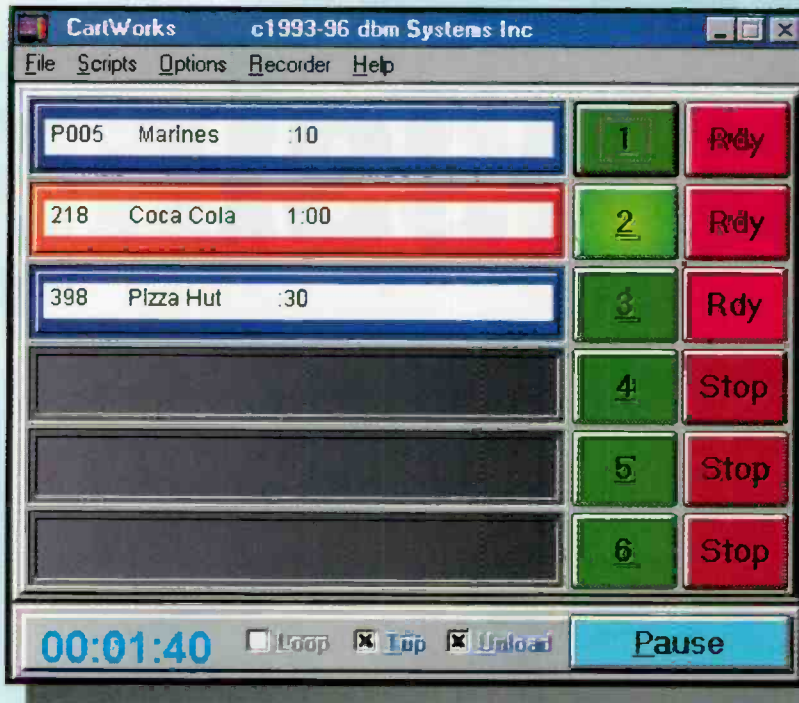
Putting it all together

Producing a talk-radio program or format may not seem as cost-effective in the continuing trend of down-sizing and consolidation. A successful talk-radio program will need at least two people, but is more commonly done with three or four. Any show needs a host. The other positions are an engineer, call screener and producer. These four duties can be combined, but certainly add to the work load.

Whether the topics are broad or specific, sports or politics or just a little bit of everything, the popularity of talk radio is as strong as ever. With more nationally syndicated programs available, and even more talk-radio programs or formats showing up on FM stations, it is obvious that a good talk show can keep your listeners tuning in. The right equipment and the right people can make it all happen.

Circle (152) on Free Info Card for more information on talk-radio equipment and studio hardware.

Going Digital Just Got Easier!



CartWorks Digital Audio Systems

From simple cart replacement to full automation, CartWorks is the easy choice!

Familiar Operation

One look and you'll know, CartWorks is undoubtedly the easiest digital audio system to learn and operate. But don't let the simple user interface fool you. There's lots of power hidden below the surface.

Windows95*

We've got features you'll never find on any dos based system. With CartWorks and Windows95, you get more than just a digital audio system. Better yet, operators already familiar with Windows become instantly productive.

Affordable

CartWorks is reasonably priced.

Complete Cart Replacement systems start at \$4,995.

Complete Satellite Automation systems start at \$6,995.

Truly affordable - music on hard drive coming soon!

Performance

CartWorks was developed by a team of longtime radio pros for the broadcast environment. It's designed to operate the way you'd expect, like broadcast equipment. And we use only the latest and best industrial grade PCs with world class **apt-X** digital audio.

Support

24 hour, 7 day a week Technical Telephone support by real radio engineers. We speak your language and understand the importance of staying on the air.

Extended Connectivity

CartWorks gives you more choices so you can work more efficiently. LAN Network, Dialup Networking, Remote Control, and Internet Spot Transfer.

NEW! X-CONVERT

Converts audio storage formats digitally, allowing you to use most any digital editor with CartWorks.

For a free demo disk or to learn more
call dbm Systems today:

1-800-795-RADIO

Fax (601) 853-9976

Or visit our site on the world wide web:

Circle (50) on Free Info Card

<http://www.cartworks.com>

Audio processing



The debate of signature sounds, loudness on the dial and clean audio goes on. Understanding how to achieve your goal helps ease the conflict.

By Jeff Keith, CPBE

Audio processing. This pair of seemingly innocent words has the power to divide a radio station, especially the programming and engineering departments. It is the one piece of technical equipment that also has the power to shape how your radio station sounds on the radio dial next to its competitors. When setting up the station's audio processor, we quickly discover that its tremendous powers have the ability to either enhance or destroy the sound of our station. Unfortunately, these two possible outcomes are usually not far from each other on the control settings, and this is where the fun begins!

The "adjuster" of the audio processing shapes the sound of the radio station just as the

Photo courtesy of Brian Chalmers.

GET IT ALL.

ONE SOURCE

ONE CALL

**FINALLY.
COMPLETELY
INTEGRATED
RADIO OPERATIONS.**

The perfect digital radio operation. Now it's a reality with Computer Concepts' complete line of integrated radio products.

With traffic and reporting, integrated music scheduling and complete studio products, Computer Concepts has the integrated digital product line for your station operations.

MAESTRO is the brain for all operations — music and commercials, announcer text with daily schedules, all on screen with instant access to all of your audio inventory.

VOICETRACKER combines your music, commercials and pre-recorded voice segments to create a live sounding automated program.

V.T. (NEW!) Sure to be the leading traffic system in the world. Now manage and report all traffic operations for up to 128 different stations from one location.

NEWSROOM captures text and audio from wire services and network feeds for creation of newscast. Write, edit, package or play audio and text. Plus link actualities to copy.

CutMaster integrated multi-track editing with powerful realtime effects editing.

Get real digital operations with just one call, Computer Concepts.

See us at
RTNDA Booth #611
NAB Radio Show Booth #209



Computer Concepts Corporation

8375 Melrose Drive • Lenexa, KS 66214

Toll Free 1-800-255-6350 • Phone 913-541-0900 • Fax 913-541-0169

Circle 130 on Free Info Card

Audio processing

artist placing paint on the canvas creates a picture. Depending on the skills and goals of the two parties in these scenarios, the outcomes can be widely different. The seemingly random placement of paint on the canvas by a skilled artist can create an abstract work of art worth millions. However, setting up an audio processor with random control settings will probably not result in an on-air sound worth millions. The result of doing that will likely be quite the opposite.

The adjustment of on-air audio processing requires a thorough understanding of the product being adjusted. You also have to know what sound you're trying to achieve, and it doesn't hurt to have a good feel for the station's programming. You also need a detailed and recent knowledge of where the other stations are in the market. Nothing can

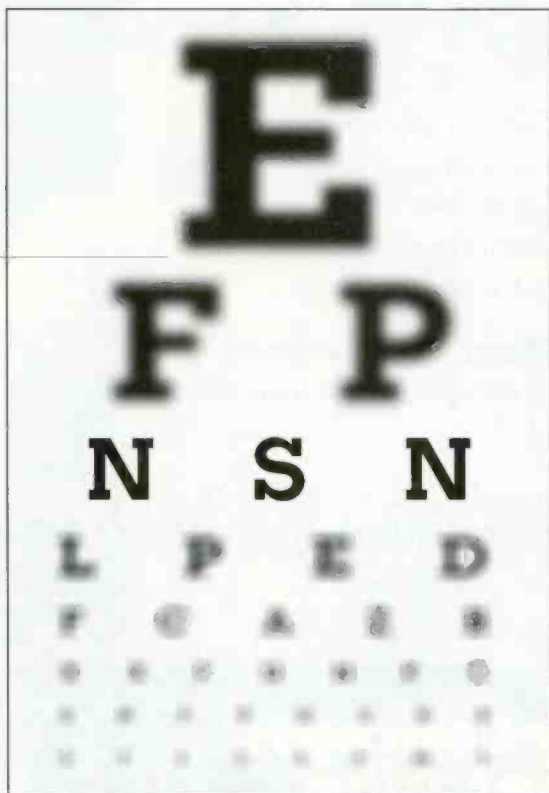
be so frustrating as to spend several unsuccessful hours adjusting your new "Tornado 2000" processor, trying to "catch up" to your competitor across town, only to find out that they know what you're doing and are temporarily overmodulating to throw you off track. This tactic has been reported by several engineers I know. You shouldn't drive your car without using the mirrors, and it doesn't hurt to look around the corner with your modulation monitor to see if everyone else is "behaving" while you play.

Research, research . . . research?

Radio stations spend tens of thousands of dollars annually on music and audience research. They have a good idea where they are at any point in time and what the audience needs in the way of program content. Then they spend tens or hundreds of thousands of dollars subscribing to a rating service to tell

them how they're doing. We do these things to try to measure our audience to make sure it gets what it wants, but do we ever ask them about their impressions about how they think our station sounds? You could argue that many listeners might not care or be able to tell, but what about the rest? What about our target audience? Do we set our processing to please the tastes of our audience and our announcers or do we just set it to please our own egos? Depending on the political structure in your station, this can be a tough call.

The station's programming department is charged with the goal of creating ratings. The station must attract as many potential listeners as possible, but then it needs to keep them. From a technical standpoint, that usually means setting the processing so that listeners' first impression of the station is one of "power," "authority" or "bigness." You want listeners to feel that the station has the power to deliver what they want.



Your Choice Couldn't Be Any Clearer.

Considering satellite systems for paging, voice, data, audio, or the Internet? NSN Network Services is your clear choice. Working with NSN you get a system designed for your needs now and in the future. We offer complete design consulting service, systems integration, equipment sales, and on-going satellite spacetime services worldwide. And NSN is the world's premier direct satellite Internet service provider.

NSN - your clear choice in VSAT networks.

Main 970•949•7774
Fax 970•949•9620
<http://nsn.net>
e-mail: sales@nsn.net

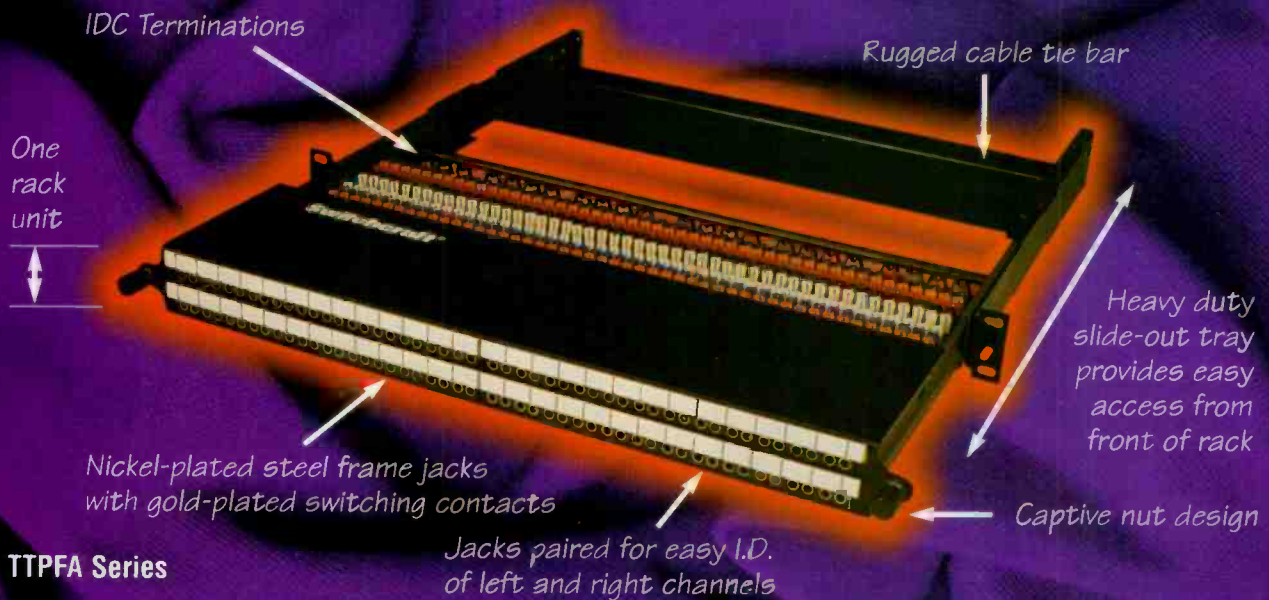


NSN NETWORK SERVICESSM

P.O. Box 7510
Avon, CO 81620

Circle (31) on Free Info Card

Fill Your Rack With Switchcraft®...



Introducing the Front Access Patchbay Series... an exciting new reason to make Switchcraft your source for audio panels.

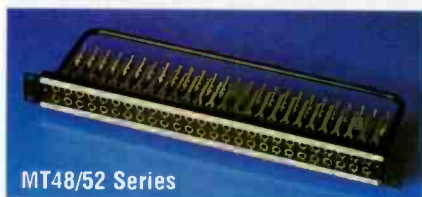
Our innovative front access patchbay gives you space where you've never had it before and convenience you've never dreamed of, in a quality package you've come to expect from Switchcraft. Our heavy duty slide-out tray gives you access to the 96 nickel-plated steel frame jacks *from the front* of the unit.

But that's only the beginning! See the photo above for all of the features and benefits, which make this panel

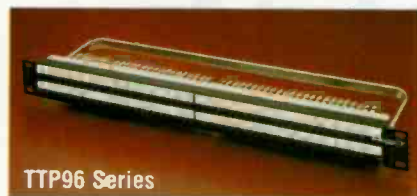
ideal for use in studios, tape editing rooms, mobile facilities and anywhere space is limited.

While you're at it, check out the patching products below. Don't forget our high quality patchcords, and industry-standard Q-G® microphone connectors.

Switchcraft is your one-stop shop for all of your broadcast interconnect needs. Call (773) 631-1234 ext. 243 today for a copy of our Audio Video Products catalog.



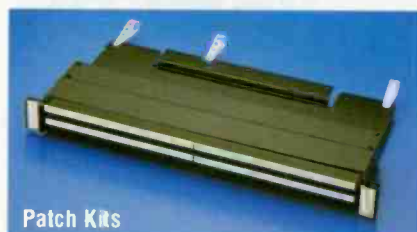
- 1/4" Nickel-plated steel frame jacks
- Rugged cable tie bar
- 3 1/2" or 1 3/4" panel height



- TT Nickel-plated steel frame jacks
- Rugged cable tie bar
- Extra wide labeling strips
- 1 3/4" panel height



- Extra wide labeling strips
- Fully-wired with EDAC connectors



- Choose from a variety of normalizing configurations
- 3 1/2" or 1 3/4" panel height (1/4" or TT)

Raytheon Electronics

Switchcraft®

Switchcraft®

5555 North Elston Avenue • Chicago, IL 60630
(773) 631-1234 • Fax: (773) 792-2129
www.switchcraft.com

Circle (32) on Free Info Card

Switchcraft® - Consistently Excellent Since 1946™



RF COMPONENTS

- Transmission Line Rigid/**HELIAX**
- Waveguide
- Filters/Combiners UHF/VHF



TV ANTENNAS

- UHF • LPTV
- VHF • Dual mode



FM ANTENNAS

- Sidemounts
- Panels
- Combined Systems



PANEL ANTENNAS

- FM • UHF • VHF

When You Want More Than Just An Antenna



Made In USA since 1954

JAMPRO ANTENNAS/RF SYSTEMS, INC.

P.O. Box 292880
Sacramento, CA 95829 USA
Phone (916) 383-1177 • Fax (916) 383-1182

www.jampro.com • E-Mail: jampro@ns.net

HELIAX® is a registered trademark of Andrew Corporation

Audio processing

The first impression listeners might perceive when changing stations is a change in loudness (unless, of course, you happen to be playing their favorite song). Hopefully, your station is as loud or louder than the station the listener is tuning away from, because this is likely where that first impression of power is made.

If we pursue this goal too far, we quickly get into trouble. The goal of raw loudness, without other considerations, creates many possible fatigue factors. Your listeners might find that they're mysteriously "getting tired" of listening to your station and they might not know why. The never-ending pursuit of absolute loudness is commonly blamed on the downfall of AM, and whether that judgement is right or wrong, from a technical standpoint, it is possible and we have to consider it. In any particular market there will always be that one station that is the loudest on the dial. It might be yours, then again, it might not. Does the audience care? Let sanity prevail.

When we look at how present-day audio processing products evolved from those simple boxes of 30 or 40 years ago, we see how the trend toward ever-increasing loudness levels hasn't slowed down a bit. Now, with digital signal processing, we are able to write code to do functions that would be complex or impossible in the old analog world. We still have to be able to write the proper code and that's where some problems exist in present-day digital processing products. Great progress is being made as audio processor designers are finally learning how to define their dreams in software. Some say we've finally reached the physical limits of how loud a station can be. But, since we won't know unless we try, we keep searching for that extra decibel of loudness.

Processing designers have made great strides in matching the dynamics of their gain control structures to what our ears and brain expect. Much like the bouncing ball above the words on a Karaoke machine, the processor's gain has to follow the signal dynamics in a way that please our ear. If the designers get this timing (and the height of the "ball") just right, instead of pumping and other artifacts, the music "just fills in." Much of this progress is directly attributable to advanced studies in psychoacoustics, which is the study of why and how humans hear what we do.

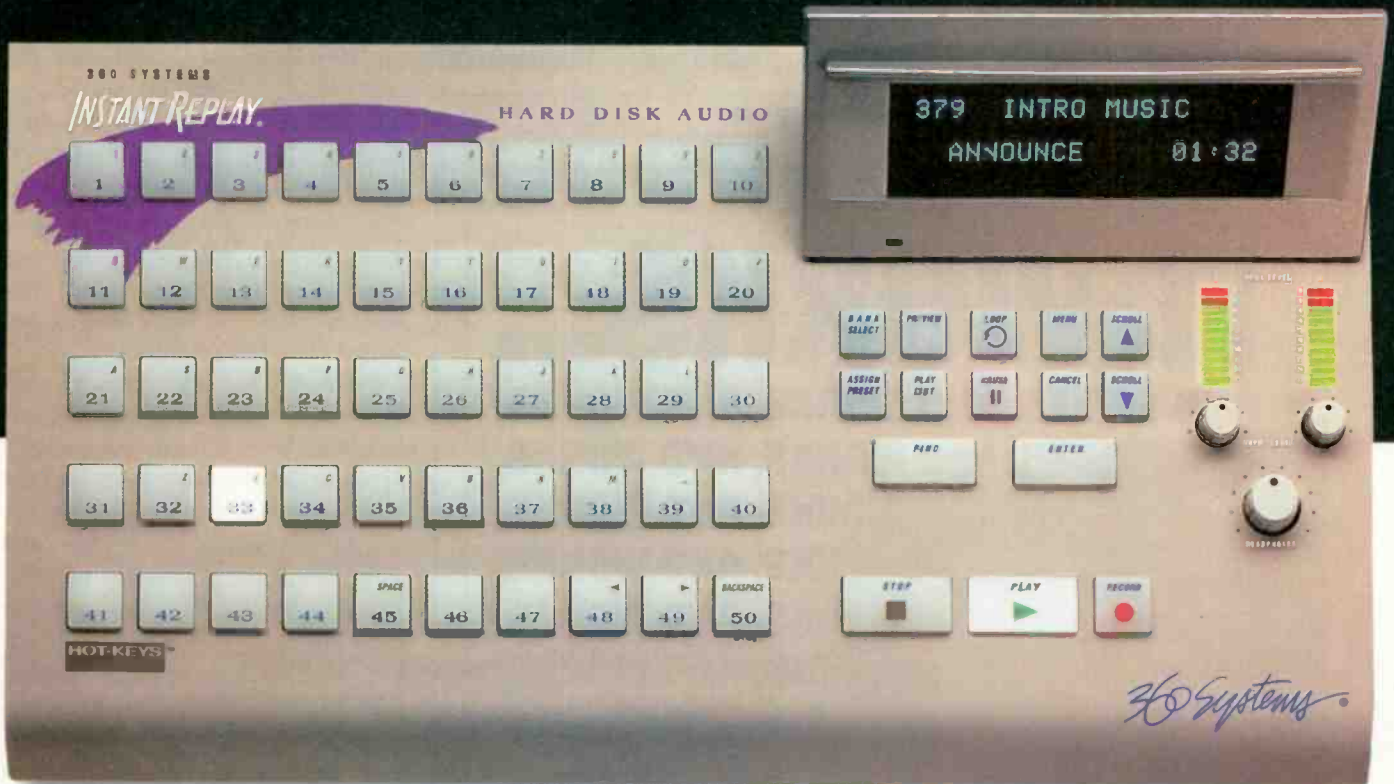
The designers of audio processing have also studied the various types of audio distortion created by their individual designs and have attempted to model their circuits to either minimize or mask things that the masses might find objectionable. They make trade-offs in their designs, just like we make trade-offs in the adjustments after we install their product into the equipment rack and tweak it. Let's see how we got into this loudness predicament in the first place and why it can be so technically and politically complicated.

Audio processing: the (once simple) past

About 30 or 40 years ago, audio processors were employed in broadcasting simply as protection devices.

Circle (33) on Free Info Card See us at NAB Radio Booth #828

Instant Replay.[®] Instant sound effects. Instant music. Instant fun.



Take it out for a 10 day joy ride.

Instant Replay puts a thousand audio clips right at your fingertips.

You want sound effects? You got 'em! You want music and song? It's yours...as much as you want. In fact, Instant Replay holds up to 24 hours of your greatest material.

With everything on-line, titled, timed and ready to play,

Instant Replay is fast, fun and easy to use.

And with 50 Hot Keys, you're in the driver's seat creatively.

So, take us up on our offer to go out for a joy ride with Instant Replay. It's on us.

We're that sure that after you test drive it, you'll want to park it at your place.

Drive it Hard!



Attention call letter stations.* You're only a phone call away from a free 10-day Test Drive.

So try it out. We'll understand if you don't give it back.

(818) 991-0360

360 Systems[®]

PROFESSIONAL DIGITAL AUDIO

VISIT US AT NAB BOOTH 337

For more information call (818) 991-0360 / Fax (818) 991-1360 / www.360systems.com

* Offer good in US and Canada only.

Circle (34) on Free Info Card

Audio processing

The early products were simple audio compressors and limiters, and they were used only to ensure compliance with FCC regulations by preventing overmodulation. At that point

in time, audio processing was in its "purist form," and as little as possible was used so as not to disturb the artistic intent of the program material. The compressors usually had gentle characteristics and they were merely used to average out gross long-term errors in program level.



Figure 1. A typical single-band audio processing chain.

This also made the job easier for the limiter, preventing it from having to deal with widely varying input signal levels.

Someone then discovered that by pushing those devices just a little harder, denser modulation of the carrier resulted. In AM, the primary medium of the day, the signal was a little louder due to the resulting higher average sideband power and this resulted in small, but usable increases in coverage area. It wasn't long before compressors and limiters were being used well beyond their original intent, and for competitive reasons, this trend continues today in a seemingly endless upward escalation of signal density and audio processor complexity.

Although there were many variants before it, the most widely remembered early broadcast "processors" seem to be the CBS Audimax and Volumax pair. Not to discount the myriad of products before them, but these two boxes performed the compression/leveling and limiting functions probably better than anything before. The first Audimax (which was the model RIIZ, I believe) was a vacuum tube design. It performed intelligent leveling of the program audio and when set correctly, it virtually erased long-term program level variations coming out of the studio. The 400 series Volumax was a solid-state limiter/clipper, albeit with germanium transistors. This was probably the most popular single manufacturer audio chain that I can remember from the '60s. It was common to find these boxes teamed up with a Kahn Symmetra Peak, a passive phase scrambler. The combination worked well and was simple to set up. These boxes remained in use throughout the changes in AM rules, which went from no limit on positive AM modulation, to the later and more practical +125% limit.

IT WORKS...

AND WORKS, AND WORKS, AND WORKS,
WORKS, AND WORKS, AND WORKS,
RKS, AND WORKS,
RKS, AND WORKS,
RKS, AND WORKS,
RKS, AND WORKS,
RKS, AND WORKS,
AND WORKS



New and sometimes confusing technologies are constantly being introduced to the market as the newest "fix," but the analog tape cartridge machine remains a reliable and proven mainstay in broadcast operations worldwide.

We are proud to continue production and technical support of the tape cartridge recording and playback products that have made the name ITC synonymous with quality and reliability:

- Series 99B
- DELTA Series
- Series 1
- Series 2
- ESL-V eraser/splice locator

For new or used equipment, and for prompt, economical equipment service, call the experts -- **ITC Audio Products!**

ITC Audio Products
1602 Rhodes Lane
Bloomington, IL 61704
TEL: 800-447-0414 or 309-828-1381
FAX: 309-828-1386

DRS AHEAD TECHNOLOGY, INC.



Two heads (I mean processors) are better than one

It wasn't long after the CBS products arrived that engineers began to make modifications to them to make



BAYS

Stainless steel construction, input connector type N, Maximum input power per Bay 600W, circular and vertical polarization

POWER DIVIDER

Brass made, chrome plated, EIA 7/8 input connector, Broadband 88-108 Mhz, maximum input power 2 Kw, Stainless steel mounting brackets included, double step.

JUMPER CABLES

1/2 inch coaxial cable, included male N connectors

MP 2-4

RADIATING SYSTEMS UP TO 20.000W

PRICE

\$1,650.00

Offer valid until May 1997

OMB also Manufactures:

FM transmitters

TV transmitters

FM and TV Links

TV antennas

Medium power FM antennas

Connectors

For other radiating systems please contact us

1-888-OMB4USA

Circle (36) on Free Info Card

Audio processing

them more competitive. Soon, the limitations and audible artifacts of broadband processing were realized and engineers around the country began looking for a better way. They began experimenting and borrowing some technology used in high-quality loudspeaker design. They began to gather multiple processors together and feed them with home-

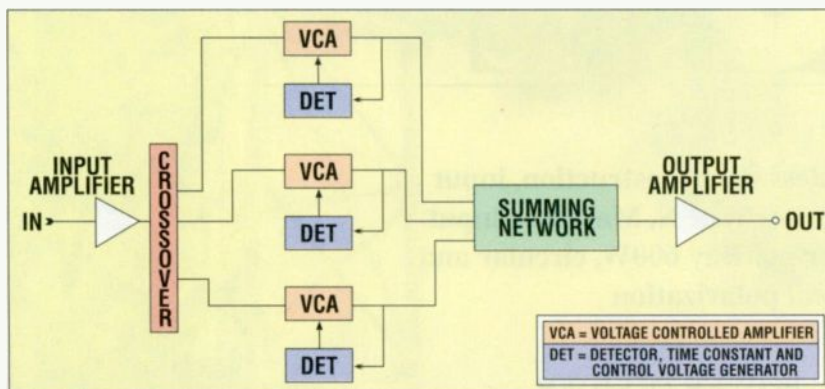
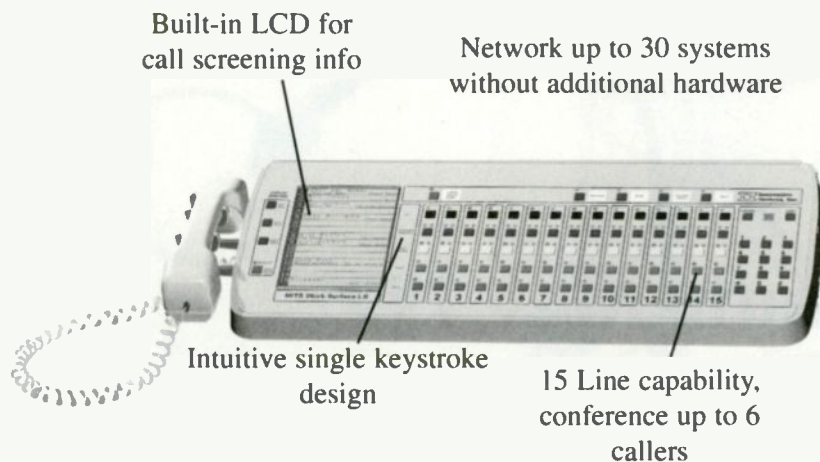


Figure 2. A basic multiband audio processor.

Need more than 12 on-air phone lines?



No problem!

For more information, call:

1-888-890-7424



Innovative Devices, Inc.

1-801-486-6556

1-250-260-2861

brew band splitting and combining boxes. The first incarnations of today's multiband processing were born, although they were crude by today's standards. I remember my first exposure to this technique in a conversation with Ed Buterbaugh, then chief engineer at CKLW. It was 1975 and I could no longer resist the temptation to call him to find out how the "Big Eight" got that great sound.

About the same time, the UREI BL-40 Modulimiter arrived. The BL-40 contained a broadband rms compressor followed by a limiter, and if you carefully study its schematic diagram, you'll notice that the BL-40 is essentially a UREI (Teletronix/United Audio) LA-3 compressor and a UREI 1176 limiter in one box, with some refinements for AM. The LA-3 is a solid-state descendent of the famous Teletronix LA-2 tube-based compressor. The popularity of the LA-2 compressor and the 1176 limiter still prevails today in recording studios worldwide, which speaks volumes about the quality and design philosophy of these two products.

Soon, Mike Dorrrough marketed his DAP 310. It was the first commercially available multiband broadcast audio processor and Mike told me that it was conceived and built on his kitchen table. The DAP was a tri-band design, with gentle 6dB per octave crossovers. Each of the three bands performed limiter and expander functions. The three bands were then summed back together and passed through a rather crude but effective broadband clipper. The unit worked well and usually out-

Bringing Portable Mixing to the Next Level.

Impressively quiet and with more features than many mixers twice its size, the Shure FP32A set a new standard in field production.

Now comes the FP33. With new high-precision sealed input potentiometers, an improved battery switching circuit, internal headphone level adjustments, and durable 3.5mm jacks, the FP33 takes portable mixing to the next level.

Professional Mixing That Goes Wherever You Do.

The Shure FP33 is a 3-input, 2-output portable mixer specifically designed for:

- Remote audio recording
- Electronic field production
- Electronic news gathering
- Location film production

The FP33 weighs just 3.5 lbs and is about the size of two video cassettes. Providing 8 hours use with just two 9V alkaline batteries — or powered by any 12 to 30 VDC power supply — the FP33 will go wherever you do.

Quiet Enough For DAT.

The FP33 has an exceptionally low self-noise and a wide dynamic range — making it perfect for use with DAT and other digital recording media.

So Many Features In So Little Space.

The new FP33 gives you all the features of the FP32A and more, including:

- Sealed, conductive plastic input potentiometers
- Dynamic range of over 100dB
- 48V phantom, 12V phantom and 12V T (A-B) power
- LED indicators of input levels, output peaks, limiter action, and low battery
- Pop-up pan pots
- Link switch to couple inputs 2 & 3 into a stereo pair
- Mix bus to connect an additional FP33 or FP32A
- Comprehensive headphone monitoring control with MS stereo matrix
- Internal DIP switches for over 4,000 customized set-ups

If you're looking to bring your mixing to the next level, make sure to pick up a Shure FP33 portable stereo mixer.

For the Shure FP dealer nearest you, call 1-800-25-SHURE.



Audio processing

performed most of the home-brew attempts at multiband processing.

Darn that disco bass

We've slid forward to the mid-1970s now, and there is a real flurry of processor design going on. Lots of new boxes are appearing on the market purporting to do all kinds of magical things to the audio. The Orban 9000A AM Optimod, with its six-band limiter section, is appearing in transmitter room racks around the country. Average modulation levels on AM are still climbing and processor complexity is ever increasing. The limits of AM seemingly being reached, program directors and station owners are now beginning to become more aware of that rarely touched sleeping giant in the back room, the FM transmitter.

It was really only a matter of time before highly modified AM audio

processors started appearing in FM air chains in the never-ending battle for more loudness, coverage and revenue. FM, however, was a lot harder to tame. Due to the competitive modulation levels desired and that nasty 75 μ FM pre-emphasis curve, engineers now had a real tiger by the tail. Strange and previously unheard processing artifacts were being generated, and modulation-robbing overshoots were preventing engineers from enjoying the same level of modulation density and accuracy that they had enjoyed with "decent" transmitters on the AM band. The problem arose of getting good loudness on the FM band; enter Bob Orban.

Orban is the first person generally recognized to discover and tackle the FM modulation overshoot problems. Through some rather astute observations, he found that even limiters with perfect output waveforms seemed to have overshoot problems when coupled to common

FM stereo generators. The problem seemed to be rooted in the low-pass filters between the processor's final clipper and the stereo generator, but why was this happening?

Simply put, the audio emerging from most competitively driven clippers resembles square waves, i.e., the audio can increase only up to a certain point (the 100% point) and then it abruptly stops. This "stop point" creates a flat top on the audio waveform. The resulting square waves contain energy that could interfere with the 19kHz stereo pilot signal if not removed. Therefore, complex filters are required prior to the stereo generator in order to pass program energy up to 15kHz, but protect the fragile 19kHz stereo pilot, which is injected a little more than 20dB below 100% modulation (less than 10% modulation). Unfortunately, these filters distort the time and phase relationships of signals passing through them while they perform their intended function of

Introducing the CB500 Tone Decoder

Satellite Systems now has available the CB500 Tone Decoder. The CB500 will detect the 25Hz, 35Hz, 25+35Hz with individual front panel LED indicators for each function. Other benefits included with the CB500 are-

- Size: 8"w, 2.5"h, 7.25" d
- Output level is adjustable from the front panel. Max output level is in excess of +15 dB
- Frequency response: +/- 1dB from 60Hz to 20kHz
- Distortion/noise better than .04% from 60Hz to 20kHz
- Sub audible tone rejection: 30 dB or greater with undistorted tone
- Relay contacts rated at 1 amp at 120 VAC. Contact NO, modifiable to NC
- Relay closure time front panel adjustable approximately .5 to 2.5 seconds
- Input and put connections: Screw terminal plugs (no soldering required)

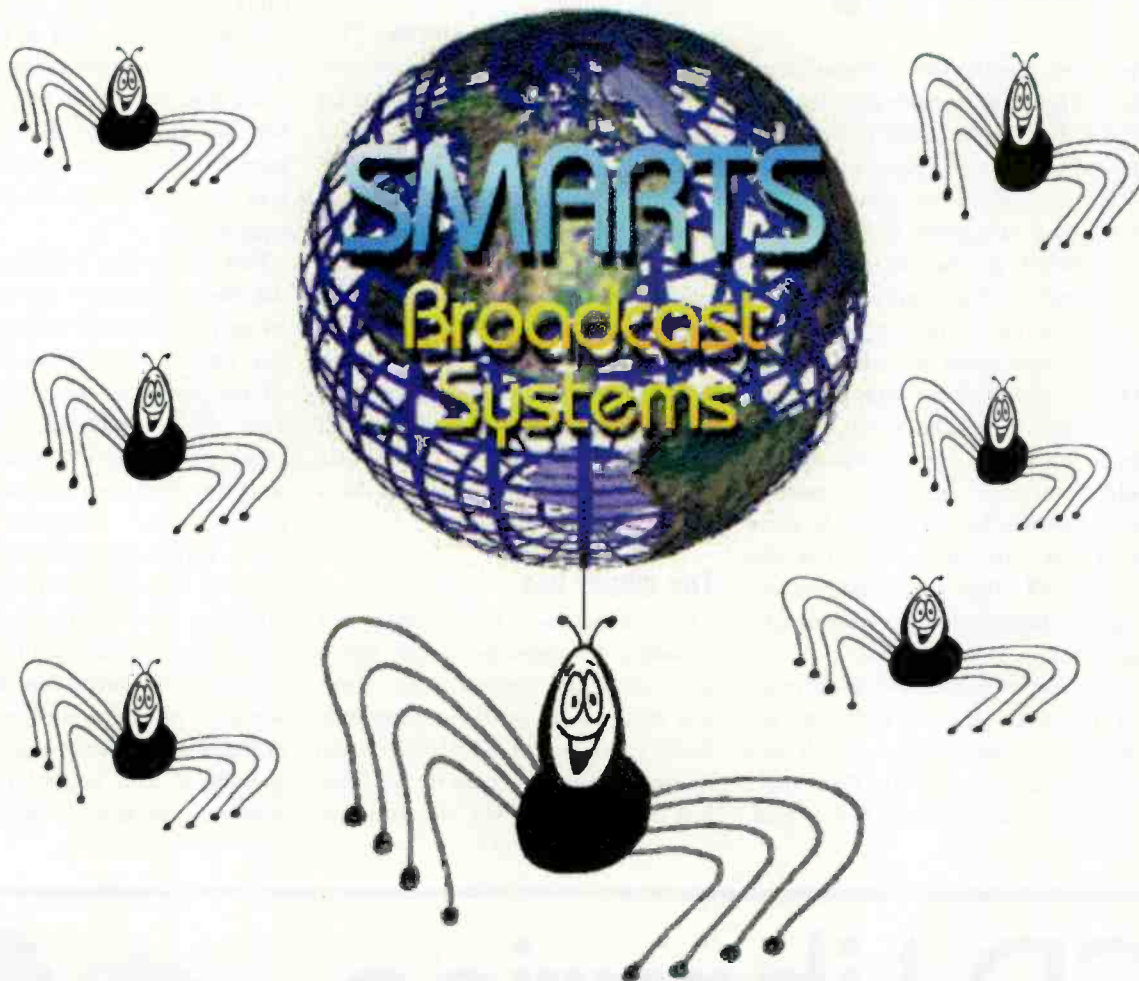
Call us today for more information on the CB500

Phone: **(719) 634-6319**
Sales: (800) 817-7664
Fax: (719) 635-8151



615 East Brookside Street
Colorado Springs, CO 80906

Circle (52) on Free Info Card



We're Proud of the Bugs in our Software!

"The Spider" interlinks your station groups to provide broadcasters a virtually free audio and data path from one station to the next, so you can centralize many costly operations into a single, very efficient system. We now have multiple stations linked via the internet so that production, traffic, and all business operations are at a single location, with sales and very minimal operational staff in the field. The system to transfer spots, music and other programming to the distant stations is intuitive and automatic once the original production is completed. SMARTS has taken the next big step in operating cost savings. You could be realizing those savings in your group. Call SMARTS or any of our dealers today for more information on *"The Spider"* from SMARTS Broadcast Systems.

P. O. Box 284 Emmetsburg, IA 50526 <http://www.ncn.net/smarts>
Phone (800) 747-6278 Fax (800) 498-0618 Email smarts@ncn.net

Audio processing

removing the higher harmonics of the clipped and perfectly limited signal. But, if the filter is doing its job, why do we still have a problem?

Mathematics tells us that removing the higher harmonics from a square wave (which is what the filter has to do) results in the amplitude of the square wave increasing over the level it had when it was "square." This is because the square wave's "squareness" results from it being made up of an infinite number of odd harmonics. Instead of making the amplitude higher, adding in more of those odd harmonics has the unexpected effect of actually reducing the peak value or making the square wave's top "flatter."

Likewise, removing these harmonics makes the square wave's top "not square" anymore. But, if it's not square, what shape is it? That varies a little by filter design, but overall,

the waveform "grows" a sharp peak extending some distance above the rest of the top, which is still flat. This extra peak, depending on several variables, can reach well above an equivalent 150% modulation and contributes literally nothing to your station's loudness. Now, if we only have a 100% modulation limit to deal with, how do we make the station legal if these "overshoots" are occurring and reaching to 150%? You have to turn down the overall modulation until the peaks no longer exceed 100%. But, doing so obviously and significantly decreases the loudness of your station. There had to be a better way.

The magic box

From experience, Orban knew that cascading FM processors with stereo generators and their built-in filters was riddled with unknown outcomes. Each combination of products had its own modulation penalty. So, what was his solution? He elegantly de-

signed a new audio processor, complete with specially designed low overshoot filters and a new stereo generator. He put them all in the same box, with each stage optimized for and aligned to the others. The now famous Orban Optimod 8000A was born and the loudness wars began.

This single-box solution probably did more to improve the sound quality and loudness of FM stations than any other audio processing product of the day, and for a while it was king. Soon, multiband processing began to join the FM band, and many were installed before the 8000A to make it "more powerful." This became especially necessary and important when disco music hit the airwaves with its tremendous bass lines. Single-band processors just couldn't deal with this music well without pumping and other nasty artifacts, and there was a modulation penalty if you backed off on the processor to keep it from pumping.

CD Libraries 97 cents/cut!



Act fast and get the best Broadcast CD music libraries at a very special rate! Until August 30, 1997 you can buy new libraries or categories for only 97 cents per track. These are our best and latest libraries! Call for a free catalog. Libraries are in stock, ready to go. Pay by check/Visa/MC/Amex. Offer not valid on prior sales.

Regular rate \$2.27/track.
Special good on Libraries or Updates.
Also available for Hard Disk Drive at
\$1.17 per track provided on CD-ROM.

50 States: 800-521-2537

Fax: 888-RPM-0006 E-mail: RPMORLK@aol.com

9,000 Tracks.
No Waiting!



rpm RADIO
PROGRAMMING AND
MANAGEMENT, INC.

Top Hits U.S.A. & Ultrasonic-Q Radio Disc trademarks of Radio Programming and Management, Inc., Orchard Lake, MI. Ultrasonic-Q system is Patented.

Circle (54) on Free Info Card

No manual required

but we'll send you one anyway



If traditional audio production is analogous to walking, a digital audio workstation is the equivalent to flying.

Unfortunately, a lot of audio production software can seem like the equivalent of 747 cockpit controls: serious technoid overkill when you're just trying to get from point A to point B.

That's why we developed the **Express™** software interface for our **Prisma™** workstation hardware. So you can enjoy workstation speed and maneuverability instead of logging frustrating hours just trying to get the thing off the ground.

Express is *the* creative tool for radio

broadcast production with a clean interface so simple that even your program director could learn it. *Everything you need is on a single screen* — cut/copy/paste buttons, snapping/grid controls, faders & pans, a transport that is very familiar, a pull-down sound library list, and the ever popular 10-level undo/redo. And the best part is, it works the way you work — quickly and intuitively. So you don't have to spend endless hours inside a manual deciphering cryptic icons, memorizing multiple keystroke combinations, and struggling with computerese.

Not that we cut out any feature you might *need*; we just took out all the stuff you *hate* about digital workstation software. Like nested menus, tricky hardware set-up, and way too many screens piled up on top of each other.

But Express isn't just some kind of "dumbed down" product. Lurking underneath this deceptively *simple* interface lies a *tremendous amount of power and capability* that allows you to accomplish even the most difficult editing tasks. Powerful tools like time compression/expansion, normalization and one-touch submix.

Prisma systems also work well in groups, with Internet-compatible network audio transfer between systems in different rooms or across the planet. You can even send a spot you've created in Express directly to one of several popular digital on-air delivery systems — all ready to play.

And if you *really* want to get going fast, we'll build you a complete turnkey Prisma system, so all you need to provide is some desk space and a power outlet.

So don't just sit on the runway reading the manual. Grab the controls and fly. **Express for Prisma.** Get it done while you're still young.



"I've always known my Prisma system was speedy. Then I got my hands on the new Express software. Its simple interface and intuitive tools make virtually every radio project a snap. It's easy, it's fast... and it makes mounds and mounds of carrot salad. We love it!"

Dave Green
Director of Production Services
Paxon Communications, Orlando

EXPRESS

for Prisma

Feature Bullets with Tiny Print

- 8 tracks with instant vertical and horizontal zoom
- Over 250 markers and 99 auto-locate points
- Fast bipolar waveform views
- Easy head and tail trim
- Directly draggable fades and crossfades
- Snap sounds to markers, grid, current position, or other sounds
- 10-level undo/redo
- Customize keyboard and MIDI controller hot keys to match your working style
- Several popular tactile work surface options to choose from
- Trade sound files and projects with other Spectral workstations via removable media, local networks, or the Internet
- Direct PCM or MPEG network transfer to popular digital on-air delivery systems
- Complete turnkey Prisma workstation systems available
- Free software updates and upgrades for 1 year

Here's the Really Fine Print

Express is just one of three compatible software interfaces for Prisma — and editors are just a part of our product line. Turn to Spectral for an established company specializing in digital audio workstation and connectivity solutions. Call, fax, or e-mail for complete, detailed information on our practical approach to enhanced productivity and for a new tuna salad recipe.

Circle (55) on Free Info Card

SPECTRAL, Incorporated

18800 142nd Ave NE Woodinville, WA 98072 USA

Toll free sales phone: 800 407 5832 Not-the-sales-phone phone: 206 487 2931 Fax: 206 487 3431

<http://www.spectralinc.com>

E-Mail: sales@spectralinc.com



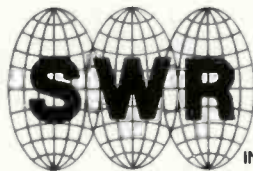
SPECTRAL
A Digital Audio Company

The FM Series

SWR's FM antennas, ranging from educational series to multi-station antenna arrays, are highly customized to meet broadcaster's needs.

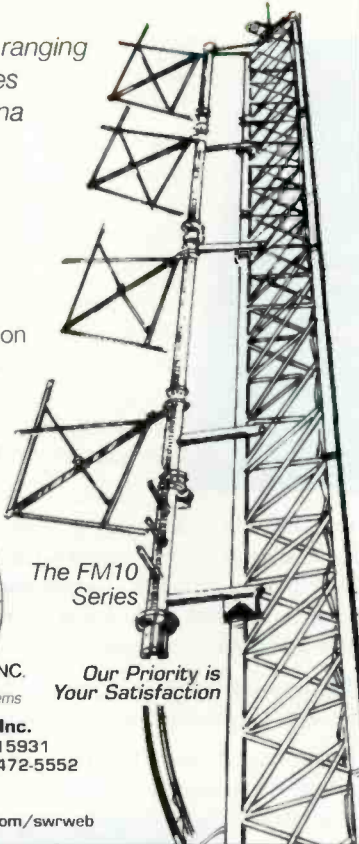
Options

- Circular, horizontal, or vertical polarization
- Beam tilt
- Null fill
- Customized directional patterns



INC.
Antennas and Transmission Line Systems

Systems With Reliability, Inc.
P.O. Box 856, Ebensburg, PA 15931
1-814-472-5436 FAX 1-814-472-5552
Sales: 800-279-3326
E-Mail: swr@third-wave.com
<http://homepage.third-wave.com/swrweb>



The FM10 Series

Our Priority is Your Satisfaction

Circle (56) on Free Info Card

Audio processing

Divide and conquer

When you read the early literature written by Bob Orban, you'll notice that he was strongly against all forms of multiband processing. He felt that it upset the natural spectral balance of music and he was correct. However, the realities of the market at the time were that music was coming out of recording studios "spectrally tilted" to extremes never before encountered in commercial music. Music was changing, recording techniques and equipment were improving, and that meant that bass energies were being mixed into modern music that gave current on-air audio processing of the day absolute fits.

The rescue attempts went in several different directions. Glen Clark, the founder of Texar, designed a four-band leveler that used carefully chosen crossovers and a digitally based control circuit for the gain control section. Clark used some common opto-isolators (similar to the ones used in the UREI LA-4 compressor) to create a simple and elegant variable audio attenuator. When these were coupled to his special control circuit, the unit could compress to reduce levels, expand to raise them or do nothing if the level was correct. That function alone made Clark's device unique, because it wasn't always chasing after itself like other products. The result was a significant gain in average level and frequency response consistency from song to song. Many of the artifacts and grunge that plagued prior simple compress/expand devices were absent in Clark's design. These boxes found themselves in front of all kinds of early processing, including the then popular Orban Optimod 8000A.

That took care of many of the problems coming from program material, but some felt that four bands were too many and Orban was one of them. Orban's solution was the introduction of the Optimod 8100A. The 8100A was designed to handle large amounts of bass, while leaving

Must everything beautiful be fast?

Yes.

You want your studio to look great, but you want it quickly and you want to be able to take it with you if you move.

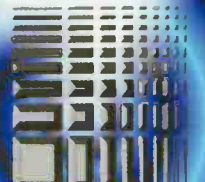
Modular means movable.

It also means faster and easier installs and a higher degree

of sound isolation. Call 1-800-749-1460 See how fast beautiful can be.



ACOUSTIC SYSTEMS
modular sound isolation
www.acousticsystems.com



the science of silence

Circle (57) on Free Info Card

"YOU CAN NEVER BE TOO RICH OR TOO THIN."



Model CT-6 Thin

Your new Radio Systems digital clock won't use up your table space or your budget.

Finally, there's a low cost timing system for your broadcast facility that mounts anywhere. Every model provides accurate time-of-day, a six digit up timer, and functions as a stand-alone or master read-out.



Model CT-6 Desktop - Standard Desktop Cabinet



Model CT-6 Large - Wall-mount with 2" Display

Models provide these features:

- clock or timer operation
- master or slave display
- full remote control
- daylight savings and 1 second adjustments*
- oven stabilized crystal*
- top-of-hour and external synchronization inputs*
- drive for Radio Systems analog clocks*

* features of master drive unit when packaged in the desktop model.

RADIO SYSTEMS INC.

601 HERON DRIVE • P.O. BOX 458 • BRIDGEPORT, N.J. 08014-0458 • (609)467-8000 • FAX(609)467-3044 • WWW.RADIOSYSTEMS.COM

Tell Us The Names
of These Three
Masterpieces,
And We'll Send You
A Coupon Worth \$25
Off One Of Them.



Simply Send The Correct Answers to:



SENNHEISER ELECTRONIC CORPORATION,
P.O. BOX 987, Dept. 206, OLD LYME, CT 06371
TEL: 860-434-9190 ext. 206
FAX: 860-434-1759
e-mail: mictch@sennheiserusa.com
World Wide Web: <http://www.sennheiserusa.com>

Call or write for a FREE color brochure.

Circle (59) on Free Info Card

Audio processing

the rest of the spectrum fairly intact and presentable. The unit accomplished this by splitting the audio into two bands — a master and a bass band. The master band handled energy above 200Hz and the bass band handled energy below 200Hz. Realizing that compression alone couldn't handle large amounts of

ate extreme amounts of loudness without generating objectionable distortion. For the first time, we heard terms like *distortion cancellation* when reading audio processing specification sheets. Orban's high-frequency limiter was also unique.

Rather than reduce the peak level of the program every time high-frequency material was present, his design reduced just the problematic high frequencies. This now meant



Finding your signature sound may require some testing and comparison. Photo courtesy of Brian Chalmers.

bass without pumping, Orban included a clipper in the bass circuit to take care of the momentary overshoots caused by the necessarily slow-acting bass compressor. A simple low-pass filter was included after the bass clipper to remove undesirable clipping distortion. In addition, in order to keep the bass compressor from straying too far from the compression value of the master band, Orban slaved the bass compressor to the master band so that it could follow it to a user-selectable degree, but still independently handle heavy bass when called on to do so. These circuits were so unique that Orban was awarded patents on them.

Orban still had the FM pre-emphasis curve, peak clipping, filtering and stereo generation functions to contend with. His 8100A used a new and patented approach to controlling pre-emphasized audio and could gener-

that a processor could deliver competitive loudness without the usual penalties. It was a major improvement over traditional methods. However, instead of a loss of loudness during high-frequency material as in past products, this method caused a loss of brightness. Now we had a new problem — loud, but dull-sounding radio stations. Program directors wanted this fixed. They wanted more brightness, but they didn't want to lose the loudness. It was a kind of "have your cake and eat it too" scenario.

A science lesson can be a good thing

The FM pre-emphasis curve is the enemy here. It is a standardized equalization boost curve used by all (U.S.) FM stations and it has a complementary roll-off in FM receivers. The main purpose of this pre-emphasis/de-emphasis trick is to reduce noise

PLATFORM FOR THE FUTURE



The 802D Digital FM Exciter from the world leader in advanced RF products puts you in a whole new universe of digital performance.

- A standard platform open architecture means simple software upgrades for RBDS and other technologies; plus, modular hardware design allows for expansion of DSP capacity to handle additional functions.
- Flexibility in design allows for program input in either AES/EBU digital format, analog composite, analog left/right, or multiple SCA inputs, depending on configuration.
- The 802D maximizes audio performance by using DSP's which adhere to the IEEE 754/854 standard 32-bit floating point format, thereby maintaining audio precision and dynamic range.

- A frequency-agile direct conversion system makes the 802D perfect for use in N+1 applications.
- Detailed control and monitoring information is available from a unique front panel LCD screen, plus front panel adjustment buttons provide full control over operating parameters. Complete test and analysis information is available at front panel BNC connectors.

The 802D Digital FM Exciter won't limit your facility's ability to grow and advance in a rapidly changing world, providing a solid platform for performance and growth... only from Continental.

5.96.121

1946-1995. For 50 years, Continental Electronics has provided excellence in broadcast transmission products worldwide. Refuse to compromise... call Continental first!

TEL 800-733-5011 • WWW.CONTELEC.COM

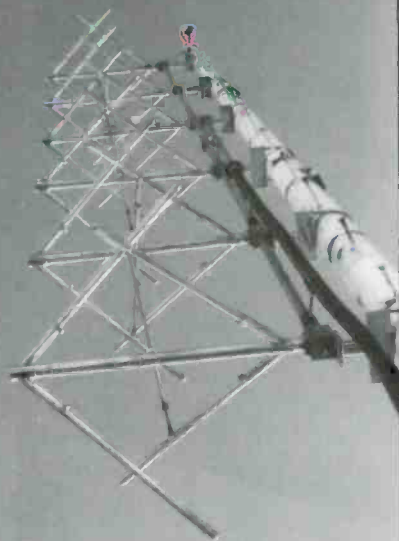


Continental Electronics Corporation

P.O. BOX 270879 • DALLAS, TEXAS 75227-0879 • 214-331-7131 • FAX 214-381-4949

© 1996 C.E.C., Pats. Pending

ULTRA TRACKER



WHAT'S UP WITH ALL THESE NUMBERS?

They have the solution to these serious FM problems:

You can see your station, but you can't hear it

(Multipath due to side lobes stealing expensive power from your main signal)

Interference from your station affects nearby electronic equipment

(RFR/RFI caused by downward side lobes misdirects your ERP instead of covering your market with a single solid signal)



ANTENNA CONCEPTS INC.

6601C Merchandise Way
Diamond Springs, CA 95619

▲ Tel: (916) 621-2015 ▲
▲ Fax: (916) 622-3274 ▲
▲ www.antennaconcepts.com ▲

Circle (39) on Free Info Card

Audio processing

(hiss) in the receiver. To reduce noise, the frequency response in the receiver is purposely rolled off according to the 75 μ de-emphasis response, which is down a whopping 17.07dB at 15kHz. But, in order to restore flat response to the listener's receiver, a complementary 17.07dB boost is required during transmission and therein lies the problem.

probably inappropriate for most modern program material, several new multiband limiter designs began appearing on the market. Most were stand-alone products, but surprisingly, even Orban bowed to market pressure and introduced the 8100A/XT, a new six-band limiter accessory for the Optimod 8100A. It's amazing what a little market pressure can do.

Occasionally, you would hear that other products existed that could deliver competitive loudness and good



The Orban 8200 is a multiband digital processor.

When the FM system was first proposed and put into practice, high average modulation levels were not an issue. No one thought about how difficult it could be to accurately control high-frequency modulation if the average levels were increased and audio clipping (on purpose) was nearly unheard of. No one ever thought that in 50 years, we'd be trying to shove a tornado through a keyhole. And, it should be obvious by now that we can't just simply stop using this problematic pre-emphasis on the transmitter to alleviate the problem. You can only imagine how many receivers you'd need to modify in order to make that idea work.

Invent, invent, invent

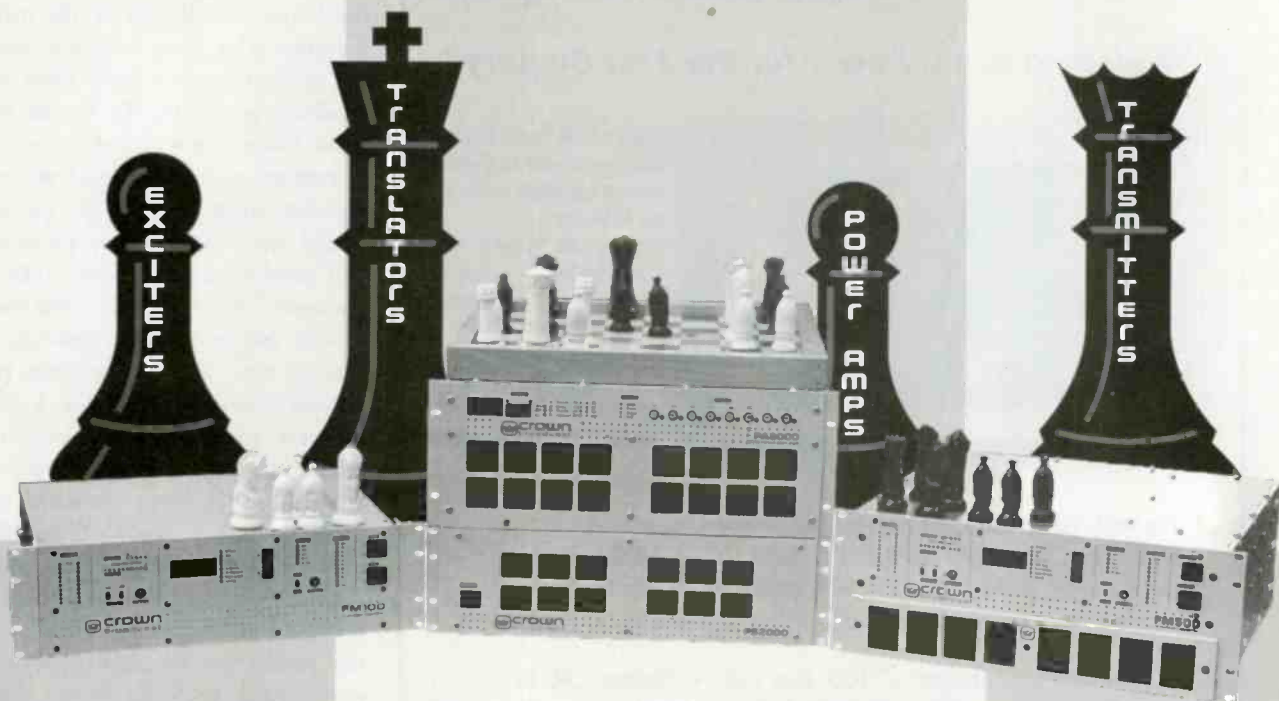
In the mid-'80s, we were surrounded by the limitations of the laws of physics. It is said that necessity is the mother of invention, and it certainly was in this case. Realizing that a single high-frequency limiter was

high-frequency power on the air. There were Apex Dominators, the CRL products, the Gentner Lazars and many others. And, there were also modified versions of all of those products on the air in some market somewhere. Every now and then, you would even hear of the elusive and exclusive Gregg Ogonowski boxes and what they could do. But we engineers were quietly wishing that we could somehow be saved from this modulation mess we'd gotten ourselves into. We can't just turn it all down and start over. Besides, who's going to volunteer to be first? I'll tell you what, I'll be a gentleman and let you be first, OK?

The promise of digital

We would hear about the new emerging digital technology and all the promises that could be realized by the resulting digital hardware. For a few years, it seemed like all we did was read and dream about them. We read the promises, and we shared

Make Crown Broadcast your next move. . .



when you want to "checkmate" the competition!

Crown Broadcast offers you versatility and flexibility in every broadcasting move you make. Our fully integrated transmitters can be configured for stand-alone applications, including satellite-fed networks, as repeaters for terrestrial-fed applications, or as exciters providing the most cost effective way to get Crown-quality components into your system. When you want to extend your broadcast coverage, add one of our highly efficient amplifiers. Like all Crown products these units are designed to provide modularity, reliability, and ease-of-use to strategically position you in the marketplace.

Crown Broadcast champions our customers by providing knowledgeable technical staff, a 3-year limited warranty, and comprehensive product information. This powerful trio is designed to support you through any broadcasting challenge. Need to make your next move fast? We can deliver product built to your requirements within ten days (or overnight in emergency situations). Just one more way that Crown Broadcast provides versatile solutions for lasting value.



1718 W. Mishawaka Road, PO Box 1000, Elkhart, Indiana, U.S.A. 46515-1000

Phone: 800-294-8050 or 219-294-8050; Fax: 219-294-8222

Email: broadcast@crowntnl.com; Internet: www.crownbroadcast.com

Equi=Tech

...Symmetrical Power Systems

"Welcome to AC Power for the 21st Century"



Pat. Pend.

Equi=Tech Rack Systems are guaranteed to greatly reduce electrical noise in a/v systems.

Five models range in size from 15A to 50A to meet the needs of every type of system environment. All models feature industrial quality components to provide years of dependable operation.

- Highest quality from the pioneer in balanced AC power.
- ETL listed. Conforms to ANSI/UL Std. #1012 & NEC Art. 530.
- Guaranteed technical support and customer satisfaction.
- 2 years parts and labor warranty. Lifetime warranty on transformer.

Equi=Tech Corporation • P.O. Box 249 • Selma, OR 97538
Tel: 541/597-4448 • FAX: 541/597-4099 • <http://www.equitech.com>

Circle (41) on Free Info Card

OUR MAST GETS IT UP FAST

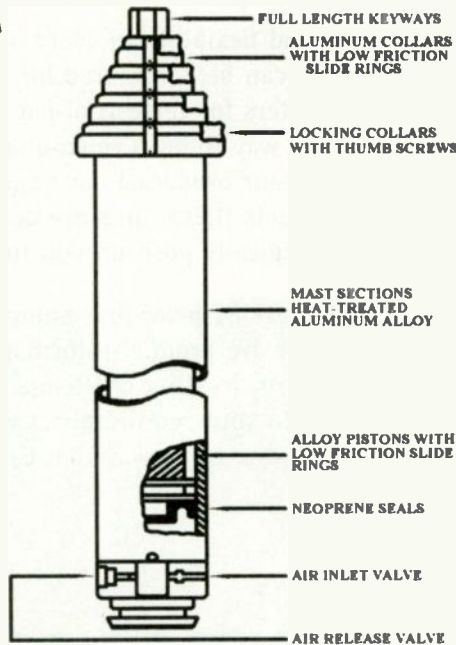
TELESCOPIC PNEUMATIC MASTS

HILOMAST

Applications

- Remote ENG Communications
- Field Strength Measurements
- Pop-up Jamming
- Remote Surveillance
- Noise Level Measurements
- Temporary Floodlighting
- Environmental Sensors
- Military Communications

COMPETITIVE PRICING



for Further Information Contact Jim Osborne
ALLEN OSBORNE ASSOCIATES, INC.

756 LAKEFIELD RD.
WESTLAKE VILLAGE, CALIFORNIA 91361
Tel:(805)495-8420 Fax:(805)373-6067



See us at our website: www.aoa_gps.com
E-mail address is: aoa@aoa_gps.com

Circle (42) on Free Info Card

Audio processing

the hopes and dreams of the manufacturers who were feverishly working in their labs to make these new products a reality. We hoped that some magical new process would be discovered in digital signal processing that could give, as one promise I read said, "digital audio processing will provide an additional 3dB of loudness." We engineers were skeptical of this promise and rightfully so. Anyone who understands audio processing knows that 1dB is a good increase in loudness when we're talking about highly processed audio. But 3dB? Wow. We could only wish. Shhhh . . . don't tell the PD.

Luckily, for audio processor manufacturers, two of the most difficult to do functions contained in on-air audio processors are now able to be done nearly perfectly in the digital domain. These are stereo pilot protection filtering and stereo generation. Both processes are difficult to do well in the analog domain because of physical obstacles like variations in parts tolerances and the like. Even the layout of the circuit board frequently becomes the limiting factor that prevents an analog designer from getting his creation to work to its theoretical limits.

Digital signal processing (DSP), on the other hand, is good at math. If the code is written properly, it does the same thing, the same way, every time. If the equations can be reduced to DSP code, nearly anything is possible and therein lies the challenge. How do we define those nebulous and mystical analog processes that we have refined over the last 50 years? The manufacturers of DSP-based audio processors are well on their way to doing this, and current-day products demonstrate just how close we can get to perfection if we spend enough time and money working toward it.

Digital processors galore

While earlier products touted the word "digital," they were in reality, still basically analog signal paths under the control of a microproces-

SCEC 97

The 19th Annual
Satellite Communications
Expo & Conference

September 17-19, 1997
Washington Convention Center
Washington D.C., U.S.A.

DISCOVER

The Real Power
of Satellite Communications

SCEC'97:
Discover the power of
the technologies, products,
services, and developments
that are shaping the future of
your business.

- ▶ 20++ educational workshops and roundtables
- ▶ 100++ exciting exhibits featuring the latest satellite technologies and services
- ▶ 1000++ new ideas and solutions for the technical & engineering management professionals

This power-packed conference program provides practical solutions to the challenges presented by today's changing satcom industries. Topics include:

- How Satellites Do What They Do
- Satellites for Applications
- The Increasingly Irresistible VSAT
- Broadcasting Radio Direct by Satellite
- Putting Remote Process Control to Work
- Asia Calling: Satellites Fill the Telephony Gap
- Betting on Latin American Power
- Busy Signals at the LEOs and MEOs
- DBS for the Pacific Rim
- Ka-band: Multimedia and the Internet Tomorrow
- How to Make Peace in North America
- Satellite Systems & Operations
- The Big Squeeze: Advances in Compression
- Switching to Digital for Satellite News Gathering
- Operating a Compressed Video Network
- Multimedia and Internet by Satellite Today
- How to Waltz with Wall Street
- A Longer Reach for Local TV
- Satellite Television Wars in Europe
- Negotiating for Occasional-Use Capacity
- Competition with PTTs: Real Progress or Lip Service
- The New Shape of Intelsat and Inmarsat

ATTENTION VENDORS:

Prime exhibit space is going fast. For details on exhibiting, call Kim Greenway, Show Manager, 770-618-0423.

For complete information on the conference, exhibitors, hotels, special events and more, return this coupon today or call **FAX-ON-DEMAND** at **1-800-601-3858**. Questions? Call Intertec Presentations at 1-800-288-8606 or 303-220-0600.

If you're involved in planning, using or buying satellite communications services, systems and/or products, the solutions to your challenges can be found at SCEC '97.

- YES!** Please send me attendance information.
 Please contact me about exhibiting.

First Name _____

Last Name _____

Title _____

Company _____

Address _____

City _____

State _____ Zip _____

Country _____

Phone* _____

Fax* _____

*International guests, please include country and city codes.

SOURCE CODE: AD

Sponsored by:

SATELLITE
TELEPHONY & SERVICES

Managed and produced by Intertec Presentations, a division of Intertec Publishing.

With support from these other INTERTEC®/K-III Media Publications:
Telephony, Global Telephony, Broadcast Engineering, World Broadcast News,
Cellular Business, WirelessWorld, RF Design, Mobile Radio Technology, and
Cellular & Mobile International.

MAIL OR FAX TO:

Intertec Presentations • SCEC '97 • 6300 South
Syracuse Way, Suite 650 • Englewood, CO 80111

Phone: 1-800-288-8606 or 303-220-0600

FAX: 303-770-0253

Circle (60) on Free Info Card

One Sweet Microphone



At Brüel & Kjaer, The Danish Pro Audio team had a lot of big technical breakthroughs, But none as big as this.

Introducing one sweet mini, the DPA 4060. This omni expands every performance parameter you can imagine, and some you may not have even thought about.

- S M A L L E R**
 ■ 5.4mm capsule and miniaturized clips
- B I G G E R**
 ■ 201Hz-25kHz plus/minus 2dB
 ■ 134 dB dynamic range
- L O N G E R**
 ■ non corroding gold diaphragm offers 6 times the life expectancy of current standards.
 ■ high humidity and sweat rejection
 ■ higher sensitivity for lower noise and longer battery pack life
- E A S I E R**
 ■ complete with two different equalization grids for alternate body placement
 ■ 48 volt option
 ■ 3 colour options
 ■ lav clips and other accessories available

The Sound, The Price, too hard to believe without a demo.



(ACTUAL SIZE)

Brüel & Kjaer

FOR A DEMONSTRATION PLEASE CONTACT:

Exclusive U.S. Distributor
 Brüel & Kjaer/TGI North America • 300 Gage Avenue, Unit 1 • Kitchener, Ontario, Canada N2M 2C8 • 519 745 1158 • Fax 519 745 2364
<http://www.danishproaudio.com>

Circle (61) on Free Info Card

Audio processing

sor. In most cases, the microprocessor's job was simply to set and remember digital representations of what would be analog knob settings. This aided repeatability to a large degree, but the signal paths were still analog. Not that analog is bad, just that this digital technology wasn't truly "all digital" as some expected. The Cutting Edge Unity 2000i, the CRL Audio Signature and even the Texas Audio Prism had analog signal paths under some form of digital control. Again, not a bad idea, but not truly digital either.

Orban was the first to introduce a truly digital audio processor, the Optimod 8200. The most popular version, the U3S, combines a broadband AGC, five bands of limiting and

processor has competition from two new, purely digital processing products that have emerged from Cutting Edge Technologies and CRL. Both products contain state-of-the-art, high-speed DSP chips, as well as current-generation A/D and D/A integrated circuits. There is also a trend in the newer products toward giving the end user more controls with which to tailor his station's sound. This act alone addresses one major complaint most users had about the earlier products — not enough knobs.

The Cutting Edge Omnia's internal structure is a broadband AGC, phase rotator, a four-band compressor and a four-band limiter, a final, distortion canceled limiter/clipper and a digital stereo generator. It contains a built-in composite clipper and an SCA protection filter. The crossover frequencies are also adjustable and there is a



The CRL DP-100 features a touchscreen control panel.

a digital implementation of the famous and patented Orban multiband distortion canceled clippers. The stereo generator is a hybrid digital/analog design using digital switching techniques. This is surprising, because stereo generation, being a mathematical process, would seem to lend itself to be a DSP process of relative simplicity. But, the 8200 is a powerful product and is easy to use. There have been several small and incremental changes since its introduction, such as remote-control software, AES/EBU interfacing and some subtle internal refinements that have improved its sound over the early versions. There is also a budget version of the 8200 available that closely emulates the previous analog 8100A. Recently, the 9200 processor was introduced for AM stations wanting to go digital.

Now, the Orban 8200 digital pro-

unique "make-up gain" function to smooth out abrupt changes in program level. The unit has a built-in remote software interface that supports most web browsers and two PCMCIA card slots are available for networking and software upgrade capability. Also, a selectable bass enhancement circuit allows stations striving for a clean and powerful bottom end "kick" to attain it. This feature fills a need not available from prior products. Cutting Edge is quick to warn though, that enough low-frequency power is available from the Omnia to possibly unlock an exciter's AFC loop. For a modern exciter, that takes a lot of bass.

The CRL DP-100 is also all digital. Its signal path begins with a broadband AGC, a selectable phase rotator and five bands of compression. Following this are five bands of distortion-canceled limiting/clipping, a final clip-

QUALITY AM ANTENNA PRODUCTS



COMPONENTS

- Inductors
- Capacitors
- Lighting Chokes
- Static Drain Chokes
- Contactors
- RF Plugs & Jacks
- Meter Switches
- Insulators
- Antenna Sample Loops
- Equipment Boxes
- Copper RF Wire, Tube, and Strap
- Coaxial Cable, Feeder Systems

Visit Us @
WWW.LBAGROUP.COM

Offered in a wide variety of types and ratings, LBA RF Components are intended for application in Medium Wave/AM antenna and transmitter equipment with power levels to over 500kW. LBA products are built to the highest standards to ensure long life and reliability.



Antenna Tuning Units -
Combiners - Matching
Networks

ANTENNA EQUIPMENT

- Tunipole™ Folded Unipole Antennas
- Combipole™ Multiple Frequency Antennas
- Detunipole™ Detuning Systems
- Antenna Tuning Units, Diplexers, Triplexers
- Transmitter Combiners
- PowerTopper™ Toploading Systems
- Basemax™ Base Enhancement Systems

LBA is the world leader in single and multiple station folded unipole antenna systems for high efficiency, wide-band AM transmissions at all power levels. LBA systems are found worldwide from Alaska to Argentina, Kuwait to Saipan.



LBA Technology, Inc.

3400 Tupper Drive • P.O. Box 8026
Greenville, North Carolina 27835

TOLL-FREE - 800-522-4464
919-757-0279 • FAX 919-752-9715
E-Mail: lbatech@www.lbagroup.com



TUNIPOLE™ - Folded Unipole
Antenna Systems

Audio processing

per and digital stereo generator. The action of the five-band compressor sections can be modified by an adjustable "dynamic gate," which analyzes the incoming program and adjusts the compressor's dynamics accordingly. Controls are available on the touchscreen interface for setting the desired equalization curve, as well as certain characteristics of the five-band compressors. AES/EBU is standard, as is a TOSLINK interface. Remote-control software has not yet been released for this product, but is under development. DSP code upgrades are made through a serial connection to a host PC running Windows 95.

Even in the face of all the digital processors, one company has taken a different approach. The Aphex model 2020 FM Pro is the processor for those who want advanced technology, but are still skeptical about the DSP-based digital audio processors, or for some reason, just don't like the sound they produce. We all tend to cling to analog technology because it is familiar and easy to understand. And, it does have infinite resolution, something digital will never have, no matter how many bits we throw at it.

The FM Pro is a combination of several patented or patent-pending circuits, which in the usual Aphex way, are unique circuits far superior to anything typically found in analog processing. Just as the Aphex Compellor and Dominator were unique and transparent sounding, so is the 2020. It starts out with a smart leveler to get control of audio levels from the studio. Following this are four bands of compression, with all kinds of adjustable parameters like crossover frequencies, drive and mix levels and release times.

After processing by the four compressors, audio flows to the optional split-band clipper and pre-emphasis limiter for final processing. The limiter stage features adjustments to allow the sound and feel of the bass frequencies to be set according to taste,

as well as overall drive levels and control over the distributed pre-emphasis filter. The final limiter can then feed the exclusive (and optional) Aphex PPDM (parallel path digital modulation) stereo generator. The FM 2020 provides analog inputs and outputs, AES/EBU digital inputs and outputs (optional), automatic switchover to analog if the digital input fails and a realm of adjustments and features not commonly found on analog processors. There is even processing preset/daypart switching built in and a remote-control interface that supports both the Windows 3.x and 95 operating systems.

Keep your goals in sight

In today's radio markets, not only are there many more stations than ever before, but sometimes more than one station is vying for the same audience. If two or more stations in the market are playing the same music, the same commercials and who knows what else, what delineates them from each other? The air talent is an important ingredient in defining the sound and feel of the station. But beyond those resources you have to rely on the technical tools at your fingertips to help shape the rest of the station's image.

Audio processing can help do just that. Given a processor with enough flexibility and power, nearly any on-air image can be created and that's why most engineers felt that early processors didn't have enough controls. If you can stray only a little from the settings the guy across town is using, how can you set those two stations apart? (We have to ask ourselves if the listener really notices these subtle things, but hey, that's a whole argument in itself.) The bottom line is that there are many tools now at our fingertips with which to help shape the sound of our stations. With other digital audio delivery systems for the consumers just around the corner, we must make certain that our listeners, and even the potential ones, are drawn to our station and captivated by what they find there. Creativity in not only the on-air prod-

uct, but also the technical aspects of the station can set your station above the rest. Extreme attention to detail in your technical facility is also required in order to maintain audio quality, which is comparable to those new sources of programming.

But, whatever processor you decide to use or buy, before you tweak it, watch, listen and learn about the market and your competitors. Look over your shoulder a few times at the modulation monitor while you and the PD are defining the air sound. Don't get duped by the guy across town who knows you're trying out a new demo of the "Tornado 2000" and just wants to make sure that you send it back. Remember, we might all be in radio, but it's a war out there. There can be only one winner!

Jeff Keith, CPBE, has been a broadcast engineer for more than 25 years and is the chief engineer of WMJI, Cleveland. He also holds a First Class NARTE certification with a Master RF endorsement.

Circle (150) on Free Info Card to receive information on audio processors.

QEI
QUICK-LINK II
CALL YOUR FAVORITE
DISTRIBUTOR
OR QEI
FOR MORE
INFORMATION
NOW SHIPPING
**E
V
O
L
U
T
I
O
N**

Coming in the November/December issue of BE Radio

Cover Story: Consolidating Facilities

What is involved when superduopoly stations move in together, and is it worth it? Physical, technical and economic issues of station consolidations are evaluated two years after the liberalization of the duopoly rules.

Feature: Interview — Insight on the Industry

Sometimes the view is clearer from the top. A major player presents his/her views about where radio broadcasting is headed.

Contract Engineering: Tower Lighting

Everything you need to know about compliance with the latest rules in this critical area.

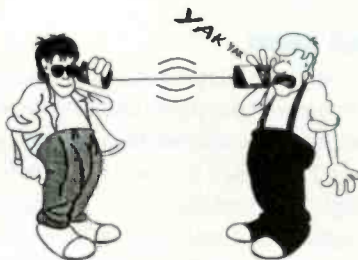
Managing Technology: Archival Storage

What audio recordings to keep and what to toss is just one of many decisions that management faces when considering this often-overlooked issue. Formats, cost, storage and longevity are some of the considerations, and there are plenty more.

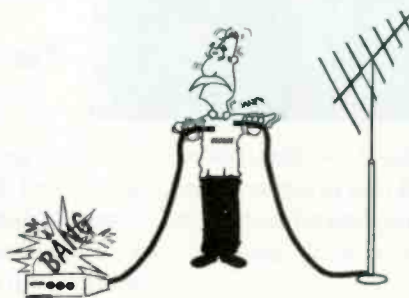
RF Engineering: RF Grounding

Proper grounding techniques are a little different and more critical for high-powered RF systems than they are for typical audio facilities. This primer on RF grounding is full of useful information for every radio engineer.

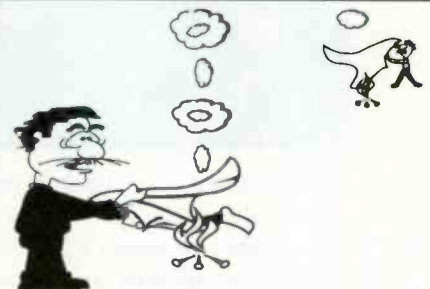
Also: The Last Byte, News, Biz/People and New Products.



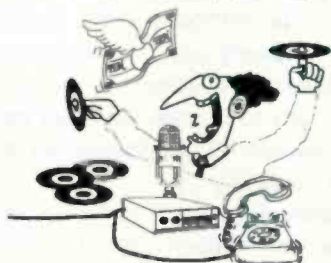
FIRST UNLICENSED SECURE COMMUNICATIONS



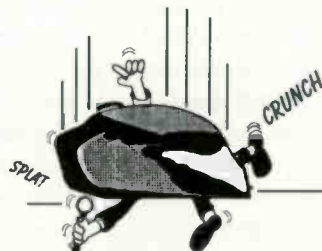
THE FIRST WIRELESS REMOTE



DIGITAL TECHNIQUES IMPROVED ACCURACY BUT SMOKE QUICKLY BECAME UNFASHIONABLE



WIRED SYSTEMS OFFER SOME IMPROVEMENT BUT ADD TO OPERATING COSTS



PRIMITIVE COMPRESSION TECHNIQUES OFTEN PROVED FATAL

QEI QUICK-LINK II

- ▶ LICENSE-FREE
 - ▶ WIRELESS SPREAD SPECTRUM
 - ▶ UNCOMPRESSED
 - ▶ DIGITAL STEREO TRANSMISSION SYSTEM
- FOR: STL/TSL, RPU & LMA AUDIO TRANSPORT



QEI CORPORATION, ONE AIRPORT DRIVE, P.O. BOX 805, WILLIAMSTOWN, NEW JERSEY 08094
 TOLL-FREE (800) 334-9154, LOCAL (609) 728-2020, FAX (609) 629-1751
 REACH US ON THE WORLDWIDE WEB AT [HTTP://WWW.QEI-BROADCAST.COM/](http://www.qei-broadcast.com/)

Orban Optimod 9200

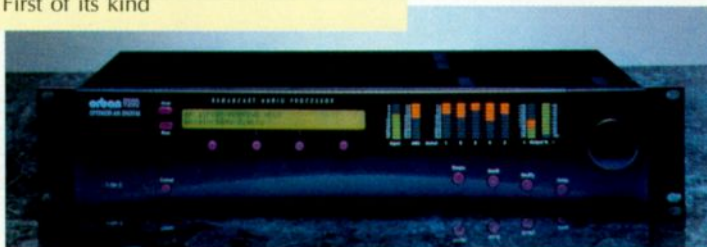
By Paul Marks

Orban revolutionized broadcast audio processing more than 20 years ago when it introduced the original Optimod. Now, the company has another first: the Optimod 9200, a DSP-based AM broadcast processor. Why add a digital AM processor to the product line? Perhaps to offer AM broadcasters many of the features that have been available to users of digital FM processors for the last several years. The significant

Performance at a glance:

- Designed for AM
- DSP-based processor
- Simplified adjustments
- High degree of flexibility
- Optional AES3 I/O
- First of its kind

features include simplified setup through factory preset settings and a LESS-MORE control; the flexibility of having



many adjustable parameters for those seeking more control; the ability to store and recall user preset settings; and off-site adjustment with a PC and long-term stability without the thermal and component aging problems associated with analog circuitry.

All processing functions are accomplished with DSP technology. Its functions include adjustable high- and low-pass filters for the input audio and a broadband automatic gain control that provides a consistent audio level to the five-band limiter. A three-band receiver equalizer is included to improve the sound delivered to listeners by compensating for the typically limited bandwidth of AM receivers and also allows the station to customize its audio tonal balance. The five-band limiter and its distortion-canceling clippers make the station sound more consistent, increase density and provide peak control. An adjustable low-pass filter is provided ahead of the output to meet occupied bandwidth requirements, selectable for the country of operation. The transmitter equalizer section can be used to compensate for imperfections in transmitters and antenna systems that can limit the station's apparent loudness and coverage, with settings for day and night operation. One thing that the 9200 doesn't do is stereo. It is strictly a monaural processor.

The 9200 comes standard with an analog input and two analog outputs that use 18-bit A/D and D/A converters. Each of the analog outputs has its own level control and transmitter equalizer. The optional AES/EBU digital input and output have 20-bit resolution and support sample rates of 32kHz, 44.1kHz or 48kHz. The user can select the left channel, the right channel or a mono sum of the AES/EBU input signal as the source. Separate output level and transmitter equalizer controls are also provided for the digital output.

With the exception of the level controls for the analog outputs, adjustments to the 9200 are accomplished using soft keys and a control knob. An LCD screen display with large, easy-to-read characters provides labels for the soft keys and other information. Ten-segment LED displays provide metering of the input level, the gain reduction of the broadband AGC and for each band of the multiband limiter. Separate output displays are provided for positive and negative modulation.

The back panel

In addition to the XLR input and output connectors, the rear panel has a ground lift switch to float the circuit ground from the chassis for connection to an unbalanced input. The DB25 connector allows remote control of up to eight different functions, including preset recall, day and night mode and analog or digital input selection. An RS-232 serial interface permits control using the included Windows (3.1 or 95) software directly or through a modem for off-site control.

Removing the top cover reveals the main circuit board with its eight Motorola DSP56004 chips. Surface-mount devices are used extensively and, consequently, many of the ICs are not socketed. A jumper on the main circuit board permits the user to change the input impedance from 3.6k Ω (as shipped) to 600 Ω . Another set of jumpers changes the input sensitivity.

Some measurements were made at the transmitter site test bench with the 9200 in the bypass mode. Frequency response and distortion measurements were within their specs. Noise was measured at -74.8dB with a 22Hz to 22kHz measurement bandwidth. The published spec is -75dB from 50Hz to 20kHz. The RFI filtering of the input and outputs appeared to work perfectly since no sign of RF ingress was detected. Using tone bursts, the throughput delay of the 9200 in the operate mode was measured to be about 5.5ms.

Going on the air

Setting up the 9200 is a straightforward task. When following the basic system setup section in the manual, the user begins to get a sense of the flexibility that the 9200 offers. Independently adjustable high-pass and low-pass filters for day and night modes set the system bandwidth. User presets can be used to reduce the system bandwidth if desired. The manual discusses the benefits of operating with reduced bandwidth under certain conditions. Adjusting the transmitter equalizer controls (low-frequency gain and break point and high-frequency shelf and delay) requires observing an RF sample with an oscilloscope while the transmitter is fed by the 9200 with its internal square wave generator active. It is possible to defeat the 9200's internal AGC when an outboard AGC is used. A positive peak control adjusts the level of positive peaks for asymmetrical modulation.

General-purpose medium, general-purpose heavy, music medium, music heavy, news, news plus noise reduction, sports and fine arts comprise the eight factory preset settings that are included to provide a starting point for finding the desired sound for the station. The general-purpose settings are intended to complement voice and music and the fine arts setting is optimized for classical or jazz formats. News plus noise reduction uses the dynamic noise-reduction feature of the 9200 to help quiet noisy sources.

Once a preset has been selected, it may be altered by using the LESS-MORE control. This allows adjustment of the 9200 with one control changing many parameters simultaneously. Advancing the LESS-MORE control in the MORE direction results in a louder, denser sound with increasingly more of the negative side effects (distortion, loss of highs, etc.) associated with turning the processing "up." Conversely, by moving in the LESS direction, the sound becomes softer and less dense with fewer side effects.

Individual parameter control is possible with the full control menu. Available parameters include AGC drive

HAVE YOU SEEN THE LIGHT?



Littlite® / CAE INC. P.O. BOX 430 HAMBURG MI 48139 USA 810-231-9373 FAX 810-231-631

Circle (72) on Free Info Card

FM Subcarrier Monitor/Demod



Accurate measurement of SCA, RDS and the new high-speed data subcarriers. This precision monitor/demod is the ideal companion to any FM Mod-Monitor. Check these features:

- Dual-conversion design with precise digital tuning. Covers 54kHz to 99kHz in 1kHz steps.
- Displays subcarrier injection level in percent and in kHz-of-deviation.
- Demodulates audio SCAs, shows subcarrier deviation and audio level. Balanced SCA program output.
- Optional RDS decoder plug-in comes with software for complete radio-data analysis.

MODEL 540 — \$1150

Inovonics, Inc.

1305 Fair Ave., Santa Cruz, CA 95060 USA
TEL: (408) 458-0552 • FAX: (408) 458-0554

www.inovon.com



Circle (73) on Free Info Card

Field Report

and release time, gate threshold, bass coupling, multi-band drive, multiband release, multiband clipping, noise-reduction downward expansion threshold and high-frequency clipping. In expert control, the user can adjust final clipping and individual drive levels to and output levels from each of the bands of the multiband limiter. Eight user presets are available for storing customized settings.

Two levels of equalization adjustment are available. Basic equalization includes gain adjustment for the low- and mid-frequency bands. Also included is a versatile high-frequency section that gives the choice of using the fixed NRSC curve or selecting other curves with steeper slopes that can be adjusted to provide greater amounts of boost. Parametric controls for the low- and mid-range bands, a DJ bass boost feature and a mid-bass control are added in the expert equalization menu.

The KVTO Berkeley facility presents a challenge to an audio processor. Being a Class C station limited to 1kW of power without night-time protection, KVTO is processed aggressively to cover as much of the San Francisco Bay Area as possible. To make matters more interesting,

KVTO is a time-brokered station programmed by many different clients that provide audio with varying quality.

The 9200 has to be pushed hard to keep up with the KVTO Optimod 9100 that has been modified for increased loudness capability. Subjectively, I find the sound

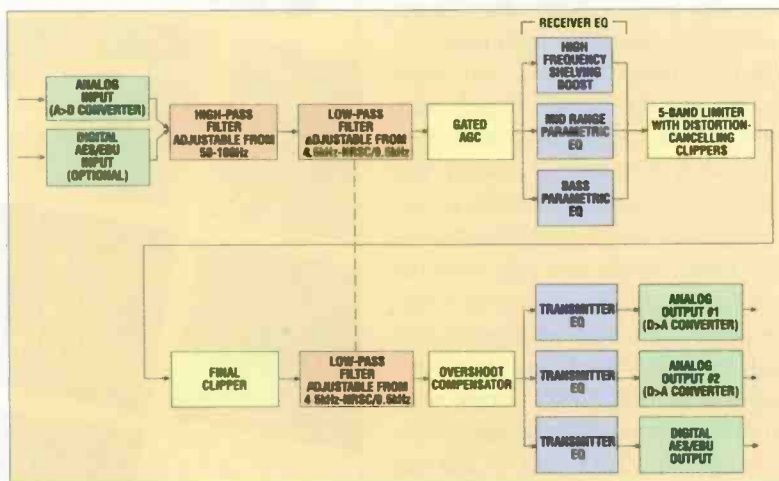
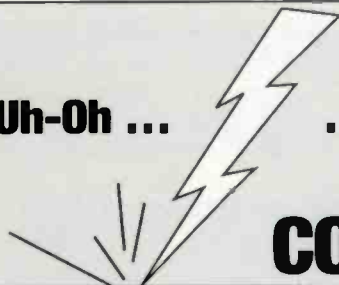


Figure 1. Functional block diagram of the 9200.

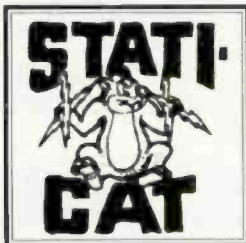
of the 9200 to be brighter and contain more high-frequency detail than that of our modified 9100. It also has a more "airy" sound quality than the 9100 on musical cuts and voices. I was able to get a more satisfying bottom end out of the 9200 with more dynamic feel and punch. In critical listening with some voices, the 9100 has a warmth and fullness in its mid-range that is not conveyed by the

Uh-Oh ...



... We Should
Have Called

CORTANA



for
Affordable
Lightning
Prevention.

Let Us Design a System for You!

Stati-Cat provides a continuous, low-resistance discharge path for the static electric charge on tall structures. Dissipation points are 1/8", type 304 stainless steel rods ground to needle sharpness. They won't bend, not even from ice and severe weather.

Cortana
Corporation

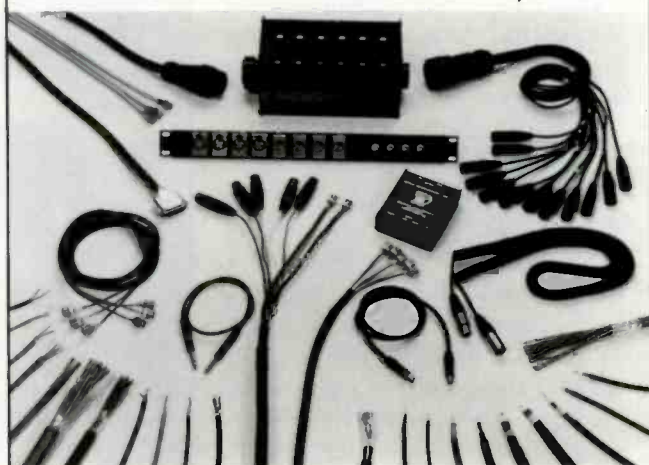
Call for **FREE** brochure!

P.O. Box 2548, Farmington, N.M. 87499

Call (505) 325-5336 FAX (505) 326-2337

Circle (74) on Free Info Card

More Reasons to Choose Gepco



Cost-effective. Quality Crafted. Your choice of cable type, length and color from our extensive selection. Delivered to you on time. Gepco manufactures custom cable assemblies, audio and video snakes, breakout boxes, panels, patch bay wiring harnesses, direct boxes and prepackaged cable assemblies for point-of-sale display. All Gepco cable and custom products are made in the U.S.A.

We are authorized distributors for ADC, Kings, Neutrik, Switchcraft, EDAC and many more. Gepco stocks audio and video cable in bulk and will custom-cut to any length requirement for no extra charge.

1-800-966-0069

Ask your Gepco sales representative for a free catalog
Cable, Connectors and Custom Products

GEPCO INTERNATIONAL, INC. 2225 W. Hubbard, Chicago IL 60612
312-733-9555 Fax: 312-733-6416 TOLL-FREE: 1-800-966-0069



Circle (75) on Free Info Card

9200, which by comparison can sound a bit lifeless.

The multiband limiter does a good job of making the varying quality of KVTO's program material sound more spectrally consistent. This is not an easy task. It can bring the audio from a dull cassette recording up out of the mud and make it sound brighter and more intelligible. The noise and distortion of poor source material are sometimes also brought up, but the result is still a positive one creating a more listenable sound.

Turning on the dynamic noise reduction and adjusting the downward expander threshold almost completely removed a low-frequency room rumble from one segment of a recorded program, but resulted in some noise pumping on a hissy segment that followed. The manual cautions discretion when using the noise reduction, and that better results may be obtained by turning it off if extremely noisy audio is expected.

After five months of operation at KVTO, the 9200 has been completely reliable in the Orban tradition without as much as a single glitch. The Optimod 9200 offers an extensive feature list, a high degree of flexibility and rock solid stability. It can be an easy processor to set up using the LESS-MORE control for those seeking simplicity or a complex processor using the full control and expert adjustments for those wishing to be power users. All of these things are available with the 9200 for less money than you would pay for the Orban analog counterpart with fewer features and less flexibility.

Paul Marks is chief engineer of KBLX-FM/KVTO-AM, San Francisco.

Editor's note: Field Reports are an exclusive BE Radio feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.

These reports are performed by the industry, for the industry. Manufacturer's support is limited to providing loan equipment and to aiding the author if requested.

It is the responsibility of BE Radio to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by BE Radio magazine.

Circle (151) on Free Info Card.

HNAT HINDES inc



The UM-2000 is a self contained split band stereo FM processor, with AGC and an **-ultra transparent-** digital stereo generator. Designed to give you concert quality, at a price you will like. Contact us for details and dealer information.

audio
processing
"hnaturally"

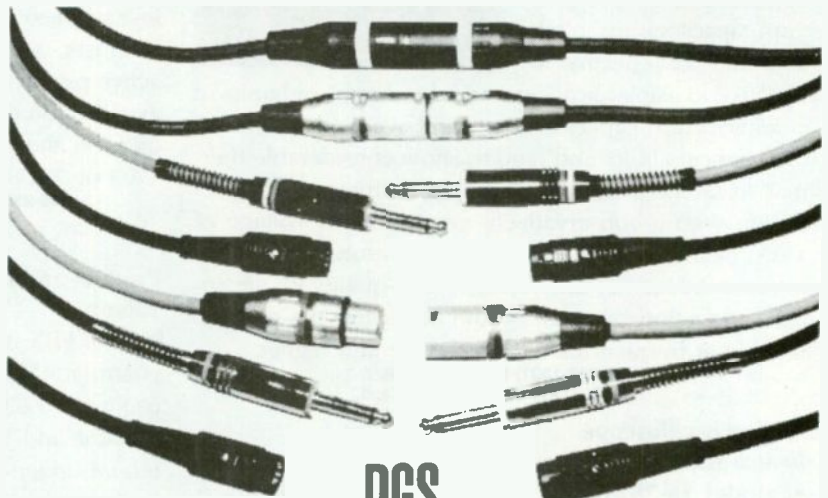
HNAT HINDES inc

42 Elaine Street, Thompson, CT
(860) 935-9066, 935-4242
Fax: (860) 935-9919

<http://www.hnat.com>

Circle (77) on Free Info Card

DELTRON GOTHAM INTERCONNECTS MAKE SWEET MUSIC



AUDIO CABLES

- Microphone cables
- Digital cables
- Multipair cables
- Ultraflexible
- Double shielded
- Digital multipair cables



Deltron/Gotham
US Sales & Stocking Warehouse

800-292-2834

CONNECTORS

- XLR's, 1/4" phono, phono, and Midi's
- New-foolproof channel identification for XLR's
- New-silent version 1/4" phone plug

Circle (76) on Free Info Card

See us at AES Booth #873

New Products

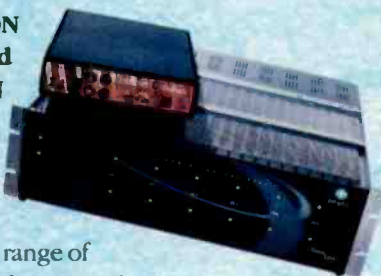
Modular, cost-efficient ISDN broadcast product line Intraplex

► IntraLink ISDN multiplexer and OutBack ISDN codec

these ISDN products allow flexible use of lower-cost ISDN services for a wide range of applications, including contribution and distribution of program audio and interfacility intercom communication, as well as data transmission for call screening, automation system control and LAN connection; IntraLink is a space-efficient unit that supports connection and management of up to six individual BRIs in a three-rack unit while allowing personnel to monitor and manage multiple channels and codecs from a single point via a PC; the OutBack is a compact, easy-to-use ISDN codec that supports MPEG Audio Layer II and G.722 coding; it is ideal for remote program feeds.

508-692-9000; fax 508-692-2200; sales@intraplex.com.
www.intraplex.com

Circle (160) on Free Info Card



Fixed vacuum capacitors Comet North America

► **MC Mini-Caps:** a family of high-quality factor, high-current capacitors designed for use in demanding RF applications; the MC Mini-Cap capacitors are a reliable and cost-effective alternative to using mica, ceramic "doorknob" or banks of ceramic "chip" capacitors that can have limited current-carrying capability and tend to show considerable thermal instability; the MC Mini-Cap features a compact design with a conservatively rated hold-off voltage of 15kV peak test; the unique design results in minimal internal inductance and features high-quality RF electrical connections that allow the capacitors to perform reliably at frequencies up to 100MHz and higher.

203-852-1231; fax 203-838-3827
Circle (161) on Free Info Card



Analog oscilloscope Iwatsu America Inc.

• **Model SS-7811:** this oscilloscope is an eight-trace, multifeature precision instrument that incorporates high-speed automatic setup, full TV triggering with field and line selection, a fast sweep to 2ns/div. and a five-digit frequency counter with +/-0.01% accuracy; some of the high-performance features include DC to 100MHz bandwidth, 2mV/div. sensitivity and save/recall for 32 panel settings; it also includes easy-to-use cursor functions and offers a responsive multifunction control for hold off, delay, trace separation and TV line.

201-935-8486; fax 201-935-8533; www.iwatsu.com
Circle (162) on Free Info Card

Ultracardiod dynamic microphone Electro-Voice

• **N/D957:** an ultracardiod dynamic microphone that features a "clean sheet" design; this true-solution-oriented hand-held vocal microphone was specifically developed as an ultrahigh gain before feedback design; according to Electro-Voice, it is without rival in high SPL performance venues; it features a unique truncated profile, ultracardiod pattern and peak-free response to provide a high-level performance-oriented microphone; the N/D957 also includes the first hygienic windscreen assembly that is easy to clean; a new design concept is incorporated to provide both near- and far-field voicing and the integral personality module can be configured for "up close and in your face" or back-up optimization.

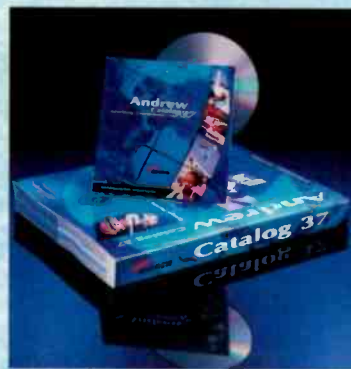
800-234-6831 or 616-695-6831; fax 616-695-1304
Circle (163) on Free Info Card

Product catalog available on CD-ROM, web site and fax on demand

Andrew Corporation

► **CATALOG 37:** a complete reference document of all products and services offered by Andrew; it is updated on a quarterly basis and the 784-page full-color catalog includes new sections on Andrew Institute technology training, wireless accessory products, wireless RF active products and base station antennas; the catalog is available on the company web site (www.andrew.com) or from the Andrew fax-on-demand service (800-861-1700 or 708-873-3614).

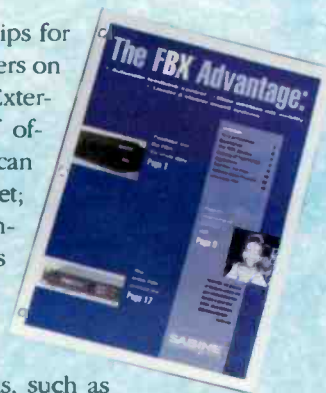
800-255-1479 (extension 301); www.andrew.com
Circle (164) on Free Info Card



Product applications guide Sabine

► **The FBX Advantage:** tips for controlling feedback, pointers on using the FBX Feedback Exterminator and definitions of often-misunderstood terms can be found in this free booklet; using easy-to-understand language, the guide explains what causes feedback and discusses how to control and avoid it; it also provides clear explanations for terms, such as comb filters, constant-Q filters and net gain before feedback.

904-418-2000; fax 904-418-2001
Circle (165) on Free Info Card



Review audio with ease
Prophet Systems Inc.

• **Crystal Ball:** this product allows you to easily review audio by typing the date and time of the audio to be reviewed; retrieval is automatically pulled from the hard disks of up to four computers or off DAT for instant replay without interrupting any program being recorded; Crystal Ball records onto compact storage digital DAT tapes.
 800-658-4403; fax 308-284-4181; sales@prophetsys.com
 Circle (166) on Free Info Card

Audio tubes product guide
Svetlana

► **1997 Audio Tube Product**

Guide: this catalog provides detailed technical information, including performance curves, for each Svetlana audio tube, from pentode, to beam tetrode to power triode; the guide provides information on the full Svetlana audio tube line and is especially helpful for users buying new tubes for amplifiers and OEM designers.



205-882-1344; fax 205-880-8077
 Circle (167) on Free Info Card

DAB receiver in the works
Philips Electronics' Advanced Systems & Applications Laboratory Eindhoven

• **DAB 752:** development has begun for this DAB receiver that will be the successor of the Philips DAB 452, also known as the DAB "reference" receiver; applications for the DAB 752 will include monitoring and synchronizing of DAB transmitters, field tests, lab measurements and mobile data reception in combination with a PC; the DAB 752 will be designed specifically for the professional user and will feature a 19-inch 2U high cabinet; other features include Band III and L-band reception, half-rate audio support, analog and digital audio output and PC-interface (RS-232) for information logging and control; a prototype should be available in November with the first products available in the first half of 1998.

+31 40 2732080; +31 40 2737353; www.philips.com/sv/newtech/
 Circle (168) on Free Info Card

AES router
Leitch

► **ASR-16x16:**

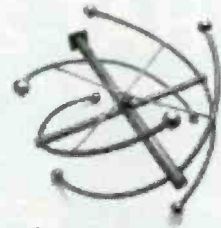
this AES router includes the new synchronous quiet switch (SQS) processor that guarantees quiet switching of AES digital audio; the SQS provides two processing steps: 1) synchronous switching that maintains AES framing during and after crosspoint switches so that downstream equipment does not lose lock during a switch, and 2) user-selectable crossfade that guarantees a quiet switch between any two sources by fading the two signals near the switch point; the fade may be enabled or disabled, and the fade duration is user-adjustable.



800-231-9673; fax 757-548-4088
 Circle (169) on Free Info Card

FM
QUADRAPOLE

why settle for 2
 when you can have 4?



DCR-M Quadrapole

- Broadband
- Low ice sensitivity
- Superior H/V ratio
- Excellent pattern performance

For Multistation applications our DCR-MBR offers these additional features

- Low weight & windload
- Station combining up to 12 MHz
- Reduced downward radiation

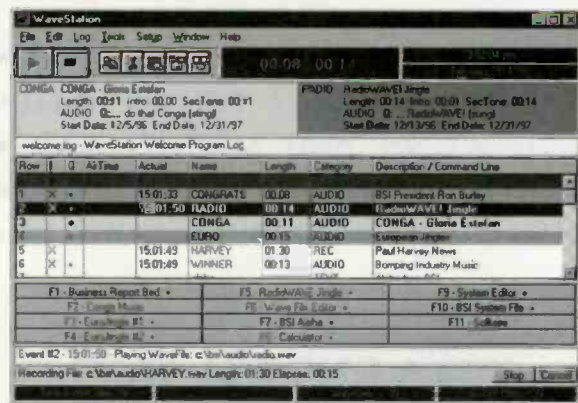
Contact us today for a **FREE** catalog on all of our FM products including: filters, combiners, transmission line, switches and more!

DIELECTRIC

Tower Road • Raymond, ME 04071
 (207) 655-4555 • Fax (207) 655-7120
 email • dielectric@maine.com
 www.dielectric.com

Circle (63) on Free Info Card

Affordable
Digital Automation



Broadcasters around-the-world are discovering our easy-to-use WaveStation automation. Install our software on your PC and you have a powerful, versatile music-on-hard drive or satellite automation system. WaveStation comes with its own digital audio editor and uses standard or compressed WAV files. Full automation, voice track or live assist. Win 3.1 or 95.

24 HOUR
FREE
TECH SUPPORT

888-BSIUSA1

Only

\$999

Try Before You Buy!
 Download the Actual Software!

www.bsiusa.com

BSI
 Broadcast Software International

Circle (62) on Free Info Card

THAT-2

Telephone Handset Audio Tap



- Analog
- Digital
- ISDN
- PBX

RCA & XLR
Line In and Out

No Batteries or
AC Needed



\$225.00

JK Audio Remote
Broadcast Gear

Call 800 JK AUDIO (800-552-8346)

815-786-2929 • Fax: 815-786-8502

www.jkaudio.com

Circle (64) on Free Info Card

PHASETEK INC.

- CUSTOM AM/MW PHASING SYSTEMS
- AM/MW ANTENNA TUNING UNITS
- DIPLEXERS AND MULTIPLEXERS
- DETUNING UNITS/UNIPOLE KITS
- COMPLETE LINE OF RF COMPONENTS

PHASETEK INC.

550 CALIFORNIA ROAD
UNIT 11

QUAKERTOWN, PA 18951

PHONE: 215-536-6648 FAX: 215-536-7180

FOR MORE INFORMATION
OR
TO PLACE AN ORDER, CONTACT:

hotam@phasetek.com

Circle (65) on Free Info Card

New Products

PDP series of tapes expanded

Sony Electronics' Recording Media and Energy Group

• **Pro DAT Plus series of tapes:** the PDP series of tapes has been expanded to offer extended lengths of 15, 35, 50, 65, 95 and 125 minutes; the tapes now come with a shatter-proof jewel case, providing greater durability in the field and better storage for archiving; an anti-static lid and a high-precision, temperature-resistant shell with a sliding hub cover virtually eliminate dust and dirt.

201-599-3445; fax on demand 800-SONY-022; www.sony.com
Circle (170) on Free Info Card

Digital network audio transceiver/recorder/editor Nagra

► **Nagra C-PP:** a digital network audio transceiver/recorder/editor that incorporates many of the performance features



of the ARES-C in a lower-priced studio unit; like the ARES-C, C-PP is designed around PC card FLASH memory technology; instead of tape or disc storage units, the credit-card-sized PC cards provide random access to recorded data, are reusable, require less power and are weather and vibration resistant; more than two hours of continuous high-quality mono recording time is provided by a single 64MB PC card and the system has no internal moving parts so it is virtually maintenance-free; a built-in ISDN codec provides digital transmission virtually anywhere in the world through the ISDN network.

+41 21 7320101; fax +41 21 7320100; mail@nagra.com
Circle (171) on Free Info Card

Pivoting panel-mount racks

Datatel

• **PPM racks:** these 19-inch pivoting panel mount racks are ruggedly constructed of 0.060-inch steel and each unit is equipped with 0.125-inch thick multirails tapped with 10-32 threads on one side and 12-24 on the other; a pivoting hinge system is equipped with a positive stop that permits the entire rail assembly to be tilted down away from the chassis for easy punchdown; the racks allow easy rear access and six models are available: the PPM-2, the PPM-4, PPM-6, PPM-6-12, PPM-8-12 and the PPM-8-18.

201-616-7078; fax 201-616-7179
Circle (172) on Free Info Card

New additions to VM-3 series

Kramer Electronics

• **VM-3M:** a 1:3 microphone amplifier that splits a single input source into three identical outputs without any discernible signal degradation; like all products in the VM-3 series, the VM-3M offers high-quality audio distribution in compact housings that can easily fit in a toolbox or pocket; it uses low-noise circuitry.

• **VM-3AB:** this product can be used as a 1:3 stereo audio distribution amplifier, as well as a 1:3 balanced mono DA with one channel being positive and the other negative; it also splits a single input source into three identical outputs with no discernible signal degradation.

888-303-5600; kramerel@netvision.net.il
Circle (173) on Free Info Card

Contract Engineering

Continued from page 12

standardize installation practices, the Electronics Industries of America (EIA) and Telecommunications Industries of America (TIA) have collaborated to create EIA/TIA 568. This guideline covers all aspects of cabling methods.

Hubs, bridges and routers

The network hub acts as a common terminus for networks configured in a star arrangement. Depending on network size, hubs range from a small box with a few ports to a large rack-mounted system with thousands of ports. Hubs can be passive or active. A passive hub is a resistive combining network for LANs using coaxial-based media and is almost non-existent.

Active hubs electronically regenerate the signals on its ports. Currently available hubs support data rates up to 100Mb/s and allow mixing and matching of data rates, protocols and media types. If you require data rates

in excess of 100Mb/s, *switching hubs* are designed to complement the higher-performance protocols.

It's occasionally desirable to combine two or more LANs within a company. A *bridge* is a relay that reads, buffers and sends information between LANs operating on different protocols and makes the two datalinks appear as one to the higher-level applications. A *router* is a network device that relays network traffic between a LAN and other network devices. *Simple network management protocol* (SNMP) was developed to simplify the task of managing hubs, bridges, routers and network interfaces. Using a special program, network managers can view, configure and troubleshoot all devices on the network using SNMP.

Kevin McNamara, CNE, BE Radio's consultant on computer technology, is president of Exegesis Technologies, a consulting firm in New Market, MD.

Managing Technology

Continued from page 16

scales, from on-premise paging, to local and regional paging services with multiple transmitters, to national and global services linked by satellite. Paging companies now offer two-way capability where the user can reply to messages. Now cellular and PCS services are in the act, blending paging into their lists of features.

Datacasting has one key advantage over the wired world — *portability*. FM datacasting could have an advantage over TV datacasting with *mobility*. The future of FM subcarrier datacasting will hinge on its ability to offer valuable information to users who are in motion. It is interesting to note that the three proponents of high-speed subcarrier technologies have highly mobile applications: highway and traffic information, consumer news and information and paging. New radio datacasting standards, if any are established, will have to take advantage of the mobility that broadcast signals offer.

Somewhere between the wireless

world of PCS/cellular communications and the wired world of the Internet, radio datacasting has a niche of its own. Yet, it does not look like it will become a big deal for broadcasters. Today's estimated \$40 million in national annual subcarrier lease revenue is dwarfed by the roughly \$8 billion in advertising revenue of FM broadcasters. Broadcasters like the additional padding put on the bottom line by a subcarrier tenant. And there is clearly room for growth as new users emerge. The business of datacasting, however, seems to belong to another industry, unless we broadcasters come up with a better way to use our auxiliary bandwidth.

David Maxson is vice president of Charles River Broadcasting Company, which owns WCRB Boston and WFCC Cape Cod, and is also a principal of Broadcast Signal Lab, New England's signal monitoring company.

Editor's note: Some data and the charts for this article were obtained from the NAB publication FM Subcarrier Report/Technology Guide. This report is available from the Station Services Department of the NAB by calling 800-368-5644.

R/SVP BETTER THAN EVER!

SAME LOW PRICE.



- Now with input level selector. Connect +6dbm line out or cassette to R/SVP for -10dbm to telco.
- Highest quality electret mic mixes with external input or mutes.
- Continuous monitoring.
- 600 ohm transformer input/output.
- Two year warranty.
- Made in U.S.A.

R/SVP \$149.75
SVP (no record out) \$130.25

SOUND AMERICA
SERVING BROADCASTERS FOR 25 YEARS

800-688-8208

Circle (68) on Free Info Card

AUDIO LEVEL INDICATORS



These high-quality, audio level meters give you near-spec performance at a very favorable price. Rugged, space-efficient core magnet design with taut-band suspension is ideal for broadcast or recording equipment in studio, stage, or location applications. Dials are buff with black and red markings. Styles are available for front- or back-of-panel mounting, with and without bezels. Request catalog today.

SELCO ▲ ▼ SELCO

HANDSOME



COLLET KNOBS

Selco's collet knobs meet the highest standards of precision, durability, performance, and beauty. Solid brass hardware is bonded to a matte-finish, 94V-2 nylon body. Black or gray, with snap-on caps in a wide selection of standard and special colors. Full range of sizes, types, and accessories. Attractive OEM prices.

Request full-color knob catalog today.

SELCO PRODUCTS CO.

709 N. Poplar St., Orange, CA 92668-1013
(714) 712-6200, or (800) 228-2332, FAX (714) 712-6222
<http://www.selcoproducts.com>

Circle (66) on Free Info Card

Circle (67) on Free Info Card

September/October 1997 BE Radio

Business/ People

BUSINESS

Fidelipac, Philadelphia, agreed to market Grass Valley, CA-based Graham-Patten's DMIX-41, a four-channel no-frills mixer, as the Fidelipac DMR-41. The unit will serve in the radio market as both a front end to the Dynamax Digital MX/D radio console and as a router for automation of radio programming.

Broadcast Electronics, Quincy, IL, was awarded a contract in excess of \$3 million by the United States Information Agency, parent organization of the *Voice of America*, in conjunction with the government of the Hellenic Republic of Greece. Under terms of the agreement, a total of 84 transmitters will be supplied over a 18-month period.

360 Systems, Westlake Village, CA, sold a Shortcut personal audio editor to the IMS Radio Network, Indianapolis. IMS is owned and operated by the Indianapolis Motor Speedway and has originated the radio broadcast of the Indianapolis 500 for 45 years.

Additionally, 360 Systems announced that its products, including a Shortcut, an Instant Replay audio player and a DigiCart II recorder, were installed throughout the TV and radio facilities of the Southern Command Network (SCN) in Panama City, Panama. The SCN is part of the Armed Forces Radio and TV Service Network.



LBA Technology, Inc., Greenville, NC, was selected by the International Broadcasting Bureau to provide critical components for the modernization and retrofit of the Voice of America medium-wave AM station in Bangkok, Thailand. Supplied under the contract were RF inductors, phase sampling equipment, coaxial isolation coils and

other high-power accessories.

Panasonic/Ramsa, Cypress, CA, announced that Merging Technologies' Pyramix Virtual Studio will be used by the Montreux Jazz Festival to record several of the evening concerts directly to hard disk.

It will be the first time that a computer-based recording system will be employed by the festival.



Digital Courier International, Vancouver, announced the availability of collect sending for radio stations on its two-way North American network. With the company's *DCI Collect* service, member stations can reverse charges on delivery of commercials, voice tracks, music and other short-form audio received over the network.

ABG, Audio Broadcast Group opened a sales office in the Tacoma, WA, area. The office, staffed by Pat and Bernice Medved, can be contacted at: toll free 888-565-9960; telephone 253-565-9360; fax 253-565-9359; E-mail: medved@abg.com. The office's address is 6824 19th St. West, Ste. 185, University Place, WA 98466.

PEOPLE

Frederick L. Godard was promoted to president and chief operating officer for Leitch Technology Corporation, Chesapeake, VA. **Bob Lehtonen** will retain his position as chief executive officer, but is resigning as president.

Barry Margerum was announced as CEO of Euphonix, Palo Alto, CA. **James Dobbie**, who has held both the chairman and CEO positions since 1991, will continue as chairman and will support the company on a part-time basis.

Mark Eagle was promoted to senior vice president/director for Columbine JDS, Golden, CO.

Andrew Greenebaum was appointed executive vice president and chief financial officer for CD Radio, Inc., Washington, DC.

WEB SITES

Kart-A-Bag www.kart-a-bag.com
Mediatron www.mediatron.com
PMA Marketing www.amfmtv.com

FM BROADCAST POWER AMPLIFIERS



The B-600 FM amplifier
600W++ of power you can rely on. Other models to 1.2 kW

Plug in the antenna
Plug in the exciter
Plug in the a.c.

... walk away.

Call 800-986-9700
Fax 408-986-1438



The RF People
115 PHELAN AVE., UNIT 10
SAN JOSE, CA 95112 USA
www.svpa.com

Circle (69) on Free Info Card

DAB forum highlights the 103rd AES convention

A forum on digital audio broadcasting (DAB) is one of the highlights that will be featured at the 103rd AES convention, Sept. 26-29, in The Jacob K. Javits Convention Center in New York City. The broadcast forum on digital audio broadcasting will take place Sept. 26, at 2:00 p.m. in the Special Events Hall. A panel of experts will address the critical issues related to DAB throughout the world and will include representatives from NAB; EIA; Multimedia Communications Research Laboratory, Bell Labs; Lucent Technologies; USA Digital Radio (Gannett); Westinghouse Wireless (USADR); CRC (Canada); CD Radio and CBS, Inc. Attendees can register in advance at www.aes.org.

NAB call for presentations

The National Association of Broadcasters (NAB) has made a call for presentations requesting proposals for the NAB Broadcast Engineering Conference, NAB MultiMedia World and NAB Communications and Connectivity '98. The deadline for the one-page proposal and a brief presenter biography is Oct. 31, 1997, and full manuscripts are due by Jan. 30, 1998. If the proposal is accepted, the author will receive an NAB '98 complimentary registration. Papers that are accepted will also be up for consideration for publication in the 1998 Broadcast Engineering Conference Proceedings or Interactive Insights '98: A MultiMedia Compendium. For more information, contact John Marino, vice president, Science and Technology, NAB at 202-429-5391 or E-mail to jmarino@nab.org.

NANBA supports worldwide standard for HF digital audio broadcasting

The North American National Broadcasters Association (NANBA) is urging all major worldwide broadcasting unions to adopt a single worldwide standard for high-

frequency digital audio broadcasting. According to NANBA secretary general Bill Roberts, a single global standard would allow manufacturers, broadcasters and consumers to have superior access to programs without the extra burden of having to choose between incompatible technologies.

High-frequency digital audio broadcasting could replace analog high-frequency broadcasting, currently the international standard for broadcast short-wave bands. The growing demand for higher-quality broadcasts combined with the increasing band congestion is driving the standard and advanced HF digital development projects are already under way in France, Germany and the United States.

@Home Network expands services

The @Home Network (www.home.net) has teamed up with Internet music partners NetRadio Network (www.netradio.net) and TheDJ Network (www.thedj.com) to offer high fidelity music, news and sports content.

In addition to receiving diverse programming, @Home subscribers can receive a new broadband audio service, dubbed "TuneIn" that delivers high-quality audio streams directly to a user's desktop at 80kb/s. The @Home's high-bandwidth service allows users to tune in even while browsing on the web and it is always on. @Home subscribers can use the beta release of the TuneIn feature located on the home page or the pop/arts page where they can choose from eight different music channels. The TuneIn feature also offers interactivity so that users can find out the title of the song that is playing, get more information about the artist or purchase a CD.

TuneIn will feature live music events, technology news and sports talk/news through partnerships with N2K's Music Boulevard, CNET Radio and CBS SportsLine. In order to begin listening, subscribers need Progressive Networks' Realplayer, which is included in the latest version of @Home's customized Netscape browser.

NEW! Qbox[®] AUDIO LINE TESTER

The new Qbox is a battery powered audio line testing system that includes a built-in mic, reference tone generator, speaker, and headphone amp. It also has voltage presence LEDs to detect phantom or intercom power. You can send tones, talk back up the line, monitor mic, line, or intercom signals — even use two Qboxes as a basic intercom.



Order a Qbox today, and reduce installation and setup time anywhere audio XLR cables are used.



99 LING ROAD
ROCHESTER, NY 14612
<http://www.whirlwindusa.com>

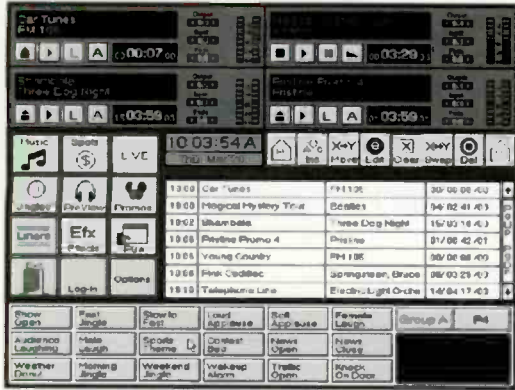
Broadcast Audio Tools **whirlwind** 888-733-4396

Circle (97) on Free Info Card

Pristine

RAPIDFIRE "...it's fun to use!"

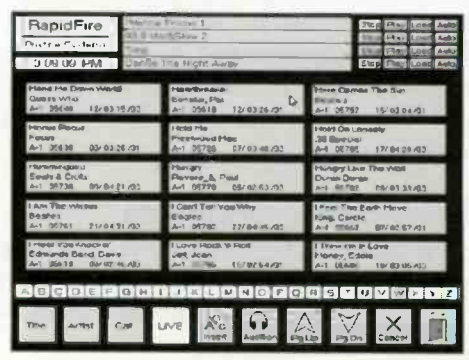
Satisfaction Guaranteed!



Pristine RapidFire is the industry's most powerful, fun to use, Digital Studio System! RapidFire will save you thousands of dollars over other high-end digital systems, while offering superior features and bulletproof reliability. RapidFire's *Quick Picks* make it easy to add or change music, commercials, promos, and last minute insertions simply by *point and shoot*. RapidFire masters live assist, walkaway, and satellite operations. Playback three audio sources simultaneously while recording a phone bit or timeshifting a network feed. Call us to find out how easy and affordable it is to harness the power of Pristine RapidFire for your station!

"Pristine RapidFire is great, it's fun to use! It's got everything a station would want in a digital system. We use RapidFire in both Live Assist and Auto modes, all day long and it never gives us any trouble."
Matt Sedota, WNMB, North Myrtle Beach, SC

EAS COMPATIBLE



The Next Generation in Broadcast Software

West & International
310-670-7500
 Fax 310-670-0133



East
864-292-0300
 Fax 864-292-9030



<http://www.pristinesys.com>

Quick Pick Screen

Circle (78) on Free Info Card

PRECISION TIMING



Designed for "Precision Timing", ESE Master Clocks & Accessories have been meeting industry needs for more than 25 years. Whether using GPS, WWV, Modem, internal crystal or line frequency accuracy, all ESE Master Clocks can drive digital or analog slave clocks, as well as interface with video or computer based systems.



PRACTICAL SOLUTIONS SINCE 1971

142 SIERRA ST., EL SEGUNDO, CA 90245 USA • 310-322-2136 • FAX 310-322-8127

Buy simplicity,
reliability and service

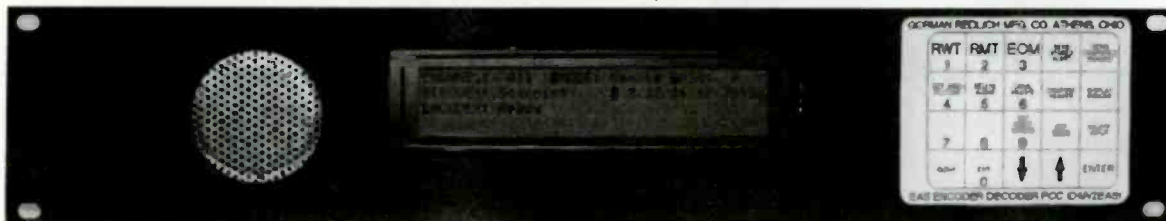
EAS
Price \$1750.00

Equipment required for
F.C.C. Jan. 1, 1997 deadline

Phone 614-593-3150

GORMAN-REDLICH MFG. CO.
257 W. Union St. Athens, Ohio 45701

FAX 614-592-3898



- 5 two-way RS-232 inputs/outputs for computer, remote signboard & character generator
- 4 audio inputs on standard models (expandable to 6 audio inputs). All audio inputs & outputs are transformer isolated from encoder-decoder board.
- Automatic interruption of program audio for unattended operation.
- 4 line 40 character LCD display with LED backlighting
- 20 key keypad to program unit, set modulation level, set input levels
- Will handshake with automation equipment.
- 2 year warranty
- 45 minutes of digital audio storage (expandable to 4.5 minutes)
- 25 pin parallel printer port for external printer
- 52 terminals on the rear to interface with other equipment by removable plugs.

Web Site: www.gorman-redlich.com

◆ Also available: printers, weather radios, antennas for weather radios, crystal controlled synthesized FM digitally tuned radios, remote signboards, cables for interconnection, character generators.

Circle (80) on Free Info Card

FIRST STRIKE CAPABILITY

Lightning Master® **TOWER LEG GROUNDING STRAPS** are designed to supplement and upgrade your existing low-resistance tower grounding with a **LOW-IMPEDANCE PATH** to ground for high frequency transients produced by lightning strikes to and near your tower.

This strap offers:

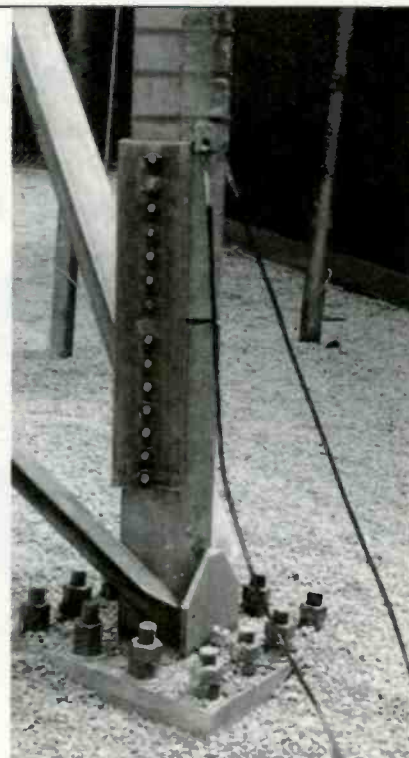
- * a large surface area contacting the tower leg
- * a gentle transition to the grounding leads
- * long leads designed to be exothermically welded directly to ground rods

Don't take chances, insist on Lightning Master® **TOWER LEG GROUNDING STRAPS** for a **LOW-IMPEDANCE PATH** to earth ground.

Other products offered by Lightning Master®

- * Structural Lightning Protection
- * Transient Voltage Surge Suppressors
- * Bonding and Grounding Products

PHONE: 800 749 6800
FAX: 813 461 3177



LightningMaster
Corporation

Circle (81) on Free Info Card



ERI, SHPX series FM Antenna and λ Mounting System

ERI[®] your single source for:

- FM Antennas and Filters
- λ Mounting System
- Towers & Poles
- Lightning Protection
- Grounding Systems
- Installation & Service

Call for special package price.

ERI ELECTRONICS RESEARCH, INC.
812-925-6000

Circle (82) on Free Info Card
See us at NAB Radio Show, Booth #530

AUTOGRAM
CORPORATION

FOR THAT SLEEK LOOK!



Submount Your Pacemaker Series
Audio Console

AUTOGRAM CORPORATION
1500 Capital Avenue • Plano, TX 75074
(800) 327-6901 • Fax: (972) 423-6334

Circle (83) on Free Info Card

BESCO
INTERNACIONAL

World Leader
in
AM - FM
Transmitters

AM & FM Pre-Owned Units in Stock

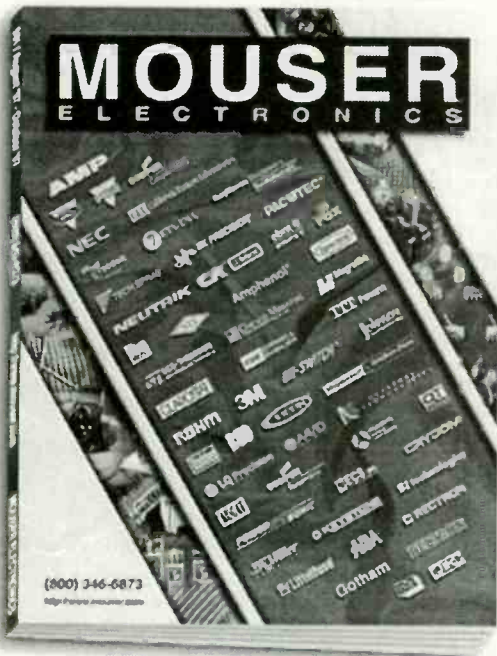
- ✓ ALL - Powers
- ✓ ALL - Manufacturers
- ✓ ALL - Instruction Books
- ✓ ALL - Complete
- ✓ ALL - Spares

*Call and take advantage of our liberal trade-in plan.
Tune and test on your frequency, available on site.
Complete inventory on request.*

Dick Witkovski — President
Robert Malany — National & International Sales
Rich Witkovski — Sales and Service

Besco Internacional
5946 Club Oaks Drive, Dallas, TX 75248
Phone (972) 630-3600 Fax (972) 226-9416

Circle (84) on Free Info Card



- 69,000+ Products
- 135 Manufacturers
- 33 Years In Business
- Same Day Shipping

MOUSER
ELECTRONICS

958 North Main St., Mansfield, TX 76063 <http://www.mouser.com> catalog@mouser.com

FREE
356 page catalog

800-992-9943
817-483-6828
Fax: 817-483-0931

Circle (85) on Free Info Card

BROADBAND FM RF AMPLIFIERS

Three power levels to meet your needs:
300 Watts • 600 Watts • 1.2 Kilo-watts



Features:

- 100% solid state
- No tuning required
- Rugged power supply
- VSWR, current & temperature foldback
- Power trim standard
- Full remote control capability, with outputs for all main parameters
- Compact 19" rack mount design

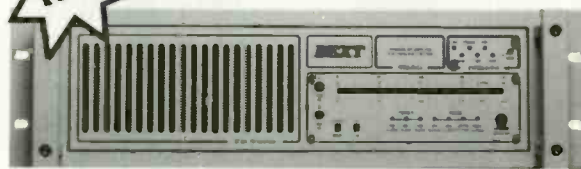
Broadcast Technology Company

P.O. Box 751, Lamar, Colorado 81052
Phone: 719-336-3902

Circle (87) on Free Info Card



The **XT** Line of Exciters/Transmitters



Compact size up to the high power models, FCC approved as exciters or low power transmitters, the XT line from BEXT comes in the 20, 30, 100, 150 and 300 Watt power levels, with 500 and 1000 W soon to follow.

Like every BEXT exciter, all XT's have outstanding specs, are frequency agile, user friendly, offer an impressive list of optional features - including a built-in stereo generator card - and are meticulously covered by the Global BEXT 2-year warranty.

Call today for your catalog with BEXT's full line of radio & TV exciters, transmitters, amplifiers, boosters, translators and STL's or view it on-line!

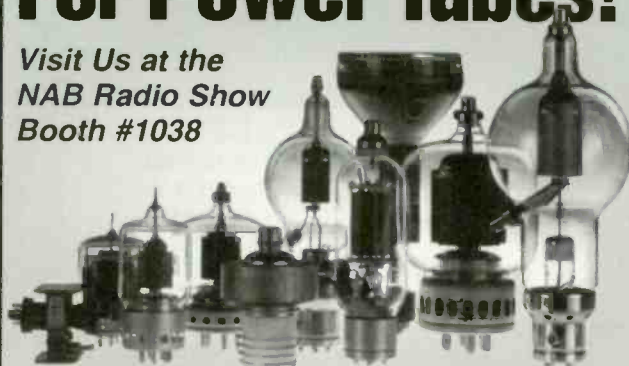
BEXT The Low Power Leader

1045 Tenth Avenue • San Diego, CA 92101 USA • <http://www.bext.com>
619-239-8462 • FAX: 619-239-8474 • E-mail: mail@bext.com

Circle (86) on Free Info Card

Your Best Source For Power Tubes!

Visit Us at the
NAB Radio Show
Booth #1038



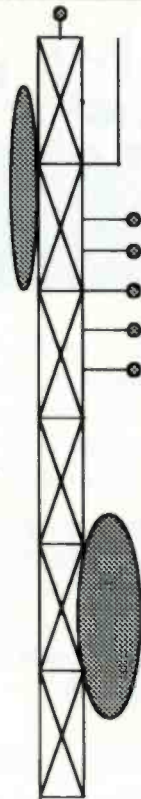
- EXTENSIVE INVENTORY**
- IMMEDIATE SHIPPING**
- EXPORT PACKAGING**
- BEST WARRANTIES**
- EXCELLENT PRICING**
- SUPERIOR SERVICE**



PENTA LABORATORIES
21113 Superior Street
Chatsworth, CA 91311
Phone: 800-421-4219
818-882-3872 Fax: 818-882-3968
E-Mail: sales@pentalabs.com
Internet: <http://www.pentalabs.com>

Circle (88) on Free Info Card

T
O
W
E



TSA SITES, INC.

Gregory B. Daly
2201 Wilson Blvd., 3rd Floor
Arlington, VA 22201
703-807-0000
703-807-1900 Fax
(888) TSA-SITE
(888) 854-7460 (FCC/FAA)
104174.654 @
COMPUSERVE.COM

Over 300 towers measured to date, 40% found non-compliant. Protect your revenue stream and your FCC licensee/tenants with reliable, accurate measurements which ensure compliance. Multi-state bids, waivers and references available. FCC and FAA filings including follow-up services. TSA uses only dGPS and laser instruments to measure facilities. Member SBE. TSA is affiliated with TelSA, Inc. Over 5,000 site locations since 1983. ASB printouts available.

REGISTRATION

Circle (89) on Free Info Card

TRANSCOM CORP.

Serving the Broadcast Industry Since 1978

Fine Used AM & FM Transmitters and Also New Equipment.

For the best deals on Celwave products,
Andrew cable and Shively antennas.

100W	FM	1985	Harris FM100K
10KW	FM	1965	ITA 10,000B
20KW	FM	1977	RCA BTF 20E1
20KW	FM	1973	Collins 831G
20KW	FM	1972	CCA FM20,000DS
25KW	FM	1982	Harris FM25K
1KW	AM	1975	Harris MW-1
5KW	AM	1979	Harris MW-5A
5KW	AM	1980	Harris MW-5A
5KW	AM	1980	Collins 828E-1
5KW	AM	1982	Continental 315-F
5KW	AM	1982	Continental 315R-1
10KW	AM	1986	Harris MW-10B
50KW	AM	1978	Continental 317C-1
50KW	AM	1981	Continental 317C-1
50KW	AM	1981	Harris MW-50B
50KW	AM	1982	Harris MW-50B

1077 Rydal Road #101, Rydal PA 19046
800-441-8454 • 215-884-0888 • FAX No. 215-884-0738

VISIT OUR INTERNET SITE → WWW.TRCORP.COM
SEND YOUR E-MAIL REQUESTS TO TRANSCOM@TRCORP.COM

Circle (90) on Free Info Card

UNIVERSAL XE-1000 SCPC AUDIO RECEIVER



AN AFFORDABLE QUALITY SCPC RECEIVER

New, affordable, frequency-agile receiver, direct channel entry by keyboard, selectable companding 1:1, 2:1, 3:1, wide/narrow bandwidth, de-emphasis selectable, 950-1450 MHz, line output 600 ohms, muting, transponder agile, LNB power supply, 50-channel memory, full baseband output, high-quality audio. Every needed feature at a sensible price (lowest in the industry).

REMOTE ACCESS AUTOMATION (OPTION)

**CALL OR FAX FOR PRICING
AND COMPLETE INFORMATION**

Phone: (614) 866-4605 Fax: (614) 866-1201

UNIVERSAL ELECTRONICS, INC.
Communications Specialists

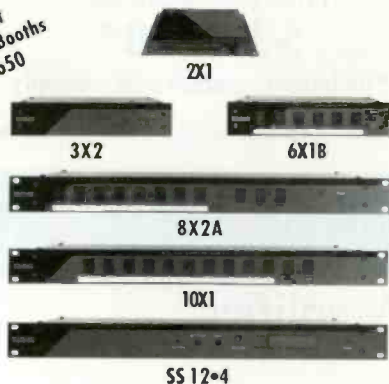
4555 Groves Road, Suite 12 Columbus, OH 43232-4135

Circle (91) on Free Info Card

Broadcast Tools

Has The Right Switcher For You!

See Us at
NAB Radio Booths
109 & 650



From the 2X1 that switches between two stereo sources feeding a single stereo output, to the microprocessor-controlled SS 12*4 with twelve stereo inputs feeding four stereo outputs, we have a switcher to fit your application. Designed by broadcast engineers for broadcasters, our switchers offer excellent audio quality, removable I/O connections, remote control capabilities and flexible mounting accessories, plus most models can be used as source routers. For your next project use the right tools - Broadcast Tools!

Check out our new web site for additional information and a list of distributors!

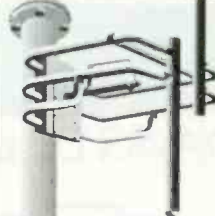
Voice: 360 . 428 . 6099
Fax: 360 . 428 . 6719

**BROADCAST
tools inc.**

E-mail: bti@broadcasttools.com Internet: www.broadcasttools.com

Circle (92) on Free Info Card

Your Bottom Line Is Only
as Good as Your Coverage.
Shively Can Predict
Your Coverage
Better than Anyone Else.



- 30 Years Experience
- Full-Service Provider
- Multi-Station Solutions
- FM & UHF Antennas
- Filters & Combiners
- New B-Line Coax

Shively Labs,
because ...

... it pays to be heard!

P.O.Box 389, Bridgton, ME 04009 USA
Tel.: (207) 647-3327 FAX: (207) 647-8273
e-mail: sales@shively.com
- An Employee-Owned Company -

Circle (95) on Free Info Card



For All Your
RF And
Audio Needs

Announcing Our New Third Office!

For Our Middle Atlantic and Midwest Customers,
Please Contact **RICK JOHNSON**
For Great PRICES + Excellent Personal SERVICE
Phone: 804-974-6635 Fax: 804-974-9942

If we have talked before, let's talk again!

For a single piece of equipment or
before you build that new station!

Don't forget **John Shideler** in the West
or

Bob Stewart in the Southeast



When You Want
More Than An
Equipment Dealer



Southeast	Bob	770-992-2230	Fax: 770-992-6538
MidAtlantic	Rick	804-974-6635	Fax: 804-974-9942
West	John	970-482-9254	Fax: 970-482-6123

Circle (93) on Free Info Card

POWERFUL DIAL-UP CONTROLLER



Shown with optional Rack Mount

The new CircuitWerkes DR-10 Dial-up remote control is perfect for studio & automation control. With features not found anywhere else, you might be amazed at the DR-10's list price of only \$439.00.

- 10 Dry relay contacts out (2 are DPDT for audio, etc.)
- Auto-answers on user selectable ring number and auto-disconnects at call's end.
- Each relay can be independently set to function as a momentary closure, latching closure with distinct on/off codes, or interlocked latching with other relays.
- Up to 8 digit user set password prevents pirating.
- Any relay can be assigned to any tone(s).
- Each relay is programmable to beep when activated.
- Two-tone & detection delay modes eliminate falsing.
- 4 Status inputs can dial 4 numbers and control relays.
- A simple, built-in audio hybrid lets you control equipment while monitoring a local audio source.
- Provides an active, balanced, phone line audio output.
- All outputs appear on easy to use screw terminals.
- Program it with any DTMF phone or encoder.
- Retains its settings after a power failure.

CircuitWerkes

(352) 335-6555 / Fax 331-6999

3716 SW 3rd Place, Gainesville, FL 32607

Circle (94) on Free Info Card

Here's A Gift From Our Engineers and Accountants...

From our engineers:

- > 100 dB signal to noise
- < .005% harmonic distortion
- +/- 0.1 dB 20Hz to 20KHz frequency response
- > -90dB crosstalk

From our accountants:

\$399.00*

*including external power supply

"Distribute your audio, not your whole budget"



DA-8S Distribution Amplifier



800-950-4260

Available through all major dealers

Circle (96) on Free Info Card

GET IN ON THE GROUND FLOOR!

Advertise in BE Radio's section called "The Gallery" and expose your products and services to more than 12,500 product buyers every issue.

It's easy . . . it's cost effective . . . and it's only a phone call away!
Call **Steven Bell**, national marketing manager, at **913/967-1848** for all the details today!

PROFESSIONAL SERVICES

JOHN H. BATTISON P.E.
CONSULTING BROADCAST ENGINEER,
FCC APPLICATIONS AM, FM, TV, LPTV
Antenna Design, Proofs, Fieldwork
2684 State Route 60 RD #1
Loudonville, OH 44842
419-994-3849 FAX 419-994-5419

**RUSS
BERGER
DESIGN
GROUP
INC**

INDEPENDENT CONSULTANTS
SPECIALIZING IN:
RECORDING & BROADCAST FACILITY
DESIGN & PLANNING,
ARCHITECTURAL ACOUSTICS,
NOISE & VIBRATION CONTROL,
& TECHNICAL SYSTEMS DESIGN

4006
BELTLINE
SUITE 160
DALLAS
TEXAS
75244
972/661-5222
FAX
972/834-3935

D.L. MARKLEY
& Associates, Inc.
CONSULTING ENGINEERS

2104 West Moss Ave.
Peoria, Illinois 61604
(309) 673-7511
FAX (309) 673-8128
Member AFCCE

CHAN & ASSOCIATES

Strategic Marketing • Public Relations • Advertising
1307 Shadow Lane, Suite C
P.O. Box 5509
Fullerton, CA 92838-0509
Phone: (714) 447-4993
Fax: (714) 578-0284
Pager: (714) 506-1357
Email: cchan@ix.netcom.com
CompuServe: 74601,2707

Curtis Chan
President

EXEgesis Technologies Technology Consultants

Design- Project Management- Systems Integration - Installations
Audio, Video, Data, RF, LAN & WAN

Kevin McNamara, President 301.865.1011
P.O. Box 278 Voice/FAX
New Market, MD 21774 EXEGESIS1@AOL.COM
E-Mail

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
RADIO AND TELEVISION

DANE E. ERICKSEN, P.E.
Box 280068
San Francisco, CA 94128
707/996-5200 707/996-5280 Fax

HELP WANTED

RADIO CHIEF ENGINEER Chief Engineer wanted for Tucson, AZ radio stations. Should have experience as radio Chief or Assistant Chief Engineer and with the installation and maintenance of broadcast RF systems. Skills should also include the installation and maintenance of radio studio and computer based station automation and digital audio production systems. Experience maintaining Dalet station automation systems and CNE or CNA certification a plus. Send resume to Randy Price, Journal Broadcast Group, 720 E. Capitol Dr., Milwaukee, WI 53211, fax (414) 967-5540, E-mail price@journalbroadcastgroup.com. Journal Broadcast Group is an employee owned and equal opportunity employer.

HELP WANTED

International Account Manager

360 Systems is a leading manufacturer of advanced digital audio products for radio, TV and commercial markets, with export sales to over 60 countries. If you have a background in broadcast or pro-audio, we would like to talk to you about joining our world-class export department. This challenging position is for salesmen interested in world travel, experienced in international markets, and with technical aptitude. For further information visit our web site at www.360systems.com.

Applicants are invited to send a letter outlining career objectives, together with resume and salary history to Robert Easton, President, 5321 Sterling Center Dr., Westlake Village, CA 91361.

360 Systems

AD INDEX

	Page Number	Reader Service Number	Advertiser Hotline
Acoustic Systems	60	57	512-444-1961
Antenna Concepts	64	39	916-621-2015
Audio Precision	39	43	800-231-7350
Audio Processing Tech. Ltd.	13	20	+232-371-1110
Audiotronics, Inc.	95	2	901-362-1350
Autogram Corporation	88	83	972-424-8585
Besco Internacional	88	84	214-630-3600
Bext Inc.	89	86	619-239-8462
Broadcast Software Intl	77	62	602-572-8525
Broadcast Technology Co.	89	87	719-336-3902
Broadcast Tools Inc.	91	92	360-428-6099
Circuitworks	91	94	904-331-5999
Coaxial Dynamics, Inc.	44	48	216-267-2233
Computer Concepts Corp.	47	30	913-541-0900
Comrex Corp.	9	17	508-263-1800
Continental Electronics	63	38	214-381-7161
Cortana Corporation	74	74	505-325-5336
Crown Broadcast	65	40	219-294-8000
DBM Systems/Cartworks	45	50	601-853-9976
DGS Pro Audio	75	76	800-292-2834
Dielectric	77	63	207-655-4555
Digigram USA	31	12	703-875-9100
DRS Ahead Technology	52	35	408-226-9991
Enco Systems Inc.	15	6	810-476-5711
Energy-Onix	16	7	518-758-1690
Equi-Tech Corporation	66	41	514-597-4448
ERI Electronics Research Inc.	88	82	812-925-6000
ESE	86	79	310-322-2136
Euphonic	59	55	415-855-0400
Fidelipac Corporation	28	23	215-464-2000
Genther Communications	29	24	800-945-7730
Gepeco	74	75	312-733-9555
Gorman Redlich Mfg Co.	87	80	614-593-3150
Harris Corp./Broadcast Div.	3	4	217-222-8200
Hnat Hinds	75	77	203-935-9066
Innovative Devices, Inc.	54	37	250-260-2861
Inovonics	73	73	800-733-0552
Intertec Publishing	44	49	800-288-8606
Intraplex, Inc.	36	27	508-692-9000
Itelco	37	28	305-715-9410
Jampro Antennas, Inc.	50	33	916-383-1177
JK Audio	78	64	800-JK-AUDIO
Kintronix Labs Inc.	26	10	423-878-3141
LBA Technology Inc.	69	70	800-522-4464
Ledtronics, Inc.	32	13	310-534-1505
Leitch Incorporated	7	16	800-231-9673
Lightning Master Corporation	87	81	813-447-6800
Littlite/CAE Inc.	73	72	810-231-9373

	Page Number	Reader Service Number	Advertiser Hotline
Logitek	5	5	713-782-4592
Mackie Designs Inc.	2	1	800-258-6883
Mediatouch	27	22	204-786-3994
Mediatron	42	46	498-131-83050
Mouser Electronics	89	85	800-992-9943
Murphy Studio Furniture	30	25	619-698-4658
Neumann (USA)	17	8	
Neutrik Canada	38	29	514-344-5220
NPR Satellite Services	33	14	202-414-2613
NSN Network Services	48	31	800-345-VSAT
OMB America	53	36	305-477-0974
Orban	11	18	510-297-2774
Allen Osborne Assoc.	66	42	805-495-8420
Pentalabs	89	88	818-882-3872
PhaseTek Inc.	78	65	215-536-6648
Prism Media Products	12	19	201-299-7790
Pristine Systems Inc.	86	78	864-292-0300
Prophet Systems Inc.	21	11	308-284-3517
QEI Corporation	70-71	71	800-334-9154
Radio Computing Services	23	21	914-723-8567
Radio Programming & Mgmt.	58	54	800-521-2537
RadioSoft	40	44	904-426-2521
Radio Systems	61	58	609-467-8000
Roscom	91	93	770-992-2230
Satellite Systems	56	52	719-634-6319
SCEC '97	67	60	800-288-8606
Scott Studios Corp.	35	26	800-330-3004
Selco Products Co.	83	66, 67	800-229-2332
Sennheiser Electronics Corp.	62	59	203-434-9190
Shively Labs	91	96	207-647-3327
Shure Brothers	55	51	800-25-SHURE
Silicon Valley Pwr Amplifier	84	69	408-986-9700
Smarts Broadcast Systems	57	53	800-747-6278
Sound America	83	68	802-748-9787
Studer Professional Audio	19	9	411-870-7511
Switchcraft Inc./Div Raytheon	49	32	312-792-2700
S.W.R. Inc.	60	56	814-472-5436
Tannoy/TGI North America Inc.	68	61	519-745-1158
T.C. Electronic USA	41	45	805-373-1828
Thorncast	43	47	01-349-031-00
Transcom Corporation	90	90	215-884-0888
TSA Sites, Inc.	90	89	703-807-0000
Universal Electronics Inc.	90	91	614-866-4605
Ward-Beck Systems Ltd.	34	15	416-438-6550
Wheatstone Corporation	96	3	315-452-5000
Whitwind	85	97	510-284-8417
Zercom	92	96	218-765-3151
360 Systems	51	34	818-991-0360

BE Radio

EDITORIAL

Skip Pizzi, *Editor in Chief*
 Chris Scherer, *Editor*
 Brad Dick, *Editorial Consultant*
 John H. Battison, P.E., *Technical Editor*
 Dawn Hightower, *Senior Associate Editor*
 Dearnna Rood, *Associate Editor*
 Jim Saladin, *Associate Editor*
 Tom Cook, *Senior Managing Editor*
 Carl Bentz, *Directories Manager*

ART

Stephanie L. Masterson, *Art Director*

BUSINESS

Raymond E. Maloney, *President*
 Cameron Bishop, *Senior Vice President*
 Dennis Triola, *Publisher*
 Eric Proffitt, *Marketing Coordinator*
 Kathy Volkland, *Advertising Coordinator*
 Annette Hulse, *Classified Advertising Coordinator*
 Doug Coonrod, *Corporate Art Director*
 Barbara Kummer, *Circulation Director*
 Leann Sandifar, *Circulation Manager*
Customer Service: 913-967-1711 or 800-441-0294

TECHNICAL CONSULTANTS

Jerry Whitaker, *Contributing Editor*
 Yasmin Hashmi, *International Correspondent*
 Stella Plumbbridge, *European Correspondent*
 Russ Berger, *Broadcast Acoustics*
 Dane E. Erickson, P.E., *Systems Design*
 Donald L. Markley, *Transmission Facilities*
 Harry C. Martin, *Legal*
 Curtis Chan, *Audio/Video Technology*
 Kevin McNamara, *Computer Technology*

MEMBER ORGANIZATIONS

Sustaining Members of:
 • Acoustical Society of America
 • Audio Engineering Society
 • Society of Broadcast Engineers
 Member, American Business Press
 Member, BPA International



BE RADIO (ISSN 1081-3357) is published bimonthly (except an additional issue in August) and mailed free to qualified recipients by Intertec Publishing Corporation, 9800 Metcalf, Overland Park, KS 66212-2215. Non-qualified persons may subscribe at the following rates: USA and Canada, one year, \$30.00; all other countries, one year, \$35.00 (surface mail), \$70.00 (air mail). Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 0956244.

POSTMASTER: Send address changes to BE Radio, P.O. Box 12937, Overland Park, KS 66282-2937.

BE Radio is edited for corporate management, technical management/engineering and operations and station management at radio stations and recording studios. Qualified persons also include consultants, contract engineers and dealer/distributors of radio broadcast equipment.

SUBSCRIPTIONS

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Intertec Publishing provided that the base fee of U.S. \$2.25 per copy, plus U.S. \$60.00 per page is paid to Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. The fee code for users of the Transactional Reporting Service is ISSN 1081-3357/1997 \$2.25+00.00.

For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. Prior to photocopying items for educational classroom use, contact CCC at 508-750-8400.

Organizations or individuals with large quantity photocopy or reprint requirements should contact Kim Whitmore, 913-967-7212. Microfilm copies of BE Radio are available by calling/writing UMI, 300 North Zeeb Rd, P.O. Box 1346, Ann Arbor, MI 48106-1346. Phone: 313-761-4700 or 800-521-0600.

CORRESPONDENCE

Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2215. Phone: 913-341-1300; Edit. Fax: 913-967-1905. Adv. Fax: 913-967-1904.

© 1997 by Intertec Publishing.

All rights reserved.



SALES OFFICES

NATIONAL & INTERNATIONAL

Steven Bell
 9800 Metcalf Avenue
 Overland Park, KS 66212-2215
 Telephone: (913) 967-1848
 FAX: (913) 967-1900
 E-mail: steven_bell@intertec.com

CLASSIFIED ADVERTISING

Jeff Utter
 Telephone: (800) 896-9939
 (913) 967-1732
 FAX: (913) 967-1735

WESTERN U.S.

Sue Horwitz
 809 South Orange Drive
 Los Angeles, CA 90036
 Telephone: (213) 933-9485
 FAX: (213) 965-1059
 E-mail: 76345,2624@compuserve.com

LIST RENTAL SERVICES

Lori Christie
 Telephone: (913) 967-1875
 FAX: (913) 967-1897

Satellite DAB update

By Skip Pizzi, editor in chief

There's been plenty of action lately in Satellite DAB (S-DAB) for the United States. In April, the FCC auctioned two licenses for S-band service (2,320-2,345MHz) to the highest bidders: CD Radio and American Mobile Radio Corporation (AMRC). Since then, both companies have been moving forward in their plans to launch service, scheduled to begin in late 1999.

The two companies eventually expect to offer between 60 and 100 channels of pay-radio programming, with subscriptions costing approximately \$10 a month or less. CD Radio has been more specific about its programming plans, which include 30 CD-quality music channels and 20 news/sports/talk channels from its twin satellite system. (Both birds are being built by Loral Aerospace, and each will beam the same signal in a transmit-diversity scheme.)

The antenna required is a silver-dollar-size disk that must have line-of-sight to one of the satellites, thus ruling out most in-building listening. In fact, CD Radio calls its service satellite-to-car radio. But even car-mounted antennas won't see a satellite in densely constructed "urban canyons." Satellite DAB, therefore, may experience its worst reception in the areas of highest population.

This could be solved with terrestrial "gap-filler" repeaters, but neither company is committing to this. Their plans seem to center on smaller markets and rural areas first, where less choice in radio programming currently exists. Nevertheless, it's likely that COFDM-style transmission formats will be adopted, allowing on-channel terrestrial repeaters.

Receiver ideas

Like DBS-TV, it's expected that each of the two services will require a separate receiver. Like cable radio, the receivers will likely display artist and title data in a text window.

In addition to seeding the market with three-band (AM/FM/S-DAB) radios in new cars and trucks, CD Radio is developing an adapter and wireless antenna for easy aftermarket conversion of existing car audio systems by consumers. The receiver will be fashioned to plug into a cassette or CD slot and internally couple with the player's audio pickup. A faceplate on the adapter will remain exposed for tuning control and display. The battery-powered antenna will stick to the inside of the vehicle's rear window and retransmit its wideband pickup across the passenger compartment to the receiver.

Market questions


As with any DBS system, start-up costs for S-DAB operations are high. AMRC paid \$89 million for its license, and CD Radio paid \$83 million. (Congress had hoped to raise more, while CD Radio had hoped to pay less with a Pioneer's Preference, which was denied.) Add another \$300+ million for satellite construction and launch, plus the cost of operations, and each company is facing expenditures on the order of \$500 million before the first customers sign up. Further revenue drain may occur if the S-DAB companies have to subsidize receiver manufacturers (like DBS-TV services do today).

On the other hand, if S-DAB is a hit, these two operators will have the market to themselves, and their license fees could seem like bargains. Analysts cite a figure of approximately one million subscribers each for the services to break even, and best-case estimates forecast that the two services could have a combined listenership of 15 million by 2003.

Until then, however, plenty of patient capital will be required. AMRC is blessed with the deep pockets of its parent companies, among them AT&T and GM/Hughes. CD Radio is less well-endowed, relying on private investors and venture capital. It's been successful in raising enough to keep its 10-person operation going for now, but still has a steep funding hill to climb.

S-DAB's ultimate success may rest simply on whether listeners will pay for radio service. Will the choice, content and nationwide uniformity of S-DAB service be sufficiently compelling to get people to subscribe? Will the quality of service and coverage be good enough to keep subscribers around?

Finally, if the subscription model is unsuccessful, will these services convert to tried-and-true commercial radio operations? Nothing in their licenses precludes this, and some pundits have observed that it may be the S-DAB services' ultimate plan, with the subscription idea serving simply to deflect some of the NAB's opposition until licenses were granted.

S-DAB supporters claim that most who will listen to S-DAB service are already lost to local radio by their preference for cassette and CD players or they are at least already dissatisfied with existing choices. If so, today's trends among radio stations to eliminate local content and move toward further homogeneity of format play right into S-DAB's hand. Keeping a strong, vibrant, unique and locally rooted service is the best defense for radio stations against the coming competition from the skies. 



THE FUTURE OF RADIO IS HERE **NuStar is ON-AIR**

Cleaner, Clearer, Quieter
DIGITAL AUDIO IS THE DIFFERENCE

The sonic quality of WEGR-FM in Memphis is really very good and it just got better. Their NuStar 3000 Series installed quickly and operates flawlessly. The Morning Wake-up Crew, TIM, BEV, and BAD DOG are pictured above at the control surface. Tim Spencer (P.D.) says "The great thing about it is that it's Digital, but operates like the regular Board we're used to. We feel that's important because with the new console, our staff hasn't had any operator miscues at all. The transition was seamless."

- AND IT'S READY FOR YOU AND YOUR STATION -
With new equipment technology and your air time on the line
The Name You Can Trust To Deliver Is:

 **AUDITRONICS**

3750 Old Getwell Road, Memphis, TN 38118 USA
Telephone: (901) 362-1350 FAX: (901) 365-8629
www.auditronics.com E-Mail: sales@auditronics.com



Sometimes
we have to
settle for
what we
need...

Wouldn't
you rather
Get what
you
WANT?

We've taken the very best technology, components and field engineering input to make this the **FINEST** console available.

The A-6000 is engineered specifically for major market stations that demand a lot of functions and need to lead with technical excellence. It's based on an open architecture mainframe that lets you change module locations with no restrictions, giving layout top priority and allowing easy reconfiguration as format needs change.

The **Wheatstone A-6000** has the appearance, features and power to excite the most demanding program and production staff; its engineering, performance and thoughtful design will help your personnel achieve broadcasting excellence.

 **Wheatstone**

315-452-5000

Circle (3) on Free Info Card