Radio World®
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Westwood to Test L-Band DAB

by Frank Beacham

WASHINGTON The FCC has granted Westwood One and Golden West Broadcasters permission to conduct experimental digital audio broadcasts in Los Angeles in the L-band and on frequencies in the existing FM band.

The Commission action is the first government authorization issued in the United States for DAB testing in the L-band and in the existing FM band frequencies.

The authorization, issued May 31, allows the two companies to conduct joint experimental DAB testing for one year in the L-band, between 1551 MHz and 1557 MHz. It also allows the companies to test proposed "in-band" DAB systems in the existing FM band. The Commission approved experimental DAB operations in the S-band for the two Los Angeles-based companies in February.

Westwood One Inc., through its Westwood One Stations Group division, is licensee of radio station KQLZ-FM, Los Angeles. Golden West Broadcasters is the licensee of radio stations KMPC-AM, Los Angeles, and KLIT-FM, Glendale, Calif.

Welcome decision

The companies propose to conduct tests of the "in-band" FM DAB system of USA Digital Radio on the frequencies occupied by both KQLZ-FM and KLIT-FM.

"We welcome (the) FCC decision and through our experimental DAB testing we plan to provide much needed test data to the FCC and to the broadcasting industry concerning the competing DAB systems being developed," said Eric R. Weiss, Westwood One's VP of business and legal affairs.

"We trust this data will clear up much of the confusion that currently exists

(continued on page 10)

Spectrum Bill May Hinge on Fiber

by Arthur Cole

WASHINGTON Action on a House of Representatives bill calling for spectrum auctions may be delayed until later this summer while backers draw up new language earmarking auction revenues for fiber optic development, a Capitol Hill source said.

As a result, the bill probably would not see final action until early next year.

According to an aide to Congressman Don Ritter (R-Pa.)—whose spectrum auction bill, HR-1407, currently is before the House Telecommunications and Finance Subcommittee—activity is focused on language that would allow spectrum revenues to be used for low-cost loans for fiber distribution.

"We would like to use auction revenues to prove the capability of fiber as a network," said the aide, who spoke on condition of anonymity. "We haven't discussed what mechanism to use (to provide the loans). We know it will be some kind of interest rate sub-

(continued on page 13)

Eureka Letter Extended

by Judith Gross

WASHINGTON After two months of uncertainty, Eureka 147 partners have written to the NAB, extending a letter of intent that expired April 1.

The original letter expressed Eureka's interest in negotiating a licensing/royalty agreement with NAB on the Eureka 147 DAB system, which Eureka hopes will become a world standard for digital radio broadcasts.

That letter led to the NAB Radio Board's endorsement of Eureka DAB in late January, but the April 1 deadline passed without negotiations taking place.

NAB Senior VP of Science & Technology Michael Rau told **RW** that Eureka has written a second letter extending the deadline to July 1, and that a meeting to discuss details was to have been scheduled this month.

Rau reiterated previous comments made by Eureka partners and the NAB: that the holdup was due to Eureka partners ironing out the business side of the project.

"A single representative has been designated to negotiate for Eureka," Rau said, "and that was the main difficulty we had in trying to work out a deal with a lot of different interests."

Rau said Eureka's negotiator is Thierry Sueur, an attorney in the legal department of Thomson, based in Paris. Thomson is one member of the Eureka consortium.

Since the NAB announced the first letter of intent, there has been some opposition to the NAB's position by broadcasters worried about the economic impact of adopting a DAB system that would require new spectrum.

There is also concern about the cost and power tradeoffs necessary for Eureka 147 to operate in the L-band—the band sought by the NAB—along with concern about getting enough new spectrum for every existing licensee.

In addition, several U.S. companies have begun working on in-band DAB systems using existing FM spectrum, although none of these is as far along as Eureka.

But Egon Meier-Engelen, who chairs the Eureka 147 project, has denied that the controversies surrounding DAB in this country have been a cause of the delay.

News Briefs

Special IDs for FCC Visitors

WASHINGTON The FCC is now offering Special Visitor IDs for guests of the Commission. Special IDs allow the person to enter the Commission through the 1919 M St. or 2025 M St. entrances without signing in.

Request forms for Special Visitor IDs, FCC Form 210, can be obtained from the Guard Station in the lobby of 1919 M St., N.W. or from the Internal Control and Security Office, Room 411.

The IDs, which are valid for one year, are intended for U.S. citizens who use the Commission facilities three times per week or more.

For more information, contact Charles Gray at 202-632-7143.

Commercial Radio Operator License Forms Change

WASHINGTON Applications for Commercial Radio Operator Licenses, FCC Form 756, were revised in March and are now available. Applicants using the March 1991 version of the form will not be required to submit FCC Form 155 with their applications.

When requesting Form 756, commercial radio applicants are advised to request a copy of the "Field Operations Bureau Fee Filing Guide," which contains helpful instructions for fees and forms.

All forms are available from the FCC Forms Distribution Center, 2803 52nd Ave., Hyattsville, MD 20871, or from any FCC field office.

For information about licenses and applications, contact Claudette Jefferson or Gabriel Collazo at 202-632-7240. For information on fees and fee payments, telephone 202-632-3337.

SBE Certification Courses on NPR

WASHINGTON National Public Radio (NPR) has announced the development of a live, interactive audio course to prepare radio engineers and operators for the Society of Broadcast Engineers (SBE) certification exam.

Courses are intended for engineers and operators with knowledge of station operations and equipment.

The course, developed in conjunction with the SBE, will be taught via satellite on NPR's training channel beginning in July 1991 and will be packaged for sale on completion.

SBE Job Line Open

INDIANPOLIS The Society of Broadcast Engineers (SBE) has installed a job line that maintains lists of potential jobs for its members.

The job line provides not only a listing of employment opportunities nationwide, but also detailed descriptions of the job, location and desired qualifications.

Employers can take advantage of the SBE job line. Technical openings for broadcast and media-related positions can be listed for a small fee, according to SBE.

The job line number is 317-253-0474. Call the SBE office at 317-253-1640 about placing a job listing.

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Pioneer Preference Approved

by Judith Gross

WASHINGTON The FCC has limited its reward for "pioneers" to one license in a specific market and left vague the criteria for obtaining such a preference.

In a 35-page report and order, the Pioneers' Preference, approved by the Commission in April, reiterated that rewarding pioneers "serves the public interest in encouraging new and innovative communications services."

But the FCC cautioned that its intent is not to grant a nationwide monopoly on a service. The Commission, therefore, decided to award a single license for a specific service proposed in a designated market.

In its final form, the preference declined to give pioneers a guaranteed head start, but did guarantee a license that would not be subjected to a comparative review.

Requirements for license

The Commission said that would-be pioneers should file a rule making petition asking for a spectrum allocation for a new service or that a rule be amended to accommodate a new technology.

In addition to new services and new technology, the FCC said it would consider enhancements to service that improve the spectrum efficiency of an existing service or proposals for sharing or co-use of spectrum for a preference as well.

But merely proposing a new technology is not enough, the Commission said. "Unless a new technology is associated with a licensable service, there is little opportunity for the Commission to create a series of rewards to encourage its implementation," the order stated.

The FCC said it would not require those seeking a preference to conduct experiments as a prerequisite to obtaining one, but said that in cases where an experiment is not done, it would require a demonstration of the feasibility of the new service or technology.

The Commission also decided not to require a financial showing from those seeking a pioneers' preference and not to require a certain level of technical qualifications.

Criteria still general

The final determination of the type of service that would be rewarded with a new license was stated in general terms by the Commission. Decisions would be made case-by-case.

The order said that eligible innovations could be added, such as functionality, a different use of the spectrum than previously available or a change in the operating or technical characteristics of a service.

The service would have to represent a "substantial change from that which existed prior to the time the preference is requested," according to the Commission.

In addition to limiting a pioneer to one license in a single area, the Commission said it would consider awarding multiple preferences for the same service in cases where a clear-cut "pioneer" is not readily discernible.

The FCC said it would consider enhancements to service that improve the spectrum efficiency of an existing service or proposals for sharing or co-use of spectrum for a preference as well.

Finally, the Commission decided that once a pioneers' preference is awarded, it cannot be transferred or sold.

DAB proponents interested

Several DAB proponents have voiced an interest in applying for a pioneers' preference.

Ron Strother, president of Strother Communications, has already received experimental UHF-TV and MDS licenses to test DAB. He also is seeking to test L-band, satellite and in-band frequencies for DAB and said he was hoping for a bigger "carrot" for DAB innovation.

"It would have been better to see the Commission acknowledge the large time and dollar expenditures that will be involved in bringing a feasible DAB system to U.S. stations," Strother said, "but we're happy to see them offer some reward."

Strother noted that the pioneers' preference could be a sufficient reward in bigger radio markets, such as Los Angeles and New York.

Ted Schober, a developer of the American Digital Radio in-band DAB proposal, whose system would require some shifting around of FM licenses, had asked the Commission to consider the preference for assignments on the FM band as well.

But the Commission declined, saying that since the proceeding was intended to help foster the growth of new technologies, awarding the preference to current commercial broadcast assignments would be "beyond the scope of our consideration."

Mini Disc: Big Audio Dynamite

by Judith Gross

FALLS CHURCH, Va. Just rushed back from **Chi-town**, my kind of town and all, with some really hot stuff from the **CES show**.

Now let's pause here to set something straight. The **summer consumer extravaganza** was nothing to write back to headquarters about. I mean, it kind of resembled some of my **D.C. haunts** after **Congress** has gone for the summer.

I won't go as far as to say **empty**, but, well, let's just say if a **cement mixer** was driven up through the corridor leading to the main hall, it might not have been **noticed**.

So what was so **hot**? Well, it was what *wasn't* on the floor that really had the **most sizzle**.

I'll give you one four-letter word: **Sony**. The company traditionally does not exhibit at the **summer show**, but Sony did have a suite in a hotel down **Michigan Ave.**, and what they were showing should make **radio stations** sit up and take notice.

We're talking **Mini Disc**, and we're talking tiny. **Tiny and rugged**.

Sony had a **player** and **recorder**—and some pre-recorded software, if you can believe it, on a **2 ½-inch disc**. That's right, a little disc that resembles a CD

but is encased in a plastic cover. You won't believe how **small** this thing is until you see it with your own eyes.

OK, so there was a recorder, and next to it a player, and you're now wondering, "yeah, but **how does it play** when you move it around?"

Well, I'll put it this way. **Sony** designed the thing to act like its **Walkman**. Jog, run, walk, shake it around—**it still plays** without skips. A **shock-proof memory buffer** is why. You take the **disc out** and it keeps on playing a while longer.

Why should **radio stations get excited** about this? Well, for starters, here is a

Music you can play catch with.

recordable digital medium. You can get **74 minutes** of music on a 2½-inch disc. Yes, they use data bit reduction, or **compression**. It's Sony's own, called **ATRAC** (adaptive transform acoustic coding) and it's similar to MUSICAM.

The **compression ratio** is 4:1, and before the **audio purists** among you start shaking your heads, let me go out on a limb here and say I think **it won't be long** before much of our audio is going to be put through some sort of bit reduction or compression. I think it's **inevitable**. Wait and see.

Sony won't go as far as calling it "**CD-quality**," but it's about on par with the DCC (also at the show, more about that later) which, also using a compression system, *is* being dubbed "CD-quality."

So, OK, it's **digital** with near-CD quality. Second, Sony has a **recorder** for it. Now, the consumer model is going to have the **SCMS anti-copy device** on it, but I bet with enough interest Sony could find a way around that for **pro use**.

And third, there's **cost**. Because it's aimed at consumers, the estimated price on the **player** will start at around $600 and come down as it becomes more widespread. The **recorder** will be around $1,000.

Have we been looking for an **affordable**, recordable digital medium to record **spots, jingles**, etc.? You bet. And this little disc is **re-recordable**, just like tape. Record it, erase it, then record on it again.

When will it be brought **to market**? Sony says **fourth quarter 1992,** so watch for it. If stations don't **jump** at this concept, I'll be very surprised.

Now, how about the **DCC from Philips**? Well, **Marantz** (owned by Philips) was showing it—also not on the **exhibit floor**—and it, too, sounded pretty good.

I especially **liked the part** where the guy doing the demo takes out the **digital cassette** and puts in the regular **analog tape cassette** and you get to hear how compatible the two are.

I guess with all these **competing formats**, it's no wonder **DAT** was not really that abundant at the show. It hardly had a chance and already they're forging ahead with **major competition**. Oh well.

And if your idea of a great way to **spend an evening** is flat out in your **favorite recliner** with a glass of your **favorite vintage** in your hand along with the crackers and brie and your **basic jazz** on the stereo, has **Marantz** got a product for you.

The **audio computer** does everything except pour you **another glass** of wine. It makes up for **room acoustics**, gets rid of that pesky **scratch** in that rare vinyl you can't find on CD and even **adds reverb**, or "ambience," just in case you want to pretend you're in the box seat at **Lincoln Center**, or in a gymnasium (hmmmm, sneaker squeals don't mix with Mozart, do they?) or some such place.

I tell you, **home electronics** are getting so smart, one day all we'll have to do is **sit still all day** and we'll still be about as **productive** as we are now (well, for some of us that will be easier than for others).

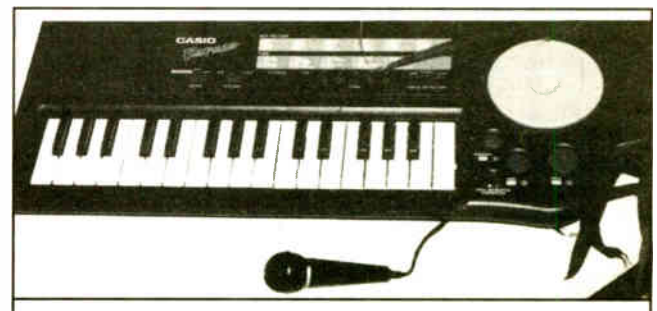
And you say your **lifelong dream** is to **sing rap**? Isn't everybody's? **Casio** has **the** solution. In a section on innovative new products, I came across the—wait for it—**Rapman**. Honest.

The **Rap-1 keyboard**, or Rapman, makes your **voice** sound like a rapper and a round **scratch table** lets you create those all-important **record-scratching** sounds. I am not making this up. It also has 25 instrument sounds and 30 background rhythm patterns.

No offense, but I bet all **30 patterns** and all **25 sounds** really sound about the same. It is **rap**, after all. Won't you be a hit at parties?

And I can't leave the **CES show** without a look at the **karaoke sing-along** gizmos, which were everywhere again, although not as many of us were as eager to **embarrass ourselves** by getting up and belting out a favorite tune.

I kept trying to picture it. Some **aspiring Sinatra** sitting alone in his den, **sequined** cummerbund, **polyester tuxedo**, perfecting *Papa's Got a Brand New Bag* or *Tiny Bubbles* or something. Somehow, I just can't see these things catching on.



Let's all rap.

But they're fun. Especially watching someone trying to be **Bobby Darin** or **Madonna**. So what the heck. I think I'll stick with **rap**.

OK, a one, and two and "The **Earwaves Rap** is really def . . . "

Have a juicy morsel of info for J.G.? FAX it to 703-998-2966 or mail it to P.O. Box 1214, Falls Church, VA 22041. Or rap it along and beg for a coveted mug.

READERS FORUM

If you have comments for *Radio World*, call us at 800-336-3045 or send a letter to Readers' Forum (Radio World, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

The good old days

Dear **RW**,

I've just read with great interest Dee McVicker's article in the May 8 edition about the Pavek and McIntire collections of old radio memorabilia. I would like to point out one sentence in the article by Michael Ohman, from Brigham Young University, which read: "We have a very early Victrola that plays on Edison disc (cylinders) . . . " Three totally different and incompatible machines are referred to here, all of which we would also call a "phonograph."

Firstly, the word VICTROLA, was (and still is) a registered trademark which described a cabinet mounted record player with the reproducing horn hidden inside. The first of these was made for the Victor Talking Machine Company by the furniture maker Poole around 1907.

Edison, however, made cylinder players, and in 1912 introduced a disc player to compete with the Victor's. Edison's discs were 1/4 inch thick, and were vertically cut, making them unplayable on the Victrola, which had laterally cut grooves. Edison also made two types of cylinders, the black "standard" type, and the blue "Amberol." The two cylinder formats were not interchangeable. Since the same catalog of music was available on both cylinders and disc, Edison never made a machine that played both.

Finally, in the same article, Mr. Ohman talks about radios with the "Magic Eye" tuning indicator. I own two radios equipped with "Magic Eye" indicators, and they don't change brilliance to indicate signal strength. There is a dark wedge shape at the bottom of the "eye" that squeezes into a slim shadow when the station is tuned in.

I am glad to see that someone besides me has an interest in preserving these old radios. But I do hope Mr. Ohman has a chance to plug in one of those old timers, and experience things like using a "Magic Eye" himself. Having so many radios right there, I am sure that he will. Also, if he can locate it, Roland C. Gellatt's book "The Fabulous Phonograph from Tin Foil to High Fidelity" is the closest thing I've found to a biography about Radio's sister media, the phonograph.

John Landry
WBZ Radio
Boston, Mass.

Responsible piracy

Dear **RW**,

You have an excellent magazine that provides informative articles on timely issues regarding the broadcast industry, and I highly enjoy the *Opinion* section as well. Opinion, namely my own, is the subject of this letter.

You have published many pieces on pirating. It is doubtful that any successful broadcast engineer who has paid his dues in this business has not at one time or another put an illegal transmitter on air. For those who are now engineers at legitimate stations, such a thing was a learning experience. Many, in fact, cut their teeth with such "toys."

Many who are no longer active in legal radio have had strong desires to start their own stations legally, but have been totally and absolutely prohibited from doing so because of the sheer costs involved. I believe that pirating exists because of the virtual impossibility of getting licensed to operate legally.

According to a recent article in "Popular Communications," many pirate broadcasters are not high school kids, but mature adults with serious broadcast facilities. Why do these people exist? The popular consensus is that licensed broadcasting is regulated beyond belief by Big Brother, and there remains something to be said that cannot be said in government controlled facilities.

Anyone who believes that he or she is getting the truth by listening to the multimillion dollar puppets on the national news at 6 is laboring under a misconception. The fact that big bucks are needed to get into legitimate broadcasting—and that's just for the license—has prohibited many lower income persons from seeking a license.

All these factors have given rise to pirating, and I expect it to proliferate as more and more people realize that their constitutional rights have been violated—mostly by the FCC, whose Communications Act of 1934 is clearly outmoded and contrary to constitutional rights.

In itself, it was a good thing, in that it was designed to promote order on the airwaves and prevent stations from interfering with each other. But many extenuating circumstances have caused it to be ineffective and clearly in need of revision since its enactment nearly six decades ago. The FCC has created a monster, and it has bred tyranny on the commercial airwaves.

The fact that pirating runs rampant on the shortwave bands is in itself a testimony to the power of shortwave to provide alternative services. It is a refuge for the listener who wants all the slants on the news, and shortwave indeed provides this 24 hours daily with such services as the BBC, Radio Moscow, and countless other high power broadcasters who provide timely news and entertainment to their listeners. These broadcasts can be received easily without much of an antenna at all.

Maybe someday someone can explain to me exactly how the 100 kW FM operation who runs a jukebox format with a lot of hype is "operating in the public interest, convenience, necessity," when the news department is closed on weekends.

I wish to make clear that I condone pirate broadcasting only if it is done responsibly for a reason, and only if it does not interfere with any licensed broadcast service. Nor do I give a blanket OK to anyone who wants to do it. The kid with his Radio Shack wireless mic isn't likely to cause any concern to anyone, but an irresponsible pirate with some decent horsepower can wreak havoc if his broadcasts are not conducted responsibly and with direction.

Ed Cole
Lakeland, Fla.

Center Support

Digital audio broadcasting is one of the most rapidly growing technologies in radio today. New system proponents are emerging constantly, and this proliferation is—rightfully—making many in the industry wonder which system would be most appropriate for American broadcasting.

That's why the industry should support a test center for DAB systems. At present, Ron Strother has publicly announced his desire to establish such a center; Westwood One and Golden West have been granted authorization to test DAB systems in the L-band. System proponents should now take the initiative and show support for the testing concept.

A test center for DAB could be patterned after the Advanced Television Test Center (ATTC) for High Definition Television (HDTV). It would, however, be easier to put into operation than the ATTC, because DAB systems are easier to test than HDTV, and the tests can be performed more quickly.

DAB researchers can also learn from the mistakes made in HDTV. A reasonable timetable for testing, as well as a deadline for accepting submissions, should be established. One hundred percent participation should be the center's goal because the only way to determine the best system is to test them all.

System proponents should also understand that support of a test center means more than simply participation in testing. Companies and manufacturers must be prepared to provide funding for the center's operational expenses.

The NAB must also be urged to support a DAB test center, as it did with HDTV. The NAB's Michael Rau has already indicated the association's interest in playing a role in such a center. However, the NAB is walking a delicate line as a DAB system proponent.

In some circles, people have questioned whether NAB should be advocating the adoption of any system this early in the game. It is important, therefore, that the NAB's role in a test center be carefully considered, to avoid even the appearance of a conflict of interest.

With any DAB test center, however, testing must take into consideration user requirements in addition to technical merits of systems. The most appropriate DAB system for American radio, after all, is the one most responsive to the needs of American broadcasters.

—**RW**

Now's Your Chance to Tell RW What to Do

Have you ever wanted to have a say in what goes into **Radio World**? Now's your chance.

Each year, **RW** publishes the Radio World Directory, a magazine-sized look at the industry, its manufacturers and their products. The staff of **RW** is starting to decide on the editorial content of the next Directory. We're also trying to come up with an eye-catching photo for the cover.

Of course, we also want to make the publication as responsive to our readers as possible. That's where you come in.

Do you have any four-color photography that could capture the attention of fellow **RW** readers—maybe even generate a story? Offbeat or topical, if you think you have a photo that merits our attention, send it to us.

If you don't have photos, don't feel left out. **RW**'s staff is also considering ideas for the editorial focus of the Directory. If you can frame a concept for a feature you'd like to see in the **RW** Directory issue, write it down—all it takes is a couple of sentences.

Send your suggestions to Radio World Directory, 5827 Columbia Pike, Suite 310, Falls Church, VA 22041. Or FAX us at 703-998-2966. Your suggestion may become a feature in the Directory, and *you* will have had a hand in the publishing process.

Drop us a line. After all, a chance like this comes around only once a year.

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Radio World
July 10, 1991

TAKE THE LEAD
WITH HARRIS ALLIED

AUDISK: IT'S A "WALK AWAY" HIT!

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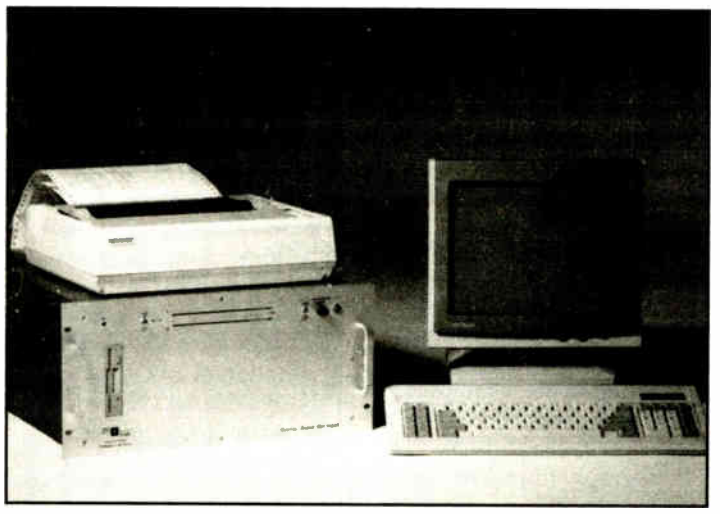

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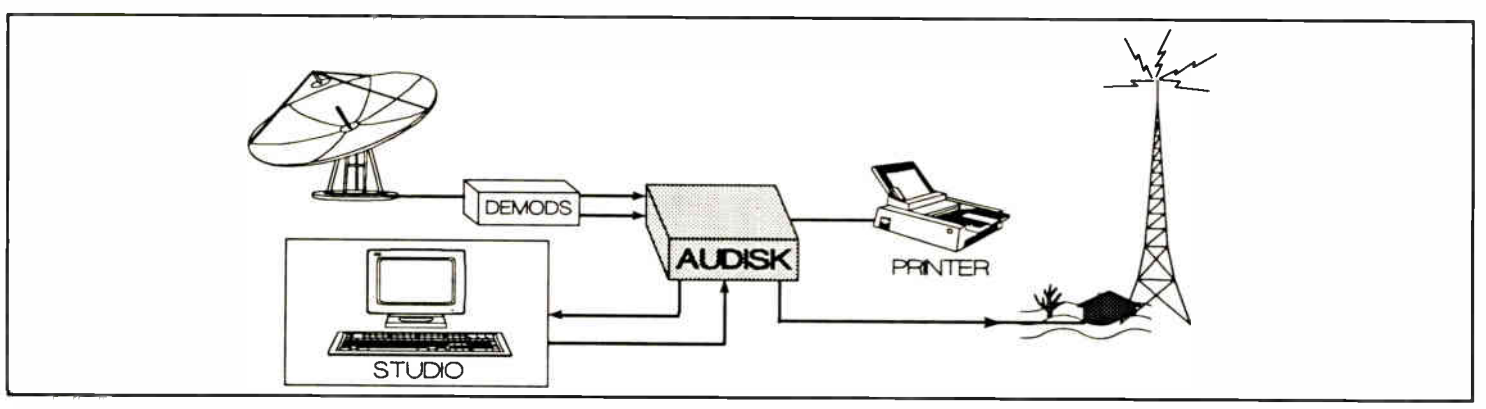

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Strother Wants DAB Test Lab

by Judith Gross

WASHINGTON A complete DAB and digital equipment test center, to the tune of two million dollars, could be operational here within a year, according to Ron Strother, president of Strother Communications.

Strother, whose firm has already gotten experimental test authority to test DAB systems on UHF-TV and wireless cable channels, said he is in the process of forming "strategic alliances" with equipment manufacturers and engineering organizations to equip the center and outline test plans.

Strother has had conversations with the CDRB, the SBE and the AES with the aim of setting up an advisory group. He said he has looked at four possible sites and is hoping to hire a project coordinator soon.

Digital showcase

More than just an independent test facility for DAB, Strother said he hopes to create a digital technology showplace. "We want to test all forms of digital technology: transmission gear, STL, and studio equipment. We hope to have a complete digital link from source through receiver," Strother said.

He also noted that the center would include test vehicles to test DAB systems in a mobile test environment.

In addition to the granted test authority, Strother is waiting for word on experimental frequencies in L-band, is applying for satellite test authorization, and has made arrangements to test in-band systems at D.C. stations WPGC AM/FM.

He has already drawn enthusiastic response from some system proponents, and would like to see the FCC and/or the NAB participate in drawing up the test criteria.

"I really want to avoid getting mired in lengthy and endless debates on test procedures," Strother said, adding that "funding by a private entrepreneur avoids some of those problems."

Possible NAB support?

Up to now, the NAB has been hesitant about supporting independent DAB tests, partly because of its endorsement of the Eureka 147 system and partly because of concern about the costs and lengthy timetables that have bogged down the HDTV testing process.

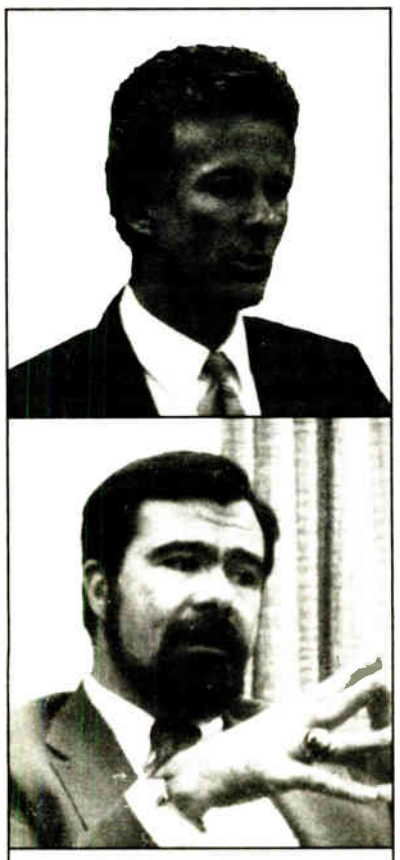
But NAB Senior VP of Science and Technology Michael Rau said that NAB is interested in being represented in tests of DAB systems but would like to narrow down some of the issues.

"It's difficult to decide how to test systems now, since they are all so different. NAB would be more interested in DAB tests once some policy issues are decided, such as spectrum. I would support industry agreement on user requirements," Rau said.

Some engineers have observed that setting up independent tests is rightfully NAB's role, instead of that of a private businessman. Rau said such a role would have to be proposed by the DAB Task Force and "right now, it's too early."

He also maintained that independent testing would not necessarily conflict with NAB's desire to form an industry consensus for the Eureka 147 DAB system. "If we participate in DAB tests, it would be as a system proponent—unless we organize the tests," Rau said.

Asked how a system proponent could fairly organize independent tests of all systems, Rau said, "It would be an open process . . . if the industry agrees on the test procedures and plans.



Former MM Bureau Chief Lex Felker (bottom) again finds himself working for Dennis Patrick (top).

New Firm Adds Felker

WASHINGTON Time Warner Incorporated has hired a former FCC chairman and former Mass Media chief to help head its new subsidiary, Time Warner Telecommunications.

Former FCC Chairman Dennis Patrick was named as Time Warner Telecommunications CEO, while former Mass Media Bureau Chief Lex Felker was named VP of science and technology.

Time Warner Telecommunications will identify and develop new technologies and focus on the use of radio technologies in various mobile communications applications, according to the company.

Patrick was FCC chairman from 1987 to 1989 and a commissioner from 1983-1987. Prior to his joining the new Time Warner venture, he headed the communications consulting firm Patrick Communications.

Felker, who writes a monthly column for RW, served as Mass Media chief from 1987-89. He later worked as a technology/engineering consultant for Wiley, Rein and Fielding in Washington from 1989 to May 20.

FCC Revises Settlements

WASHINGTON The FCC is looking to inhibit unscrupulous groups looking to make a buck off legitimate broadcast applications by setting new rules for settlement payments.

The Commission recently modified the settlement payment procedure for construction of new broadcast stations as a way to end abuse of the regulatory process.

The intent is to deter the filing of non-bona fide competing applications.

Previously, whenever a group proposed a new station or modifications to an existing one, a second application or petition to deny often would be filed by individuals or groups. These groups, the FCC has concluded, were looking to solicit a payoff to avoid a lengthy proceeding.

Earlier, the Commission had stipulated that negotiations for settlement would not be allowed once the hearing process had begun. The FCC's new rules permit the recovery of expenses at any stage during the comparative hearing process.

The FCC, however, stipulated that the new rules will not apply to bona fide mergers of competing applicants.

Dial-Up Remotes on Upswing

by Frank Beacham

NEW YORK Only a year after making an NAB presentation on how to use digital data telephone circuits for dial-up remote broadcasts, CBS Radio is on the fast track to adopting the new technology for on-air use in a variety of news and sports applications at its network and owned and operated stations.

Space shuttle launches, White House trips, sports events and news bureau links are only a few of the ways CBS Radio is currently using switched 56 kbps data lines for 7.5 kHz quality audio remotes. "It makes sense. It is very inexpensive compared to satellites and the quality is just as good," said Tony Masiello, technical operations director at CBS Radio, New York.

Conversion in progress

Two months ago WCBS-AM, New York, linked its news bureau in Albany via a permanent switched 56 line. The Long Island news bureau goes digital in June. CBS in San Francisco is now converting remote news bureaus to digital. CBS outlets in Detroit and St. Louis are doing digital news remotes. And the list goes on. "The correspondent on the other end dials in, gets connected and does the report. It's that simple," said Masiello.

CBS Radio installed its first permanent switched 56 line at the Kennedy Space Center. All shuttle launch coverage now uses the data transmission link. Sports coverage is also benefiting from the new technology. All New York Jets games from Giants Stadium are broadcast on switched 56. And CBS Radio coverage of the Masters Golf Tournament from Augusta, Ga., was carried on a digital circuit.

"Right now the only problem is getting the service from some local phone companies," said Masiello. "We've been working with Northern Transdata Networks (Hauppauge, N.Y.) to sit down with the various telephone carriers and ask what it is going to take to equip all the sports stadiums in the country. Not all stadiums have access to switched services. But it is getting better as every day goes by."

The international circuit

CBS also used AT&T's ACCUNET Switched Digital Service for international coverage of President Bush's trip to Paris earlier this year. "The French provided the ISDN circuit. We had to go through rate adaptor units. They were 64 kb while we are 56," Masiello said.

The international circuit was a success and CBS will always seek a digital circuit, if available, for future foreign news remotes, Masiello said. The CBS executive said lower cost, less engineering time and ease of operation have been key factors to the success of the digital phone remotes.

"If your circuit is established—like ours at the Kennedy Space Center—a technician here in the studio can dial it up and do a loop back of the audio without anyone being at the other end. He can send audio down the line and have it come back to him to test out the circuit," Masiello said.

"The modems look like a regular telephone with a modular jack. The producers, sports people and newscasters can go out, find the line, plug it in, dial in, and they are off," he said. A switched 56 link requires a codec and modem on each end. CBS Radio is currently using codecs manufactured by Corporate Computer Systems and modems by INC.

NRSC Refines RDS Draft

by John Gatski

WASHINGTON The National Radio Systems Committee (NRSC) RDS subgroup continues to refine its draft standard that will be used for U.S. broadcasting of the data service.

NRSC Coordinator and NAB Staff Engineer Stan Salek said work continues on adapting the European system for U.S. broadcasting. The changes include station identification codes, program type codes, and character type to be used in the eight character receiver displays.

An approved standard could be ready by the NAB Radio Show in August, Salek noted.

RDS is a 57 kHz data subcarrier that allows a multitude of uses including display of call letters, traffic alerts, automatic format selection, and automatic transmitter/translator switching. Other potential services for RDS include synthesized voice traffic and emergency warnings.

The RDS system also is one of the technologies that the FCC is evaluating as a replacement for the existing EBS system.

In Europe, RDS is based on the CENELEC standard and provides such services as traffic alerts and messages via RDS radio displays. In the system, 31 codes are available for transmitting the data. The U.S. version also would be based on CENELEC, but with some exceptions.

They include codes to ensure that a receiver can select the different frequencies of two stations broadcasting the same programming, codes for stations with three call letter IDs and nationally-linked stations carrying different call letters like NPR.

Salek said the NRSC subgroup also is working to make U.S. RDS compatible with technologies that offer some elements of RDS. They include on-board navigational systems, ID Logic, a format selection technology that is not broadcaster dependent; and the Cue Paging System, already used on about 250 U.S. broadcast stations.

Compatibility with the Cue Paging Systems has been a sore point with some subgroup members who feel it may inhibit use of RDS features.

Salek said, however, that Cue Paging's significant use in the U.S. and Canada is too important to ignore.

"We are looking to accommodate Cue Paging because 250 stations use it," he said.

Some subgroup members have questioned whether a hybrid Cue/Cenelec system will interfere with other RDS functions because of variations in data block lengths. Cue Paging intends to demonstrate that RDS can work properly with its paging system, possibly at an upcoming meeting.

The subgroup hopes to have a draft RDS standard for U.S. broadcasters drawn up by this September.

Sony Debuts Mini Disc in New York

by John Gatski

NEW YORK A new digital recording technology designed for portable consumer use may end up in the hands of professionals.

Sony's new Mini Disc (MD) playback-only and record/playback systems were introduced here in May. The unique magneto optical technology enables play and record with "quality digital sound," according to Sony.

Sony plans to market a playback-only unit and a playback/record unit by 1992.

Sony's palm-size prototype Mini Disc, with a prerecorded disc (left).

Although the initial target appears to be the "young lifestyle oriented music enthusiast," based on the showing of two portables, industry watchers are betting professional versions could be available in a couple of years.

For the consumer products, pricing is expected to compete with the Philips-designed Digital Compact Cassette (DCC).

The Sony Mini Disc comes in a small package. The 2.5-inch discs are protected in a plastic caddy, similar to a computer disk, and weigh 0.6 oz. The cost of the recordable disc will be comparable to a metal analog cassette, according to Sony.

No A/B comparison

The MD player-only unit is palm size. It was demonstrated for the audio press, and first listening impressions indicated good sound quality. The demo did not include A/B comparisons with CD or DAT, and the player/recorder, which is slightly larger than the player-only unit, was non-operational.

The Mini Disc system's prerecorded software is based on an optical disc, like a CD, but smaller. Sony engineers said the prerecorded software can be duplicated at CD pressing plants.

One audio writer remarked that the MD system (though only intended for consumers, according to Sony) could be considered as replacement for the cart machine because of its near-instantaneous access to any track on the disc.

NAB Staff Engineer Stan Salek agreed that the Mini Disc system could have broadcast applications, such as ENG.

Sony's MD Memory Overwrite (MO) system of recording and playback is unique in its ability to simultaneously erase old and record new information. It is the first disc-based technology that can do so.

Simultaneous erase/record

A new magnetic field modulation technique places the laser source on the opposite side of the disc. When recording, a magnetic field that corresponds to the input signal is produced over the 400 degree heated laser spot. The disc's rotation then displaces the area previously recorded, allowing the temperature to lower. The laser spot then takes on the polarity of the new magnetic field.

Because of the high power demand and tremendous heat generated by this overwrite technique, Sony developed a magnetic disc layer made of terbium ferrite cobalt and a magnetic head that reverses polarity with little power consumption.

The format uses a compression scheme similar to DCC that is five times as efficient as conventional 16-bit CD technology. The compression technology is known as Adaptive Transform Acoustic Coding (ATRAC). It is based on the psychoacoustics of the human auditory system.

According to Sony, "the psychoacoustic principles are based on two characteristics of human hearing: that the ear cannot detect sound below a certain level and that sound below that level can be removed without significantly affecting sound quality.

What this means is that the small disc can store 74 minutes of digital quality music, company officials said.

The MD specifications include a 5 Hz to 20,000 Hz frequency response, 105 dB signal-to-noise ratio at its 44.1 kHz sampling rate.

Shockless technology

Sony also touted the Mini Disc's new "shockproof" technology that incorporates a memory chip. The pickup reads information off the disc at a rate of 1.4 million bits per second, but the ATRC decoder requires only 300,000 bits per second for real-time processing, according to Sony's technical information.

By using a 1 megabit memory chip, the MD unit can store up to three seconds of real-time music. "Therefore if the player is jolted and the optical pickup shifted off the correct track, uninterrupted playback continues while the pickup returns to the correct position," a Sony engineer said.

At the demo, a disc was actually removed for a few seconds. The unit continued to play while the disc was reinserted, inaudibly picking up at the point when it was taken out.

Other features for the MD system include the Serial Copy Management Systems (SCMS), which limits digital copying. SCMS was first introduced on consumer DAT recorders in 1990.

Future of AM Radio Debated

by Mary C. Gruszka

NEW YORK Is there any hope that radio reception—especially AM reception—will ever be improved? At a recent meeting of SBE's New York Chapter, an industry panel addressed this question.

While there was general consensus on what the problems are, and even what some of the solutions might be, there was the feeling that changing the status quo would be an uphill struggle and may not even happen at all before digital radio becomes a reality.

Herb Squire, chief engineer, WQXR AM/FM, led off the evening by "calibrating" the attendees on the sound of AM receivers over the last 25 years or so. His goal was to determine if, indeed, the quality of AM receivers has changed over the years.

Squire shared some recordings that he had made of "air checks" played over actual AM receivers. These included a small college station from the mid '60s, a New York Top 40 station from the late '60s, and a stereo AM broadcast from WNBC in New York in 1987.

One of the more interesting examples that Squire demonstrated was a comparison of how two types of AM receivers reproduced the sound of a current AM station. One was a new portable receiver and the other was a radio that Squire purchased at a flea market. It turned out that there was a remarkable difference in sound quality and that the older tube receiver sounded much better.

AM receiver problems

What are some of the problems with receivers or the environment in which they need to operate? In automobiles, noise is the main problem, according to Walter Doelp, Ford Motor Company's audio systems manager.

"We are our own worst enemy by creating the noise conducted or created in the car," he said.

Low signal strength resulting from smaller antennas is also a problem, he added.

"You can't blame everything on the set manufacturers," said Ken Brown, of Capital Cities/ABC. He reiterated that noise and interference affect audio quality. "Adjacent channel interference is greater on wideband radio," he noted. "You can hear the (interfering) signals on the skirts of the IF filter. Also wideband has a slight noise increase."

Leonard Feldman, of Feldman Electronic Laboratories, said that AM interference problems are due to station overassignment. Based on measurements he has made on a variety of radio receivers in all price ranges, Feldman also concluded that most manufacturers concentrated on the FM design; AM seemed to be an afterthought.

Feldman showed a number of the frequency response curves that he had measured. The worst curves showed peaks and dips across the entire bandwidth, which was severely limited in most of the receivers. The best ones had a relatively flat response, some farther out in frequency than others, but all exhibited low end rolloff.

There was the feeling that changing the status quo would be an uphill struggle and may not even happen at all before digital radio becomes a reality.

Bass rolloff

Feldman wondered why. "Everyone loves bass, so why are the manufacturers rolling it off?" he asked.

If the problems are so well known, why isn't something being done? Almon Clegg, a receiver designer and a consultant to a number of receiver manufacturers, pointed out that radios are commodity items.

Because of this reasoning, there is little or no research and development, and virtually no receiver design engineers who could make possible improvements, Clegg noted.

"Component vendors have a big say," Clegg added. Radios are made of parts and pieces from a diverse number of sources and then assembled together. According to Clegg, there is no real systems engineering involved.

Manufacturers slow to respond

Set makers "are cautious to consider innovation," Clegg said. "It (the receiver market) is demand driven. Manufacturers won't make changes until there are sufficient consumers who say they want it." The attitude seems to be, "If it ain't broke, don't fix it."

Any changes that do get made are done incrementally, not all at once, he added.

Despite all of these problems, can anything be done? "We are working on the total vehicle to manage emissive and conductive noise," Doelp said. The first step to improve quality is to make the system quieter. Ford's goal is "to allow the customer to hear the information the way it was presented in the first place."

Ford is also looking into improving the antenna by such methods as adding more sections or by possibly installing multiple concealed antennas, according to Doelp. Other improvements will involve speaker baffling, better stereo imaging by changing the number and position of the loudspeakers, and the incorporation of digital signal processing.

Clegg said some of the technologies that hold the most promise for improving AM reception are NRSC wideband, noise gating, and radio data (RDC). "By coming up with a new class of radios everyone wins—the consumer, the broadcaster, and the set makers," he said.

Improvements needed

Clegg was clearly in favor of improving radio receiver quality, FM as well as AM. As far as NRSC wideband is concerned, he said, "I believe it can work and that the obstacles can be overcome."

He noted that there are still mixed opinions on NRSC wideband and noise gates. "A lot of education needs to take place," Clegg added.

Another way to improve AM receivers, Brown suggested, is to produce an automatic variable bandwidth NRSC receiver. In the presence of a strong signal, the receiver would go into wideband mode, but if the signal were weak, the bandwidth would narrow.

Feldman said a dynamically variable bandwidth receiver was a possible

(continued on page 14)

L-Band Tests Approved

(continued from page 1)

about the workability of these systems," he said.

Golden West President Bill Ward said it is time to get some hard data about DAB. "Without such information, any decisions by the FCC on DAB systems and DAB spectrum allocation would be premature."

Running a fair race

In an interview with Radio World after the FCC decision, Brian Heimerl, Westwood One's VP of production, said both companies are open-minded and have no favorites in the DAB race.

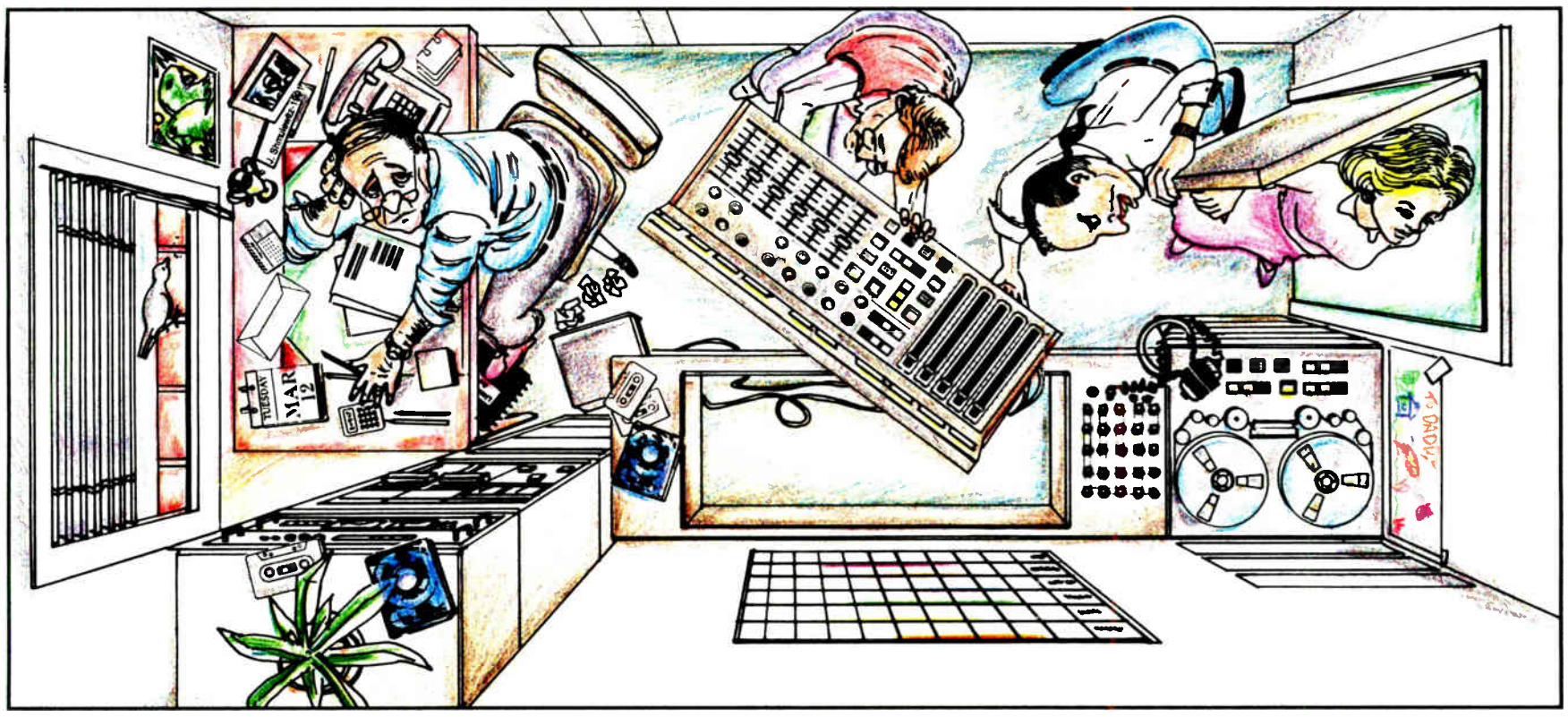
"We are out there trying to be as curious and as thorough as we can about looking into these options. And we are trying to expedite a decision as well," Heimerl said. "To have the Europeans and Canadians so far ahead of us at this point in their planning without any educated input from us at all is unfortunate."

Heimerl said the companies plan to ask each of the DAB system proponents to supply their stations with transmission equipment and receivers for testing. "We'll provide the ground facilities and the personnel to anybody who wants to come in and partner with us in a real metropolitan broadcast situation," he said.

At some point in the testing process, Heimerl said, the stations will conduct public listening sessions to get feedback from Los Angeles radio listeners. He said the stations' existing programming would be used as listening material. Similar criteria will be established to test each DAB system and the test data will be submitted to the FCC for consideration and evaluation, the companies said in a joint announcement.

Westwood One, Inc., the nation's largest producer and distributor of radio programming, and the nation's second largest network radio organization, is the parent company of the Mutual Broadcasting System, the NBC Radio Network, The Source, Talknet and Westwood One Radio Networks. In addition to their Los Angeles station, Westwood One owns two stations in New York City.

In addition to its two Los Angeles stations, Golden West Broadcasters operates two radio stations in Seattle, Wash.



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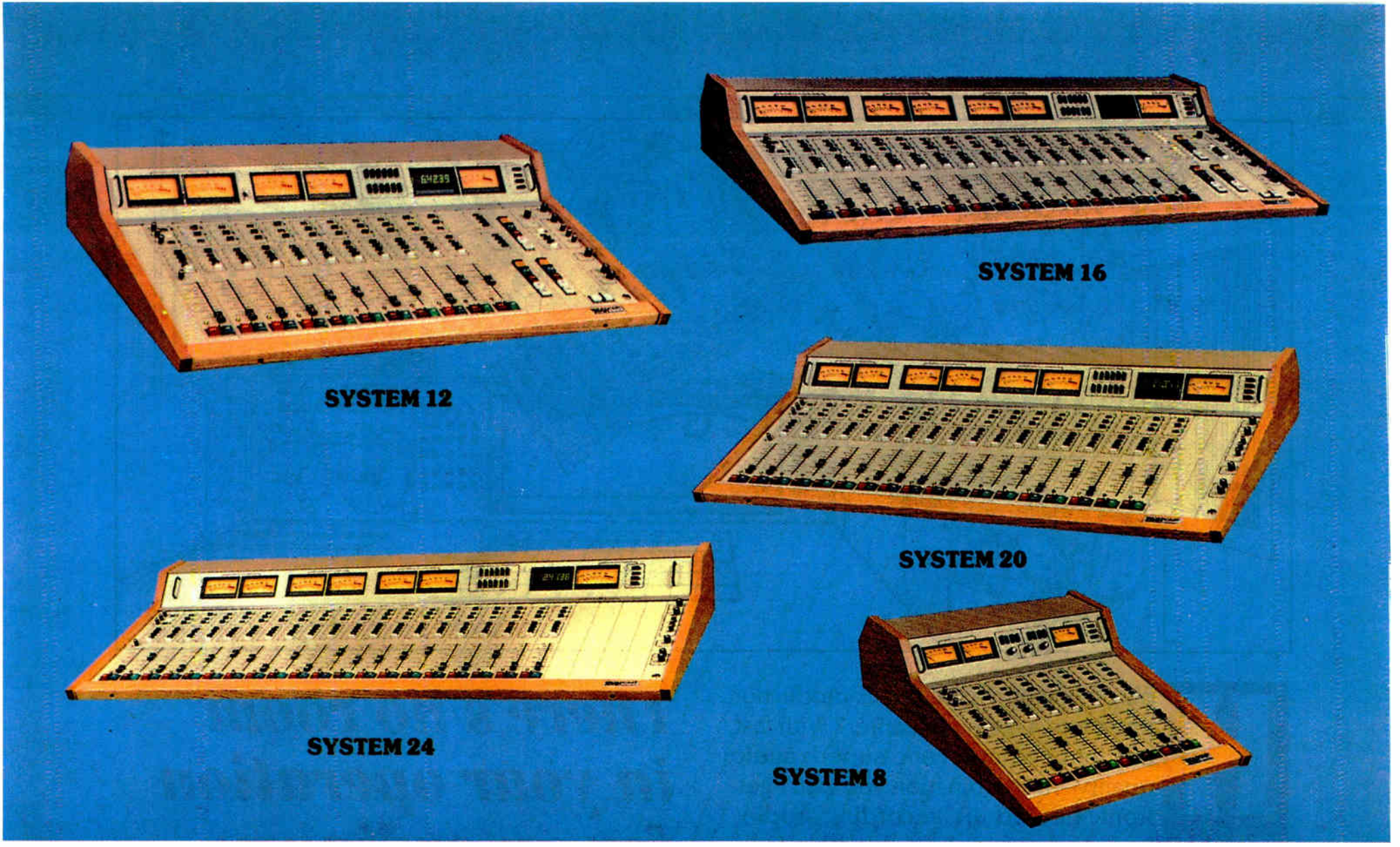

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Circle 34 On Reader Service Card

Text of AM Inquiry Expected by the Fall

by Charles Taylor

WASHINGTON The FCC staff is working full force to get the Commission's influential AM technical criteria docket in manuscript form by the fall, according to the FCC's Mass Media Bureau.

"We have a lot of people working right now. Our goal is to have a draft to send to the chairman and other commissioners so that it can be considered in the fall," FCC Assistant Mass Media Bureau Chief William Hassinger said.

At that point, the FCC would schedule the issue for Commission consideration at an open meeting. MM docket 87-267 aims to revitalize the technical guidelines for the existing and expanded AM bands. The notice was released April 12, 1990.

Predominant goal

The predominant goal of the rulemaking, Hassinger noted, and one that was stressed in the notice, is to reduce interference on the band over time.

"(That was) the heart of the item, what we thought of as the guiding principle for everything that we put into it," he said during a session on "AM Systems and Engineering" at the recent NAB show.

Because of the vast number of issues included in the AM proposal, Hassinger said the FCC received 200 comments/reply comments, filling 2,000 pages. Reply comments were filed in January.

Included in the text will be a sample plan for the proposed AM expanded band, as well as a call for broadcasters to file "binding expressions of interest" in migrating to the 10 new channels, from 1605 to 1705 kHz.

The band's best hope for rejuvenation, Hassinger noted, will include thinning out the band and giving remaining stations higher power.

"I think we need fewer stations. There should be some thinning out process. I do think some of the weaker stations should perhaps go by the wayside," he said.

"Then if you have fewer stations, see what can be done to give them more power so that they can put out a stronger signal that will enable them to deal with the very real interference problems we have today, particularly the interference that comes from man-made sources."

Crowded markets

Ideally, Hassinger said, in markets with crowded spectrum, several stations would volunteer to move up the dial. "We figured a lot of good candidates would be the ones that both give and receive interference. If you can get four or five channels out, you will notice some difference."

As a result, the band could be made up of stations with "a decent operating area, one that gives them a good economic service area, to pull in enough audience and advertising revenue so the station can be profitable and prosper."

Hassinger also noted that it is unlikely the freeze placed on applications for new AMs or major changes to existing stations will be lifted until the conclusion of the rulemaking.

Spectrum Auction Tied To Fiber Optic Funds

(continued from page 1)

sidy, but whether it's through a trust fund or tax incentives, we don't know."

The House Commerce Committee recently sent to the House floor HR-531, which would require 200 MHz of government-held spectrum to be turned over to the private sector. The bill, which does not include an auction provision, was slated for possible action by early July. The Senate Commerce Committee recently passed a similar bill.

Ritter's aide said the auction bill will probably go to hearings during August, once the fiber proposal is finalized.

"We'd like to have our proposal in better shape before we head into hearings," the aide said. "We definitely want hearings this year, but I don't think there is enough time this year to get it out of committee. We could be looking at early next year for floor action."

The proposal is not likely to please many television broadcasters who are already experiencing declining revenues due to expanded cable offerings. Fiber optic systems can potentially offer customers hundreds of channels.

"It certainly seems like an odd approach to promoting a more competitive communications marketplace," said Lynn McReynolds, spokesperson for the National Association of Broadcasters, which has come out against spectrum auctions. "We will continue to oppose all auctions no matter what the money is used for. And as long as the (congressional) leadership continues to oppose it, we are optimistic that we will beat it."

If approved, a spectrum allocation bill is likely to give the Commerce Department up to two years to decide what government spectrum is to be turned over, giving auction proponents plenty of time to get their measure through.

Of course, if a House or Senate amendment mandating auctions was successfully attached to the final bill, the auction portion of Ritter's bill would be dropped, although the fiber development aspect would continue, the aide said.

Although House and Senate versions of the allocation measure differ slightly, the two bills are expected to be reconciled with little or no trouble.

One major difference lies in the range in which Commerce can tap spectrum for reallocation. The Senate version puts a cap at 5 GHz, while the House would allow 20 MHz between 5 and 6 GHz.

Last year, a reallocation bill succeeded in the House, but died in the Senate.

Synetcom Enters DAB Race

by Alex Zavistovich

HERMOSA BEACH, Calif. A new entrant in the DAB competition, which introduced a mono compatible FM system at the NAB this year, now has an analog stereo compatible system in development.

California-based Synetcom Digital first showed its Digital FM•S™ system at a meeting of the Committee for Digital Radio Broadcasting (CDRB) during the NAB convention in April. The mono compatible system uses baseband-only encoding techniques. According to Synetcom, Digital FM•S "adhere(s) to existing FCC subcarrier rules."

On May 14, Synetcom's VP of Development Etienne Resweber announced a stereo compatible version of the company's DAB system. Using a technique called MSD-FM (Multiple Subcarrier Digital-FM), specially encoded digital subcarriers are placed in the FM baseband. Transmission of the Synetcom system requires a Digital FM•S stereo generator.

The digital signal is placed above the station's current stereo transmission. Resweber said this prevents the two signals from interfering with or degrading each other.

Prototype mobile receivers for the new digital system are being developed in cooperation with Radix Technologies, a developer of communications equipment for military systems. The receivers are to be used with an "adaptive" antenna system known as Ap•X ("Adaptive Excision," or "apex"). The Ap•X system does diversity tuning one better, combining signal voltage in each of multiple antennas by microchip control, according to the company.

Going mobile

Resweber explained that "Synetcom's view is that mobile applications (of the system) are the most important." He pointed out that "signal distortion—such as time-varying multipath and co- and adjacent channel interference—is most severe in a mobile environment."

"If we can show that it works in a mobile environment, making it work in a fixed environment is somewhat trivial," Resweber said.

There is one hurdle Synetcom must overcome regarding its stereo compatible Digital FM•S system. Although the mono system adheres to existing FCC subcarrier technical rules, Resweber acknowledged that the rules would have to be modified for the stereo system.

In particular, he said, "injection levels in the stereo baseband must be made higher and the highest frequency allowable in the baseband also must be made higher." The current highest frequency allowed is 99 kHz; Resweber would not disclose how much higher it would have to be to accommodate the Synetcom system.

Resweber said Synetcom also plans to formally announce an AM DAB system "in the next several months."

SCAs not threatened

Stations providing SCA service will not be threatened by Digital FM•S, according to Synetcom. A statement from the company stressed that SCA capability "will be based on an open protocol, where multiple SCA programs are transmitted using time division multiplexing in the digital baseband."

There is an advantage to using strictly baseband techniques for digital broadcasting, said Resweber. Installation is simple: "merely replacing a station's stereo generator with one of our own."

He added that the Synetcom/Radix partnership is the only DAB project in which adaptive antenna techniques are being used to address the problems of multipath.

For more information, contact Etienne Resweber at Synetcom Digital: 213-379-2000.

Fate of AM Discussed

(continued from page 10)

answer. He expressed concern, however, that the cost might keep this and similar improvements from being incorporated into receivers.

"You are dealing with penny differences in savings," he said. "To incorporate them puts (a receiver manufacturer) out of competition."

Feldman said that legislation, such as that which could force incorporation of an AM stereo section in every receiver with FM stereo, is a bad idea. He also doesn't agree with FCC Chairman Al Sikes about creating a level playing field for AM and FM.

"I don't think that we can talk about that," Feldman said. "FM was invented as a superior medium from the fidelity point of view. We shouldn't fight that."

What's the prognosis for any improvements happening soon? With 372 million receivers out there, and with a product life of five to seven years, 68 million sets are sold each year, according to Clegg.

"People just don't think that it is possible for high quality AM," Brown added. "People don't know what is possible, and manufacturers have no interest in producing a product that they don't know who to sell to. We need audio quality on AM to compete with FM."

Lexicon's All-in-One Effects Box

by Ty Ford

BALTIMORE As an increasing number of us cautiously venture forth onto the sometimes thin ice of the digital domain, it's somewhat comforting to know that companies like Lexicon have been testing the ice for some time, and have many products on the market to prove it.

Lexicon's latest contribution to the ever-increasing stockpile of digital toys, the 300 Digital Effects System, is a good example of how to effectively put many useful applications in one box.

The confines of this article don't allow for complete explanation of all of the effects parameters. Take my word for it, the effects are smooth and clean, the box is quiet and there is an abundance of control parameters.

The Lexicon 300 is targeted toward music production, digital mastering and post production.

More than enough

Lexicon has provided more than enough presets (75) for the faint of heart, and enough well-written documentation to serve as a guide if you choose to create your own masterpieces from the palette of possibilities. And isn't that what effects programs are really all about?

We're a bit down the road from dumping in the Fisher "Space Expander" to fatten things up a bit. Incidentally, parameters special to the 300—like the random reverb—reduce the "metallic" sounding programs you may have come to expect (and hate) in other less evolved reverb systems.

Sure, at first you'll probably stick with the presets. Just learning how to navigate the complex sub-directories will take some time. Keep the manual and "quick card" handy and you should be all right. If you hate the lack of dedicated controls and the profusion of "soft" controls as much as I do, consider the Lexicon MRC, which allows you to select and dedicate control of parameters via MIDI.

New technology, such as that evidenced in the Lexicon 300, has spawned a new order that demands we continue to push forward to create (or recreate) new ambiences. Among sound designers, there are two camps.

The first consists of those who wish to recreate, with ultimate fidelity, a variety of realistic ambiences. I liken them to classical musicians who endeavor to express "the true meaning" the composer of a classical work had in mind. The second camp contains (barely) those who would create ambiences that are impossible to create with simple architecture.

The idea is to construct ambiences that psycho-acoustically transport the listener through aural experiences that are sometimes even more complex and interesting than the performance itself. The processing power of the Lexicon 300 allows visionaries of both camps to make their point.

Connectivity plus

OK, you've got a couple of DAT machines, maybe a digital workstation, a digital reel-to-reel, an F1 or a CD player, all with various digital I/Os. Most of them will even let you transfer digital audio back and forth. Level, EQ and pan changes, the kind you'd like to do for that collection of songs you've mastered on DAT, aren't really possible unless you go back through the analog domain. Because the Lexicon 300's I/Os are analog, 32 kHz, 44.1 kHz and 48 kHz audio (AES/EBU, SPDIF and optical), you're covered.

PRODUCER'S FILE

The Lexicon 300 doesn't do sample rate conversion; however, it will automatically read and adjust for the sample rate of incoming digital audio.

You can change master levels, individual channel levels, stereo width and rotate a signal so that the ambient information is preserved and both channels retain equal loudness. The EQ section has both stereo treble and bass crossover adjustments, and separate 6 dB/octave shelves with +6/–18 dB control. There also are additional individual left and right treble controls.

The Lexicon 300 also handles analog or digital pre- and de-emphasis, including compensation for 11 μ delay between F1 stereo channels. The "Flip 'n Swap" feature normally set to L+R can be switched to correct single channel out of phase, channel reverse or right channel phase switch and channel reverse.

Another inviting feature of the Lexicon 300 is that all outputs—the analog, AES/EBU, SPDIF and optical—are hot all the time. So in effect, you're getting a distribution amplifier with one stereo analog and three stereo digital outputs. In addition, you also can combine a stereo analog input with one of the digital stereo inputs to create a mixed digital output.

Time compression

The time compression algorithm works well and includes a "look ahead" predelay and manual splice interval adjustment to reduce glitching. If you're using a center-track audio machine and varying the speed, the 300 will automatically adjust to proper pitch and will read out the new play time. During time compression operation, the 300 reads incoming time code and compensates for servo drift over time. It also will read time code from a machine running off-speed and automatically bring the audio up to correct pitch.

Connecting the Lexicon 300 to a variety of tape machines via the D9 Comm port control allows you to control the speed of the transport via TTL tach pulses from the 300's control knob.

(continued on page 19)

"Chicken Coop" Workmanship

by Howard L. Enstrom

MOUNT DORA, Fla. You know, lots of problems at studios and transmitters arise from "chicken coop" workmanship. Come with me on an imaginary trip to a worst-case translator. We'll meet with the group head.

Carl was a farmer who retired in town after his son took over. Fifteen years ago, he and neighbors wanted service from a distant FM station. Carl provided the farm site, plus a used tower. The FM station CE did part of the application and a local CBer installed.

LOWPOWER LOWDOWN

They've had problems—lightning damage and erratic operation that sounds like primary signal trouble. Listeners say they hear fluttering, other FM stations, even deputy sheriff talk from a two-way radio.

Kathy's Cafe

The scene shifts to Kathy's Cafe. The tinkle of a bell signals our entry and a bushy-browed man of about 70 offers a huge hand—Carl. After some coffee, the three of us leave on a short drive to the translator site. It's a sunny but windy April morning. We hear about the history and troubles with the translator.

Turning onto a machinery lane, up and down we go. I'm thinking we should really be in a truck—the field furrows run the wrong way. Anyhow, here's where our passenger labored so much of his life and ahead is the translator.

The tower looks like a Rohn 25G, about 90 feet, with only three guy sets. Nearby are a corrugated steel shack and an irrigation pump station. We get out and shade our eyes to look up the tower. I hear that familiar sound of wind at a transmitter site. Carl says the highest aerial is for receive. The sending one's below it, he says. They seem awfully close. Oh boy—old RG-8/U coax cables.

With clipboard and binoculars, I roam guy anchor points and view the system. The receive antenna's director element is loose—swings with the wind, probably because lightning burned part of the boom at the setscrews. One guy cable runs very close to the front of that antenna—not good.

I'm making many notations, even before I see the shack. Guy cables sure need retensioning. Transmit antenna looks OK.

Approaching the shack, I mutter, "No sign." Carl thought I said, "Oh, fine." Anyway, he loosens the door hasp and opens up. What the . . . ? Looks like old kitchen cabinets from the farmhouse. A counter is now a bench covered with pieces of pipe, motor parts, gaskets, wire and fuses.

Where's the J-317? Oh, up there inside the wall cabinet next to the PVC fittings department. Poor thing. No ventilation. I ask about this place in the summer: "Pretty hot in August," says Carl, pointing out the surge protectors in the RF lines. "Yeah, we got tired of sending the thing back to the factory. Lightning, ya know . . . three times." More notes. I gotta get stuff from the car.

Input voltage and Twinkies

Returning with the Potomac FIM-71 field strength meter, Bird 43 wattmeter, miscellaneous fittings, a box of Twinkies and the car radio punched up to 90.7, the translator sounds fine—for the moment.

"At best, primary signal is marginally useful. Seasonal foliage absorption accounts for long term changes, atmospherics for short. Damaged receive antenna compounds problem. When the primary signal fades, translator AGC increases sensitivity so co-channel and adjacent stations are processed.

"Sporadic rebroadcast of other signals is likely caused by a strong local signal that shock-excites rusted parts of the translator system, generating a train of spurious energy having frequencies on or near that of the translator input."

I offered Carl a list of 14 recommendations, along with a slice of Kathy's cherry pie. Restore the integrity of the tower/guy system, I began. Use non-metallic guys for the upper portion; repair or replace the receive antenna with one of higher gain; use lower loss Heliax lines, secured to tower; and seal connectors with 3M plastic tape coated with silicone compound.

Also: Use drip loop to line the entrance to the shack and seal the open-

I offered Carl a list of 14 recommendations, along with a slice of Kathy's cherry pie.

Let's see, the manual and maintenance notes? No. Switching through metering positions, it looks like the primary signal is varying, so let's see what we have for input voltage.

Translator off, connect the receive antenna to the FIM-71, calibrate. The signal goes cyclic excursions from 10 to about 50 microvolts with some flutter at times, due to aircraft. This is typical long haul signal behavior, but the lows are the problem, and they're not helped by the floppy antenna element.

Reconnect the antenna and put the wattmeter in the output line. Forward power, close to 10 W. Return power .5 W. So, the VSWR is 1.6:1. Not too bad. The J-317 reflectometer tracks with the bird, so no need to recalibrate it. Check and log metering position readings, set the muting control and leave a dated and signed record.

During lunch at the cafe, I write a report for Carl on pages of a yellow legal pad: "Causes of Erratic Signal Broadcast," I call it, with the following notes:

ing; install several ground rods at the tower base; add silver solder bonding straps to the tower and equipment; provide screened louvers for the shack to move air; consider using a thermostat-controlled fan; and put a quality surge protector in the AC line.

Finally, keep spare arc plugs on hand and RF line surge protectors; keep an equipment manual and maintenance log on site; post the FCC-required sign at the site; provide better security (locked door); have a qualified broadcast engineer or technician oversee things; and be sure to have a current copy of FCC rules on hand, station records readily available and be aware of license renewal time.

■ ■ ■

Howard L. Enstrom is a broadcast consultant. He has owned and managed an AM station and is president of FM Technology Associates, Inc., specializing in engineering design and sale of FM translator equipment. He can reached at 904-383-3682 or by FAX: 904-383-4077.

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Marketing: What's It All About?

by John Cummuta

DOWNERS GROVE, Ill. Over the past few issues, we've covered many of the operational considerations of running your own contract or free-lance broadcast engineering business.

We've looked at how to structure your business, how to price your services, how to manage the cash flow and how to balance the books. But now we're going to begin examining what I consider to be the most important aspect of any business—marketing.

First of all, let's agree on what marketing is and what it is not.

Many people confuse marketing with selling, or at least they seem to use the terms interchangeably. But that's like saying cheese is the same as omelette,

ENGINEERING MANAGER

because while selling is an ingredient or a part of marketing, it is hardly the whole.

Marketing is *everything* you do that has any impact on customers or potential customers, or that influences your product or service and its perceived value to those customers or potential customers. That's a pretty broad statement, but it's completely true.

Beginning and end

Everything in the marketplace begins and ends with the customer. And everything that affects how that customer perceives your value to them is marketing. It doesn't matter how much *you* like your new letterhead. Does your customer like it? Does it communicate the right impression to him or her?

It doesn't matter how fancy your test equipment is. Does your customer perceive any increased value in it? It doesn't matter that you save money by having your wife answer the phone. Does she make a positive impression on your prospects and customers?

Your marketing strategies and concepts should guide every facet of your business. Everything you do in your business should be directed at reinforcing your marketing goals, and those marketing goals should all be designed to help you communicate value to your marketplace, for the purpose of getting them to pay you for that value.

Marketing actually begins at the inception of the business and it never ends. And the most important thing good marketing will bring you and keep you is a customer.

When a person goes into business, he usually has a lot of his ego tied up in that process. That's good, because it takes confidence to continue in the face of adversity. But it also can be a problem, because it tends to focus the energy on attaining *his* goals and solving *his* problems.

In business, however, there is only one perspective that matters—the customer's. If your marketing mindset is not dedicated totally to the benefit of the customer, your efforts are hollow and cannot produce solid results. You must look to see what the customers need, what they want and what problems your services will solve or what goals you will help them reach in their lives. That is what you're selling. That is what every facet of your business must reflect.

Strategic Analysis

In future columns we will be looking at how to develop a marketing plan, but long before that process comes the Strategic Analysis. This is simply a no-nonsense look at where you are, where the customers are, who else is playing in your game and what it will take to get where you want to go with your business.

The first question you want to ask yourself is, "What business are you really in?" This might seem foolish or obvious at first, but its accuracy is at the heart of true marketing. It relates back to the question of perspective.

A few decades ago the railroads in this country almost went out of business. The reason was that they tended to look at the world—and their businesses—from their own perspectives. They saw themselves as the "Iron Horse" blazing trails across the vast continent with massive machines and men of steel. Romantic stuff, but meaningless to the marketplace.

You see, none of their potential customers were sitting around saying, "Gee ... sure wish we could find an adventurous way to haul our products across the fruited plain."

What they really were saying was stuff like, "We've got to get six skids of product to Cleveland by next week or we'll lose the Acme account."

What the marketplace wanted was *not* a railroad. All it wanted was a "Get my six skids of product from here to Cleveland" service business. Customers and potential customers are *not* thinking about you and your capabilities. They are thinking about themselves and their needs.

So, in relationship to your business, the bottom line would not be that you're in the radio station engineering business. You want to be in something like

(continued on next page)

Lexicon's All-in-One Effects Processor

(continued from page 15)

The Lexicon 300 reads 24, 25, 29.97 drop frame and 30 frames per second and lets you use the time code to make effects changes happen just where you want them. An event list with up to 50 entries can be entered with the keypad, done on the fly or selected with the 300's soft controls. Events added out of sequence will be automatically moved to the correct position.

The Lexicon 300's 16-channel MIDI capability is equally impressive, providing simultaneous real-time control of up to five parameters, automatic effect selection via program change data, real-time effects automation via system exclusive or non-registered parameters and setup transfers to MIDI enabled computers, another Lexicon 300 or other MIDI-compatible devices.

In each of the five patches, you can select from a huge menu of MIDI control sources including Ctrl 0, modwheel, breath, foot, porta, volume, sustain, soften, soft, pitchwheel, aftertouch, last note, first note, clock, soft knob and a whole lot more. The MIDI documentation is extremely thorough.

Both SMPTE and MIDI offer an amazing amount of programmable control. In addition, parameter changes within a particular program are glitch-free. If you're switching between programs (e.g., from a reverb program to an ambience program), you can choose between mute or dry signal to occur while the program is changing.

According to Lexicon's Will Eggleston, the 300 currently uses two chips for creating one stereo effect. Software release 2.0, which should be available soon, will let you run two monaural programs in series simultaneously and/or independently.

Run a reverb program

For example, you will be able to independently run a reverb program on one channel and a pitch shift program on the other, or run a reverb followed by a pitch shift. Because this independent operation requires more number crunching, the number of parameters within algorithms during the split mode will be fewer than those available during standard stereo operation.

Steve Rosch and Mike Hamilton at Roar Productions in Columbia, Md., have had a 300 for a few months. Experienced with both the LXP 1 and LXP 5, they report few problems getting up to speed. Engineers at other studios with less Lexicon experience took more time to become comfortable with navigating the "pages." In an effort to reduce the learning curve, Lexicon offers rebate incentives to dealers to train users who purchase the 300.

For information, contact Will Eggleston at Lexicon: 617-891-6790; or circle **Reader Service 63.**

■ ■ ■

Ty Ford's studio doubles as a beta test site for a continuing parade of audio production gear. Contact him at 301-889-6201; MCI Mail (347-6635); or America Online (Tford).

What's It All About?

(continued from previous page)

the "Making sure that management never has any problems with their equipment that costs them any time or money, while helping them maximize their business' profits" business.

That's the business you want to be in, because that's the business that station owners would be willing to pay for.

Positioning is everything

You see, from a marketing standpoint, positioning in the customer's mind is everything. Most engineers allow themselves to be positioned (in the minds of management and ownership) as a necessary cost. They are a negative that, unfortunately, must be lived with. But a smart marketer understands what his customers are really trying to accomplish, and works to position himself on the positive side of the scale.

You don't want to just be the guy who has to be called when the equipment breaks down or otherwise gets in the way of the radio business making a profit. You want to appear to be one of the team members who is continually helping the station stay profitable. Don't identify yourself with the obstacles, identify yourself with the achievement of goals.

So when answering the question, "What business are you really in?" you want to make that answer is a positive, constructive one from the customer's perspective.

Once you see where you can fit into the customer's game plan, you must honestly examine the competitive lay of the land. What other options do they have or can they get? Don't restrict your thinking here. Consider every possibility.

For example, your competition might not only be other contract service providers or on-staff engineers. It might also include installation of more modern, lower-maintenance equipment. It might even include a station owner thinking he can get away with doing little or no maintenance, except a few mandated measurements.

You have to deal with the realities of your marketing environment—from the customer's perspective. Your opinion of what he or she should be doing is completely irrelevant. Only their opinion matters. Remember, you can win the argument *or* the sale—never both. You can argue with a prospective customer about his real engineering needs and win the argument. But you'll lose the customer.

We will continue our discussion on marketing over the next few installments of this column. But, in the meantime, get into your customers' heads and start looking at the world—and particularly the service you provide—from their perspective. That's the beginning of real marketing.

■ ■ ■

John Cummuta is president of Advanced Marketing Concepts, a broadcast management and marketing consulting firm. He can be reached at 708-969-4400.

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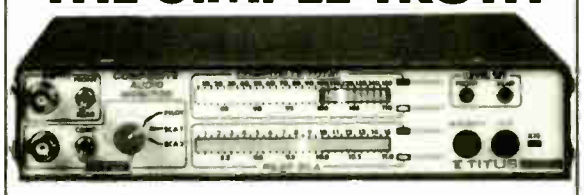

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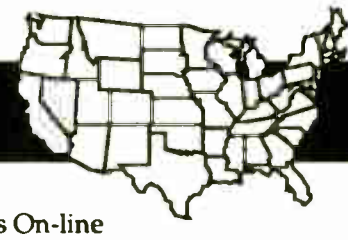

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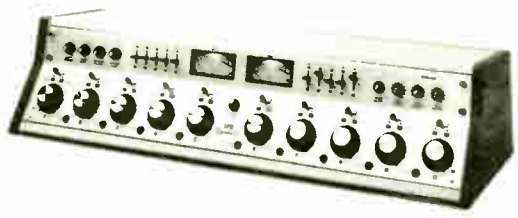

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How to Treat a Computer Virus

by Barry Mishkind

TUCSON, Ariz. A few months ago, we considered the threat from the various computer viruses going around. The response I received indicated this is a concern of many. This time we'll explore how concerned you should be and what to do about it.

Clearly, broadcast stations are data intensive. Not only are the general bookkeeping files found on station computers, but also letters, traffic logs, music programs, sales leads and other material. The loss of any of this would be inconvenient at the least.

The oft-repeated worst-case story is that of a company whose receivables list was destroyed by an angry employee. Despite advertised pleas to "please pay what you owe us," the company went bankrupt as debtors realized there was no record of their bills.

KEYBOARD CONNECTION

But, while employee actions can more or less be anticipated, a viral infection can slip in unnoticed until its time to wreak havoc. On the other hand, increased awareness of the problem has many users taking a more careful look at their systems. As expected, reports indicate an upswing in the incidence of computer viruses. Losses range from time delays to trashed hard drive directories.

Virus attack?

Protecting your station's data involves two areas: The recognition of the danger of viruses and implementation of a regular program of backing up your computer files. Let's explore what's involved.

Sometimes the problem is written off as coincidence, such as two computers suddenly having trouble sending data to a printer. One company suspected the printer first. Then, the "Stoned" or "Hawaii" virus was discovered on their disk, eating away at key files.

Other strains of computer virus recently reported include "Jerusalem-B," "Bloody!," "Joshi," "Whale" and "Ping-Ping." If you thumb through any computer magazine, anti-virus ads fairly jump out at you, warning "over 50 new viruses each month" endanger your computer.

Does this mean that you should immediately turn off your computer and not use it again until it's swept for viruses? No, not at all. While viruses are a fact of life and need to be acknowledged, "safe computing" is not hard to achieve.

Richard Levin, author of "The Computer Virus Handbook" (Osborne/McGraw-Hill, 1990) and an international computer consultant, told me that while anti-virus programs are useful, "there's still a lot of misrepresentation going on in the market, using fear and doubt to sell products."

According to Levin, "Viruses are a problem, but not a big problem. Computer users need not panic. A simple three-point plan will prevent most problems of data loss." Since most systems aren't infected, what users need is confirmation that everything is OK.

First, organizations should "use their head, and make sure they educate their people on safe computing practices." This means not bringing in software from home unless they *know* their diskette is not infected.

Secondly, use an anti-virus package. Levin recommends either the Norton Anti-Virus™ or the Central Point Anti-Virus™ as the best of the commercial programs available. These programs identify viruses by their "signature," or pattern of machine code. Regular updates of new virus signatures keep them current.

Additionally, an activity scanner should be used as a backup. Activity scanners, such as Levin's CHECKUP™, look for things that viruses do, such as write to executable files or boot sectors. They alert you to the entry of a virus, even new ones that haven't yet been identified.

While viruses are a fact of life, "safe computing" is not hard to achieve.

CHECKUP and VIRUSCAN™ from McAfee Associates, are shareware packages, and can be found on many BBSs, where sysops often use them to check the programs they offer.

Finally, users should back up their data regularly and save the backups. Since files usually are infected before you find out, your last week's backup may be infected itself. Thus, a month-old backup may not be totally up-to-date, but may be just what you need to get back up and running in case of trouble.

Backup programs

While DOS has its own buggy BACKUP program, most everyone that has used it quickly moves on to one of the better commercial programs. There are several that deserve your special attention. Of course, even the best backup program is useless unless it's used.

Those familiar names, Norton and Central Point, return again with excellent backup programs. Additionally, Fifth Generation's Fastback Plus™ is considered by many to be the "computing industry standard."

It's hard to go wrong with any of these three. They're all fast, and provide convenient features such as handling all diskettes, formatting while backing up and compressing data to reduce floppy diskette needs.

By the way, if you have PC Tools™ version 6, you already own a copy of Central Point Backup™. One feature you may like is the memory resident scheduler that runs backups in the background at preset times, allowing you to keep working while the backup is being done.

Fastback Plus has been around a long time, and while it has temporarily lost the speed crown to the Norton Backup™, a new version 3 is due out at any time. Either way, the speed difference is minimal, so if you have experience with Fastback Plus, you'll find no reason to change.

As mentioned, the Norton Backup is fast. It's also flexible, well thought out and an easy-to-use package. While not the oldest program on the block, version 1.2 will handle almost anything you'll need, even multiple partitions.

There are also a few Windows-based backup programs. I can't, however, recommend any of them because of occasional problems with data loss or corruption.

If you can't find it on your local BBS, CHECKUP can be obtained by calling Richard Levin's BBS at 215-333-8275; VIRUSCAN from McAfee's BBS at 408-988-4004.

■ ■ ■

Barry Mishkind is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797; FidoNet 1:300/11; or on MCI Mail at 325-9883.

Special Delivery Radio Station

by Dee McVicker

SACRAMENTO, Calif. In a waystation on a stretch of highway between Sacramento and Auburn, Calif., an unidentified person waited impatiently for what appeared to be a delivery. Soon, as it sometimes happened several times a day, someone would drive into the waystation and deliver a valuable package.

FACILITIES SHOWCASE

The goods? Not heisted jewelry, but radio advertising spots delivered on tape by the staff at KHYL-FM.

"We always had a problem with having a sales staff in Sacramento, and the rest of the staff in Auburn, 25 miles away," said Ron Kazda with Parker Communications, which owns KHYL-FM and KAHI-AM.

KHYL-FM, he explained, is licensed to Auburn along with its sister AM, but maintained an auxiliary sales office in Sacramento to better serve the larger market. This arrangement, he said, made working relations difficult between the two locations and often required a visit to the waystation—sometimes three times a day.

Deserted by staff

Fortunately, the waystation, a halfway point between Auburn and Sacramento, was deserted by KHYL personnel a few months ago. With KHYL-FM at last able to house all its personnel under one roof in Sacramento, the station's staff now delivers advertising spots within one building—and one city.

KHYL-FM's production room.

"It had been our idea to move the studio to Sacramento when we bought the station," said Kazda, "but we couldn't do it because there was a rule at the FCC that said you had to maintain your studios within the limits of the city of license." With that rule no longer in effect, Parker Communications immediately began plans for KHYL's new Sacramento broadcast center.

Kazda, then VP of operations for Parker and now GM for the group's AM and FM stations in Minneapolis, visited several properties before deciding on a quiet development in a small business park. The new facility would put KHYL-FM on Marconi Street, "a great street for a radio station," enthused Kazda.

In addition, the new facility had plenty of space for future expansion and could be custom-built for the radio station, thereby eliminating compromises in sound isolation and layout. "We had the luxury of doing things right with isolated floors and setting up the air conditioning so it was zoned properly," said Kazda.

The new facility, said Kazda, "was designed from the standpoint of putting people that work with other people close together." Within the studio complex, Kazda expanded on this concept with a wiring scheme that bridged studios together in the engineering room. "Each studio has its own umbilical cord to engineering so feeds can be easily changed."

Kazda also had a video system wired throughout with monitors located in studios and the lobby. The video system carries sports, AP news and cable weather—information used by the staff while on the air and is popular with guests waiting in the lobby.

Minnesota to California

For studio cabinetry that would furnish KHYL's new on-air, production and news studios, Kazda sketched designs and contracted Minneapolis' Englewood Woodworks to do the construction. Shipped from Minneapolis to California, KHYL's new mahogany cabinetry fit around equipment brought over from the facility in Auburn, as well as some new equipment purchases.

Having favorable results with Auditronics products in the past, Kazda decided to add a new Auditronics board to the station's existing two. For the news studio, Kazda moved over the Auditronics 200 Series 12-channel board. In the on-air studio, he brought in a new 18-channel Auditronics 200 Series console, a twin to the station's existing Auditronics in the production studio.

Given that the production studio also doubles as backup to on-air, console redundancy in these two studios had been a priority. And unlike the station's previous studio in Auburn, both consoles were situated for stand-up control of KHYL's oldies format.

The group also had favorable results with the station's Otari reel-to-reel recorders, and brought these over from Auburn to the new facility in Sacramento. Otari MX5050 recorders are in the on-air studio, used primarily to record callers, and an Otari MX5050BQ four-channel recorder is used in the production studio for commercial and production load.

Since the station's 1960s, 1970s and 1980s era format comes from a variety of sources, including vinyl and compact disc, a Technics SL-P1300 compact disc player is used in the production studio along with two Technics SP-15 turntables.

With the entire format carted for on-air broadcast, where there are now some 3,000 music carts in the station's library, station management decided to

(continued on page 29)

Air Force Takes Aim at L-Band

by Steve Crowley

WASHINGTON As time runs out for the U.S. to develop a position for DAB at the World Administrative Radio Conference (WARC-92), the Air Force has taken aim at L-band (1500 MHz region) proposals.

The L-band—in particular the 1435 MHz to 1530 MHz range allocated for flight test telemetry—is favored by all of the satellite proponents of DAB; satellite power consumption, transmit antenna size and other factors all point to L-band as optimum. The NAB also is pushing for an L-band allocation for terrestrial DAB.

CONSULTANTS CORNER

In a paper presented to the National Telecommunications and Information Administration (NTIA), the Air Force Frequency Management Center states that it needs all of the L-band for flight testing telemetry purposes, and that spectrum needs are increasing at an eight percent annual rate. The paper also notes that flight telemetry operations are using S-band (the 2300 MHz region) for expansion.

Flight test data

The Air Force says the increased demand comes in part from increased bandwidth required to send flight test data, due to the requirement of encryption for weapons system telemetry. This means the replacement of analog FM multiplex data transmission systems with digital systems. Current bit rates for these systems are said to be two million to 10 million bits per second.

According to the study, the bandwidth now used for telemetry averages 3 MHz and is rapidly increasing to 5 MHz and beyond. The study also says data rates are increasing because of the increasing complexity of weapons systems and the need to send substantially more information.

The Air Force includes with its report a copy of an Oct. 15, 1990 letter to FCC Chairman Al Sikes stating that flight tests at Department of Defense test ranges often have experienced delays due to spectrum congestion.

As a specific example of spectrum need for flight telemetry, the report notes that the Navy has spent more than $100 million to develop an extended area tracking and telemetry system, and that similar capabilities are needed on the East Coast to serve the Atlantic fleet.

Gather telemetry signals

The system uses telemetry relay aircraft to gather telemetry signals from aircraft and missiles operating over the ocean. The telemetry signals are relayed to shore-based facilities for analysis. Relaying the data from two missiles using two relay aircraft requires 80 MHz of spectrum in the 1435 MHz to 1530 MHz band. The Air Force says reallocating any significant part of this band would create a major obstacle to realistic testing.

The paper gives another example of the need for wide bandwidth in flight testing: video transmissions from weapons sensors. In the past, transmission of video data was difficult because of security requirements. Now, the signals are being digitized, compressed and encrypted. Typical video signal transmission requires 1.5 million to 10 million bits per second.

The Air Force Frequency Management Center states that it needs all of the L-band for flight testing telemetry purposes.

In support of its comments, the Air Force also uses the Persian Gulf War, noting that flight telemetry was vital in developing the Patriot missile and the Tomahawk cruise missile. It also includes an economic argument, stating that weaponry is the United States' greatest export revenue-producing industry.

The Air Force study suggests that broadcasters look to their own spectrum, giving as an example proposed in-band FM DAB systems. The study also points to UHF-TV spectrum as a possibility, without commenting on the potential adverse impact that would have on implementation of high-definition television.

■ ■ ■

Steve Crowley is a registered professional engineer with the Washington firm of du Treil, Lundin & Rackley. He can be reached at 202-223-6700.

Ins and Outs of Station Leasing

by Harry F. Cole

WASHINGTON Let's talk about leasing stations. That was, after all, a topic of considerable interest at the NAB convention in Las Vegas, and it continues to generate a good deal of conversation.

COLE'S LAW

Perhaps most important, it's a story with a moral, and that moral is: Hire a good lawyer.

As you probably know, the Commission historically looked down its administrative nose at the idea of "leasing" a station. The closest the FCC came to letting that happen was in the context of time brokerage deals, where a non-licensee would pay the licensee for large blocks of time, and then provide the programming (and sell the advertising) during those blocks of time. And even time brokerage deals were subject to limitations and agency scrutiny.

The FCC historically looked down its administrative nose at the idea of "leasing" a station.

But that was then, in prehistoric (or, at least, prederegulation) days. Along came the 1980s, and with them a whole new lease on life, so to speak. Broadcasters were accorded vast new freedoms from regulation and they took advantage of it. By the end of the decade, it appeared that the majority of regulatory constraints had more or less vanished, and licensees could do as they wished in many areas that previously had been forbidden.

One such area was station leasing. Marginal stations realized that they might simply sell *all* of their programming time to another station (whether in a nearby town, a somewhat distant town or even the same town) and thus reduce operating expenses to nearly nothing. For the station acquiring the programming time, this presented an opportunity to expand its service area and increase listenership for a relatively low investment. After all, the programming and sales force were, in all likelihood, already available and on the payroll.

As with most things in life, there is a right way and a wrong way to handle leasing. In this case, the right way was to get your communications counsel to make sure that the leasing arrangement contained a variety of magic provisions that had a calming, soothing, reassuring effect on FCC regulators.

For example, consider deals where the acquiring station was to get a 10-year lease of the acquired station's facilities for 24 hours a day, seven days a week (except for a maximum of two hours a week for routine maintenance). Even in those cases, the acquired station's licensee was said to remain solely responsible for public affairs programming and it could accept or reject any programming or advertising it chose.

Forget the fact that, in all probability, the acquired station would likely not exercise those contractual rights to any significant degree. The mere fact that those rights were there was enough.

Some of the smart licensees did another smart thing. They took their deals to the FCC directly (possibly invoking the time-honored strategy that the best defense is a good offense). They spelled their deals out and asked the FCC if they were all right. And sure enough, in a series of rulings last year and early this year, the Commission signed off on them.

Fred and Ginger

In so doing, the Commission played Ginger Rogers to the licensees' Fred Astaire: Each time the licensees pointed to a provision guaranteeing that the acquired station would retain some potential control over its programming, the FCC duly noted that provision approvingly, reminding the parties of the importance of licensee control.

But the FCC did not speculate as to the reasonable likelihood that any acquired station would actually invoke those provisions,

(continued on page 30)

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WORKBENCH

"Big Guys" and Little Gizmos

by John Bisset

FAIRFAX, Va. Ever wonder what the "big guys" (manufacturers) do for test equipment? Surprisingly, many fixtures and test jigs are homemade.

That's the case for the RF attenuator offered by Tom Wright of Delta Electronics. If you've ever looked at the prices of RF attenuators and just shook your head, you might want to consider building the one described in Figure 1.

Tom's attenuator uses a series of Caddock resistors. These resistors are shaped like a coin and permit easy heat sinking. However, Tom says that any non-inductive resistors will do—just watch the power rating.

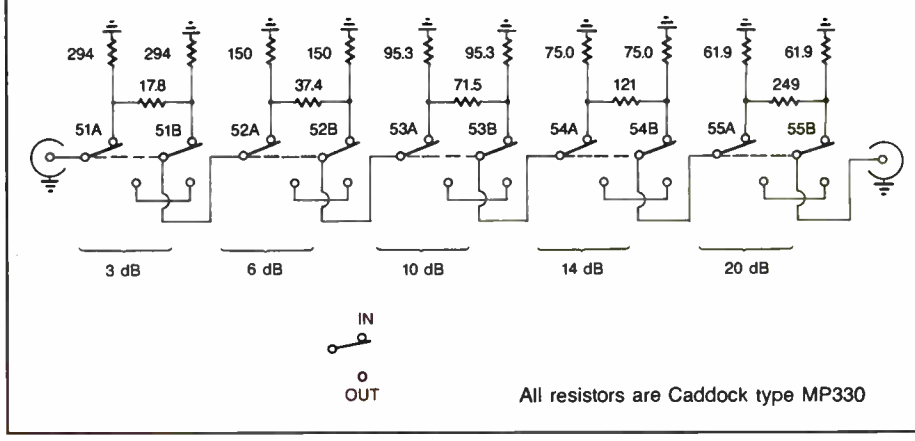
Figure 2 shows the resistor values in table form. The five DPDT switches are rocker type, and permit switching in a specific amount of attenuation. Tom Wright can be reached at Delta in Alexandria, Va., by dialing 1-800-8-DELTA-8.

★★★

While we're on the subject of RF gizmos, Figure 3 describes a slick little circuit that I obtained from Arno Meyer of Belar. We recently had a need to drive two 50 ohm terminated devices off of one 50 ohm cable. A typical application would be two modulation monitors, or a mod monitor and another piece of equipment that you could not bridge across the line.

Arno's circuit is essentially a 50 ohm splitter that ensures that each piece of equipment sees 50 ohms. Construction is not critical; just keep in mind the power levels you are using and size your resistors accordingly. We built our "RF splitter" in a pomona box with built-in bnc jacks. We added a third bnc off the side of the box and the circuit was complete. Arno Meyer can be reached at Belar Electronics Laboratory: 215-687-5550.

Figure 1. Delta's switchable RF attenuator



All resistors are Caddock type MP330

Jim Wenstrom, CE for Wynne Broadcasting in Klamath Falls, Ore., wrote in to tell about a strange problem with his Harris MW-1A. After about three years of service, Jim noted the distortion was increasing. Furthermore, on program peaks, the transmitter would shift frequency.

"It got to the point where the frequency drift was putting us out of compliance," he said. Using an oscilloscope, Jim detected an oscillation on the audio of about 30 kHz. Tracking backward through the audio circuits, the oscillation was at the audio driver board, but not present in the processing.

There is a filter capacitor at the input and it checked well, but using the old axiom, "If one is good, two are better," Jim added another cap across C-Z (0.002 MFD).

The oscillation was reduced. Another cap and the oscillation disappeared. Jim ended up placing two O.1 MFD 100 V capacitors across the 0.002 input filter cap. The distortion disappeared as did the frequency drift. Jim Wenstrom can be reached at 503-882-4656.

★★★

Our free offer this month is a neat booklet that's offered by Econco. You may have heard of Varian's "Care and Feeding of Power Grid Tubes." A good reference book, but some of its topics may pass over the heads of some broadcast engineers. Econco's booklet, "Tube Topics" is a very easy to read (and understand) treatise on power tubes.

In addition to being chock full of real-world examples, the booklet has some great pictures of mistreated tubes. Econco in Woodland, Calif., offers "Tube Topics" at no charge. To receive a copy, circle **Reader Service 84.** (A special thanks to J. Fred Reilly of Continental Electronics Field Service, who shared this booklet with a group of engineers at a recent transmitter seminar.)

■ ■ ■

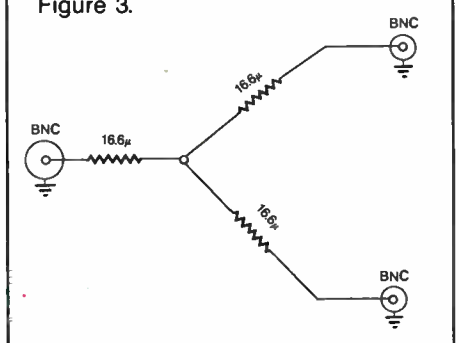
John Bisset, a principal with Multiphase Consulting, a contract engineering company, can be reached at 703-379-1665.

Figure 2.

dB	0	R-1/R-2	R-3	1% to 5% Conversion
3	0.34538	292.4 or 294 ohms	17.8 ohms	294=300 ohms
6	0.69078	150.5 or 150 ohms	37.4 ohms	17.8=18 ohms
10	1.15129	96.25 or 95.3 ohms	71.5 ohms	37.4=36 ohms
14	1.61181	74.93 or 75 ohms	121 ohms	95.3=100 ohms
20	2.2036	61.11 or 61.9 ohms	249 ohms	71.5=75 ohms
				121=120 ohms
				61.5=62 ohms
				249=240 ohms

Delta's RF Attenuator Resistor Values

Figure 3.



Forming a Star with three 16.6 ohm resistors insures that equipment connected to each port will see a 50 ohm termination.

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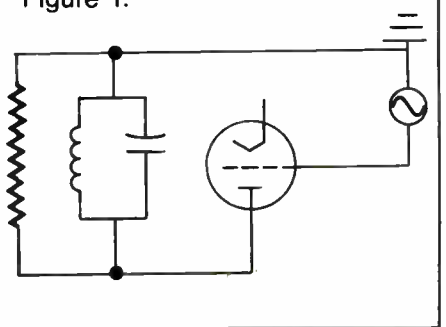
A Look at Harmonic Resonators

by Thomas L. Vernon

HARRISBURG, Pa. Although high-level plate modulation was the mainstay of AM transmitter design for many years, there always have been innovations and improvements to the circuits. More often than not, these were introduced at the 50 kW level and were intended to improve overall efficiency. Ampliphase, Doherty

Figure 1.

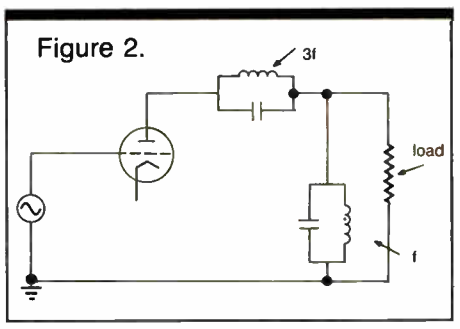


and screen grid modulation are well-known examples.

The harmonic resonator also was developed to improve efficiency; that circuit was patented in 1951. Since harmonic resonators are not as well known as some other efficiency schemes, this month's *Station Sketches* takes a look at these devices. To understand some of the advantages of harmonic resonator circuits, it's best to compare them with the well-known Class C RF amplifier circuit.

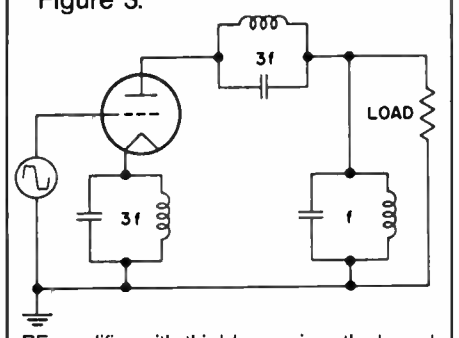
Figure 1 shows a Class C RF amp, while Figures 2 and 3 illustrate the development of resonator circuits.

Figure 2.



The plate curves for a Class C circuit are shown in Figure 4A. Note that peak efficiency occurs only during time T1, about four percent of the

Figure 3.



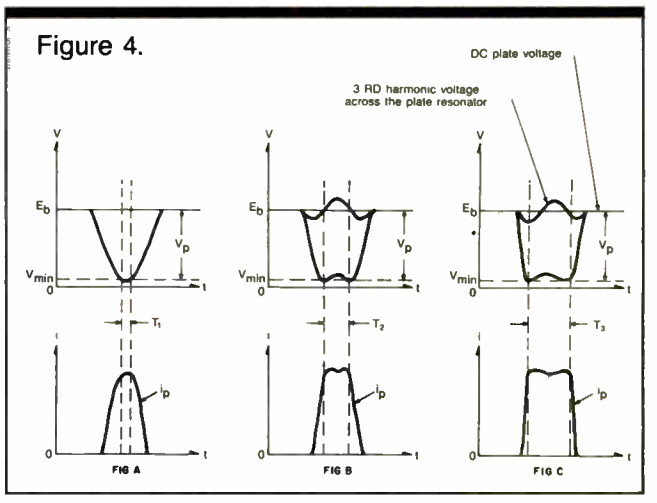
RF amplifier with third harmonic cathode and plate resonators. Efficiency averaged 88-92%.

power curve. Next, 4B illustrates the curves for an RF amp with a plate resonator. Note that the conduction time, T2, has improved to about eight percent.

Finally, Figure 4C shows the enhanced efficiency to be had with both cathode and plate resonators, as shown in Figure 3. Here, peak efficiency equals average efficiency, which is about 90 percent.

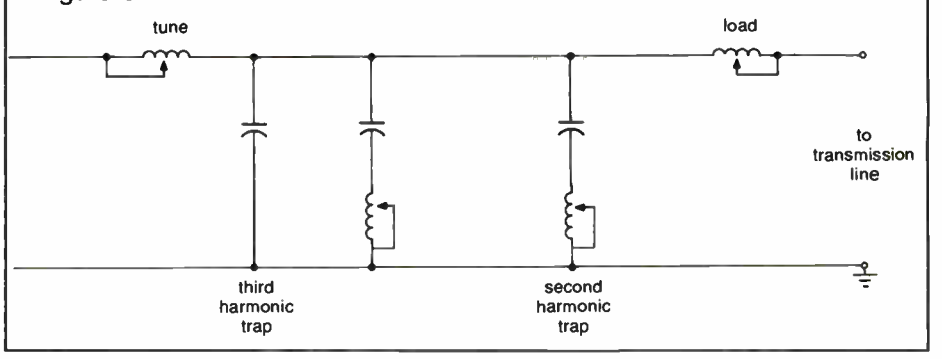
Harmonic resonators comprise only half the circuitry required in our transmitter. If we're going to put square waves through the PA, we'd better trap them in the output network. If not, the efficiency we've just gained will be wasted, and harmonics will far exceed the legal limit. The conventional Pi network used in most AM transmitters is not up to this task. Special second and third harmonic traps are required in this output network. Figure 5 shows what a typical circuit looks like.

Figure 4.



Thus, harmonic resonators present improved efficiency with lower peak plate current, lower plate dissipation

Figure 5.



and lower grid drive than a comparable Class C circuit.

Historically, only two American companies ever manufactured AM transmitters with harmonic resonator circuits. ITA built a limited number of 5 kW units in the early 1960s, and RCA produced a 5/10 kW transmitter a few years later at its plant in Italy. The

STATION SKETCHES

obvious question is: Why weren't harmonic resonator circuits more widely used in order to enhance efficiency?

When theory was put into practice, a few problems came to light. Transmitters with harmonic resonators often suffered from excessive harmonic radiation, RF distortion and were sensitive to antenna load variation. The high Q resonator circuits were difficult to tune, as were the second and third harmonic traps. Tubes had to be carefully selected because the very high plate current peaks could be hard on filaments. Many of these problems may have been related to the mechanical layout of the RF cubicles.

Small spaces used may have contributed to unwanted interaction between components and magnetic coupling might have caused harmonics to be reinserted after the traps. Engineers who worked with resonator circuits felt that, given time, these problems might have been worked out. But in the meantime, other high efficiency schemes came along and the harmonic resonator fell into disfavor because of these early experiences.

While not a major milestone in transmitter technology, harmonic resonator circuits are an interesting footnote.

Special thanks to Bill Johnson with Eagle Hill Electronics for sharing some thoughts on the history of these circuits.

■ ■ ■

Tom Vernon divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-367-5595.

FROM THE TRENCHES

by Alan Peterson

Dead Air Dreams: Dealing with Dread

Dear Alex,

June's almost over, huh? Let's see ... I've survived my 34th birthday, the Spring Arbs, no air conditioning in my apartment and a motor vehicle inspection. Two more weeks and I'll see if I survive a Continuing Ed course at WestConn University.

Things will go much smoother if I survive my latest episodes of the bane of all American broadcasters—the dreaded Dead Air Dreams. For the past few nights the same miserable nightmare has crept into my personal Post-Sunset Authorization time. Tell me if this sounds familiar:

I'm in a studio I have never seen before. The CHR record (yes, *record*) lasted all of one second and I now have dead air. I scramble to hit a source—*any* source—to fill 'til I can think things through. Playing a spot won't help because some ergonomic genius put the cart rack two rooms away. The station doesn't use jingles so I can't buy five seconds there.

Forget music; there's all of four discs in the studio with me, and all along the lines of Patty Page, the Hi-los, Domenico Modugno (at a CHR!). To hell with it. I slap one on cold to buy time, noticing for the first time the turntables are made of rubber so badly rippled that the tone arm is jumping all over the place.

The GM's hotline is ringing for me as I'm reaching for the mic—a carbon button mic—and discover there's no mic key on the console. There's still nada on the air and I need more records, which are naturally kept in a locked room on the next floor at the end of the hall. Getting there means a sprint in lead swim fins through eight inches of sand ...

Had enough? Let's see how well the show goes after one of these babies.

It's little consolation, but the Dead Air Dream Muse descends on nearly everybody connected with the biz. New York morning guy Jim Douglas at WNSR (always good for a story) has similar nightmares, except—lucky guy—he has carts in the studio he can fill with. All are clearly labeled and all are completely blank.

His dead air continues until the emergency fill reel machine at the Empire State building comes to life—then promptly dies like a flat soda. Then, he's off down the same hallway my records are kept, wearing the same lead flippers. Jim tells me when he wakes up, it's with a high SPL yell to test his ears and voice. Those dreams can be that unnerving.

Jocks don't have the monopoly on Dead Air Dreams. CEs go through it, too. How about retuning a directional array in your sleep, running from tower to tower like some plate-juggler on the Ed Sullivan Show trying to stabilize nutso readings? The towers are glowing a psychedelic orange, ATUs are spitting flaming magnesium like an Irwin Allen special effect and your tuning and alignment gear has just turned into a toaster oven when you looked away. Something goes *foom*, everything goes silent and begins to smell like an old bell transformer as the phasor door swings open, revealing 20 FCC inspectors all looking at *you*.

Not even warm milk helps after a dream like that one.

What's bizarre is how little it takes to make dreams like those a reality. Jim's machine needs regular maintenance, my turntables need leveling, but those towers are better left to a pro; someone who knows the difference between an ammeter, 'am and eggs and an 'ammond organ.

Older, less reliable automation frames are legendary causes of Dead Air Dreams for most PDs running them. Budget CD players can't tolerate dramatic phone slams or coffee mugs on the console—some can't even plow through a thumbprint on a disc. Then there are those older cart machines that floss with each tape loaded into them. Periodic heavy cleaning and a pinch roller alignment is what it takes.

Good thing we're at a point in radio where listeners are fairly tolerant of a moment of zilch modulation here and there. In many ways it can improve the pacing and mood of a specific presentation, depending on application. What it means is, while I'm running down the hall in my flippers for another Perry Como disc for my urban rock-formatted station, I won't worry too much. The folks who listen to us will still be there two seconds from now.

Sweet Dreams,

—Al

■ ■ ■

Al Peterson is 6½ feet tall with sandy blondish hair and an athlete's physique. He can fly, breathe underwater and stars in his own top-rated TV sitcom. But only until his clock radio wakes him up. Write him at WLAD, Danbury, Conn. 06810.

FM Special Delivery

(continued from page 22)

invest in new playback cart machines. The ITC Delta Series was chosen and put on line in the on-air studio. The on-air studio also is equipped with a Technics compact disc player for the occasionally aired CD, as well as a Technics SP-15 turntable for a weekend program that comes in on vinyl.

KHYL-FM and KAHI-AM CE Bill Emanuel, who started engineering for the stations soon after the new facility opened, entered the Sacramento studios with few construction or equipment worries. The Auburn studio, however, has demanded much of his attention since February.

With the Auburn studio now housing one station instead of two, Emanuel explained, "we've been re-building and rearranging the AM studios." KAHI-AM is being downsized according to its new space requirements and a new lease is expected to be signed the end of the year.

Until the close of this project, Emanuel will no doubt make the 25-mile trek between Auburn and Sacramento several times a week. And, he might even stop in at a familiar waystation along the way.

■ ■ ■

Dee McVicker is a free-lance writer and regular contributor to **RW**. *She can be reached at 602-899-8916.*

Ins and Outs of Station Leasing

(continued from page 24)

nor did the FCC require the stations to report on the implementation of their agreements from time to time.

The result, for those licensees who took this approach, is a written ruling from the FCC blessing their deal. Sure, somewhere down the line the Commission might raise questions about how the deal is working out. But, as a practical matter, the licensees cannot be accused of hiding anything from the Commission, and they certainly cannot be faulted for moving forward with their leasing deal once the FCC signed off on it.

The less smart licensees didn't do any of that. Take, for example, the AM licensee who apparently did not have communications counsel. That was Mistake Number One.

Apparently without counsel, he entered a lease with a company that took over operation of the station lock, stock and barrel. The company hired personnel, sold time, determined programming, etc.

The FCC inspected the station, found out about the arrangement and asked the licensee about it. At that point he made Mistake Number Two, which was to respond to the inquiry apparently without the assistance of communications counsel. In his response, he acknowledged that he had leased the station to the other company, that he was seldom in contact with station personnel and that he communicated with the other company's president "as any landlord does simply for payments of rent, etc."

Damage control

Bad move. The Commission reviewed his response and sent him another inquiry in which it raised questions of possible unauthorized transfer of control of the station's license. The licensee seems to have wised up some—in his second response he claimed that the other company had "only the right to limited use (of the station) under my complete control. I always have had access and control of the station."

But this was only damage control and it turned out to be too little too late. This May, the licensee got hit with a $10,000 fine for unauthorized transfer of control.

It is reasonably easy to draw distinctions between this latter case and the other cases in which the FCC has approved station leasing. But, when you get right down to the nitty gritty, how much real difference in the deals was there?

The basic elements in each case were a licensee who apparently did not want the burden of managing the day-to-day operations of its station, and another party that was willing to undertake that burden for a price. The primary differences—and the differences that probably made a difference to the FCC—were largely window dressing in the way each deal was presented to the FCC. Again, the moral of the story: Hire a good lawyer.

Words of warning

A cautionary note, though. First, even though the FCC seems to be favorably disposed to station leases at the moment, it appears that certain influential members of Congress are not. Congressman Dingell, for openers, has asked Chairman Sikes to explain the FCC's policy in this area.

And a final cautionary note. Even when the Commission signs off on station leasing arrangements in a case-by-case context, the Commission emphasizes that the licensee remains responsible for the ultimate performance of its station, no matter what. This "gotcha" may not have many teeth insofar as ultimate enforcement by the FCC is concerned; it is extremely rare that the Commission would review a station's programming performance at renewal time, absent some challenge.

But the possibility of some such challenge unquestionably exists. The comparative renewal mechanism is still alive and kicking. If a station that has been the subject of a lease arrangement is challenged by a competing applicant at renewal time, the station's licensee will almost certainly have to make an exhaustive demonstration of its programming efforts.

■ ■ ■

Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.

TECHNOLOGY BREAKTHROUGHS

NAB91 DIGITAL EFFECTS PROCESSORS

by Geary Morrill

Adapting to the New Age of Digital Effects

LAS VEGAS As broadcast audio processors enter the digital age, many "truths" that have held ground for decades will become tomorrow's nostalgia.

Just the quantity of possible selections and the awesome capabilities within each of these magical manipulators will mean that one will be arriving soon in a market near you, and perhaps even at your own facility.

While each of the processors described in this section of **RW** has its own unique features and design philosophy, there are some common threads that unite any DSP-based audio processor that will take some getting used to—but I'm sure you won't mind.

New breed's life expectancy

First, it will be some time before any of today's "new breed" of processors becomes obsolete. While the packaging remains reminiscent of the units they replace, a casual peek "under the hood" will show all the real action taking place in the software domain. What this means is that future enhancements and technological breakthroughs will be appearing as a PROM or a disk or some other method of file transfer.

If more processing power is needed, it will be as easy as slipping another DSP card into the mainframe along with the "smarts" upgrade, much the same as you now add enhancements to your PC. This also will mean that a change, such as the addition of say, FMX technology, will require only a new algorithm to be created and input to effect the change. It will be cost effective for the typical broadcaster to implement new enhancements as they become available.

The PC in your office also will have a new friend to talk to, as you'll be able to manipulate parameters and tweak for the ultimate sound from the comfort of your easy chair while listening to the home unit. The RS232 port on the back plate makes these boxes extremely user friendly. The manufacturers have gone to great lengths to achieve this, in many cases actually duplicating or enhancing the display available on the processor front panel.

On a perhaps less obvious, but for the manufacturers, no less important matter, we're seeing a return to the "one box" solution that was pioneered by the Orban 8000 in the 1970s. During the past decade, it's not been uncommon for a top-rated station in a competitive market to employ a whole string of processing to achieve the desired results.

The quantity of possible selections and the awesome capabilities within today's broadcast audio processors means that one will be arriving soon in a market near you, and perhaps even at your own facility.

Now that ultimate performance is a function of bit resolution and compression schemes (that's digital, not audio, folks), expect most of the manufacturers to be able to deliver whatever "X factor" you need without daisy chaining another stage of potential problems to the system.

More of a challenge

It will become more of a challenge for the technical warrior to add external enhancements, but at least one manufacturer, Cutting Edge, has bowed to the obvious potential by providing a "patch point" back for a brief excursion into the analog domain for the addition of reverb, stereo enhancement, etc., between the leveler output and limiter input.

As of show time, the Audio Animation Paragon and Gentner's Prism/Lazer were available off-the-shelf; since that time, most other units have become available on a limited basis. Because your ultimate decision will be one you'll want to live with for the next few years, you'll want to select carefully and will probably want to test drive at least a couple models before you buy.

One additional feature I found to be worth its weight in gold is the ability to do an instantaneous A-B comparison of various setups within the box. In most cases you're even able to save a preferred setup or two to memory. Because you can quantify every parameter adjustment in finite values, that old debate of "did it drift or have other fingers been visiting here?" will go the way of the dinosaur as well.

More effective than a key lock (how many BH754 keys do you think would exist in the world anyway) or a hex or torx wrench, the passcode protection should thwart the air staffer intent on making your station processing "signature" a moving target. And bits, by their very nature, have the pleasant tendency to maintain a constant value, which is more than can be said of the reactive component of an RC time constant, or even the R sometimes.

As I departed from McCarren International Airport, I couldn't help but think of all the changes in store for "business as usual" at the radio ranch. But then again, it's the constant change that attracted me to the business some 19 years ago, and still puts a smile on my face when I arrive at work in the morning.

■ ■ ■

Geary Morrill is director of engineering for Mid-West Family stations, a group owner of 14 properties in Michigan, Wisconsin and Illinois. Geary and his wife, Nancy, also are proud owners of a new FM allocation in Essexville, Mich.

In this and the next three issues, **RW** will focus on the various new technologies introduced at the NAB convention this year. This installment of *Technology Breakthroughs* deals with processing; look for the next installment—FM products—in RW's Transmission Special Issue, July 10.

TECHNOLOGY BREAKTHROUGHS

DIGITAL EFFECTS PROCESSORS

Optimod FM 8200

Orban has unleashed the digital Optimod FM 8200, which digitizes and processes audio by multiple high-speed Digital Signal Processor (DSP) math chips. The chips work under the control of proprietary software to emulate the effect of conventional analog processing.

With the 8200's Modular Variable Processing (MVP) structures, the user can configure the system as either a two-band system, similar to the 8100A Optimod, or as a powerful multiband system. The latter option adds five bands of downward expansion, compression and clipping.

The 8200 is field upgradable to the more aggressive five-band option.

It also can switch from one processing "set" of parameters to another, allowing a station to "daypart" its processing automatically. Performance from analog input to composite output is ±0.2 dB frequency response from 5 Hz to 15 kHz, THD and IM distortion of 0.1 percent and separation better than 60 dB (70 dB typical) from 20 kHz to 15 kHz. The 8200, which can be upgraded with software revisions without changing the hardware, ranges $7,400 to $9,820.

For information, contact Howard Mullinack at 415-351-3500; FAX: 415-351-0500; or circle **Reader Service 25.**

Unity 2000

Cutting Edge Technologies has unveiled its answer for one-box digital audio processing with introduction of the Unity 2000. The integrated system combines wideband AGC, low frequency EQ, digital preprocessor/leveling, limiting, clipping/filtering, a stereo generator and a digital composite clipper.

A menu-driven interface allows precise control of all parameters of the Unity, including crossover frequencies, attack and release times and threshold levels of the four-band processing, as well as control of the clippers and stereo generator with one screen and keypad.

The Unity 2000 uses a "Feed Forward" system (as opposed to feedback in other processors) to maintain processing ratios through a wide dynamic range, and a unique intelligent Time Constant Controller that "learns" the music being played, and adjusts attack/release times accordingly. The digital composite clipper operates prior to pilot insertion.

For information, contact Joe Foti at Cutting Edge Technologies at 216-241-3343; FAX: 216-241-621-2801; or circle **Reader Service 109.**

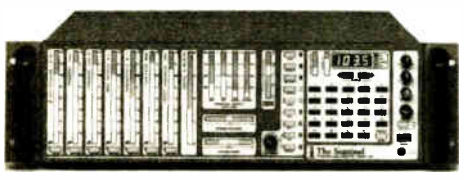
Paragon

Audio Animation's MUSE system of digital mastering is a standard in the recording industry; the company now has incorporated its audio expertise into the Paragon digital audio processor package.

In one box are four bands of compression and limiting and a 10-band graphic EQ with wideband input AGC. The Paragon utilizes a touch screen, one large knob and four push buttons to link it to the outside world.

The system retails for $10,450 with an additional $1,500 for the AES/EBU interface, and the generator projected at $1,500.

For information, call James Ruse at Audio Animation at 615-689-2500; FAX: 615-689-7815; or circle **Reader Service 131.**



Inovonics Sentinel

Inovonics Sentinel Model 550 program audio monitor can provide 24 intermixed AM/FM station presets to compare your signal with anyone else in the area.

Graphic displays of total mod, L,R, L+R, L−R, loudness (CBS spec), dynamic range, spectral profile, program symmetry, stereo balance and stereo image allow you to quantify that "sound" you're looking to meet or beat.

The system receives NRSC-AM, C-QUAM AM stereo, standard FM stereo and FMX stereo, as well as analog and digital SCA/RDS subcarriers. An integral power amplifier is capable of driving loudspeakers and headphones, or it will accept an external line input for direct source/off-air comparison.

For information, contact James Wood at Inovonics at 408-458-0552; FAX: 408-458-0554; or circle **Reader Service 41.**

Lexicon 300

Lexicon introduced the 300 Digital Effects System, which the company is targeting for music production, digital mastering and post production applications. The unit comes with a time code reader and event list.

The Lexicon 300 also is equipped to handle analog or digital pre-and de-emphasis, including compensation for 11 μ delay between F1 stereo channels. The "Flip 'n Swap" feature normally set to +L+R can be switched to correct single channel out of phase, channel reverse, or right channel phase switch and channel reverse.

For a review of the Lexicon 300, see Ty Ford's *Producer's File* in this issue of **RW**.

For company information, contact Larry Rich at 617-891-6790; FAX: 617-891-0340; or circle **Reader Service 54.**

QEI Model 710

QEI's Model 710 stereo generator boasts 18-bit D/A converters and a TDS (truly digital stereo) numeric digital signal processing system.

The Model 710 may be used as a digital sampling device and by way of daisy chain connection, the processing can be handled externally and handed back to the 710 Digital Stereo Generator for creation of the composite signal.

For information, contact Jeff Detweiler at QEI: 609-728-2020; FAX: 609-629-1751; or circle **Reader Service 139.**

Aphex Digicoder

Aphex Systems has debuted the Digicoder PPDM Model 400 stereo generator. According to the company, the Model 400 exceeds the performance of 18-bit resolution systems, unless the sampling rate is increased to 2.4 MHz.

Aphex said the unit will be available in September, with a $3,995 price tag.

For information, contact Marvin Caesar at Aphex: 818-767-2929; FAX: 818-767-2641; or circle **Reader Service 20.**

Gentner Lazer

Gentner Corp., which debuted its Digital Prizm at last year's NAB, has added the second half of its one-two digital punch—the Lazer, which appeared last fall in prototype form. Full LCD display shows status of all parameters and LED bargraphs display multiple function readouts. Twenty-three processing parameters are accessible from the Lazer front panel, giving the user a wide range of control.

Eight preset processing programs (user adjustable) are built into the Lazer, with A/B processing program comparison to allow instantaneous comparison in real time.

The Lazer and the Prizm are fully remotable through RS232 ports by any IBM compatible computer, allowing full control from any location via modem.

The Lazer specs out at better than 65 dB of separation across the audio range, and .05 percent THD with 10 dB of limiting in either the tri-band or final limiter sections, and frequency response ±1 dB within the FCC curve for 75 μS pre-emphasis.

For information, contact Dave Finley at Gentner: 801-975-7200; FAX: 801-977-0087; or circle **Reader Service 22.**

Audio Signature

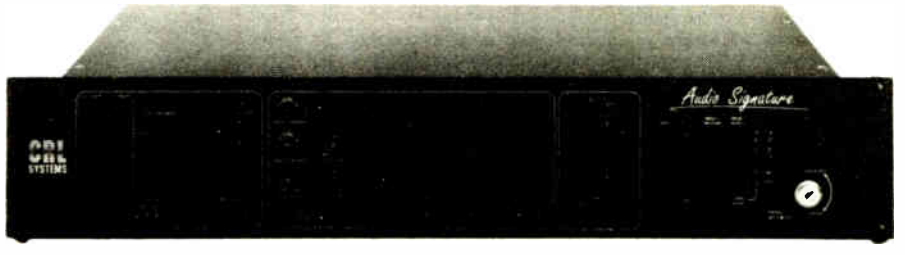
CRL Labs' digitally-controlled AGC/compressor/equalizer, called the Audio Signature, gives the user "real-time analysis" of audio density and equalization at the output of the unit. Eight position audio diagnostic metering and four memory recall settings allow user-defined parameters to be repeated.

The unit allows IBM or automation remote control of parameters. CRL also is adding a daypart event sequencer to affect parameter changes automatically.

Separate wideband and multiband control will take the user from little or no processing to an aggressive extreme with the flip of a switch by changing numerous parameters simultaneously. In addition, the Gain Lock control provides further tailoring of the gain reduction characteristics of the Audio Signature.

The system lists for $5,995 and the sequencer option at $600.

For information, contact Bill Ammons at CRL Systems at 602-438-0888; FAX: 602-438-8227; or circle **Reader Service 95.**



NAB Hosts Foreign Investment Seminars

WASHINGTON The NAB is taking strides in foreign broadcast investment opportunities by hosting small group seminars in London and Paris in September.

"Positioning for the 1990s: Investment Opportunities in Western Europe," will take place in London Sept. 22, 23 and 24, then move to Paris through the 27th.

"Europe is and will continue to be a major center for media growth," said NAB Senior VP Charles Sherman. "Our members are finding an increasing need to assess the investment prospects for them in Europe."

The group intends to meet with government officials, program directors, media and finance consultants. Topics to be covered include foreign ownership, regulatory overviews, banking and venture capital, market opportunities and advertising, banking issues and legal frameworks.

British, French and German media opportunities, production possibilities and prospects for joint ventures also are on the agenda.

For information, contact the NAB at 202-429-5350.

60 YEARS AGO

Editor's note: The RW of old, printed for a time in the 1920s and 1930s and today's RW are unrelated except in name.

UNION FIGHTS CENSORSHIP

The American Civil Liberties Union, 100 Fifth Avenue, New York City, announces the organization of The National Council on Freedom from Censorship. The scope includes radio, movies, periodicals, books and plays. The slogan is "Censorship Covers Up But Does Not Cure."

The announcement discusses radio censorship as follows:

"Censorship of radio hides behind station policies. Unlike the publishing or theatrical business, radio is a strictly limited field in which competition for public favor runs high. The general policy, therefore, is to avoid controversial subjects that might cause embarrassment to business interests or incumbent political powers.

"Three major considerations must be met by any program aimed at making radio free from censorship and firm in its rightful place as a constructive educational medium.

"First, it must prevent a continuation of selective consorship at the stations, now greatly in evidence. Secondly, it must prevent domination of the industry by two or three large groups. Thirdly, it must protect public interests in free speech against discrimination in issuing licenses."

The officers are Hatcher Hughes, chairman; Barrett H. Clark, Fannie Hurst and Elmer Rice, vice-chairmen; Harry Elmer Barnes, treasurer; Gordon W. Moss, secretary.

Others listed in the announcement are: Helen Arthur, Bruce Bliven, Louise Stevens Bryant, Witter Bynner, James Branch Cabell, Henry Seidel Canby, Edward Childs Carpenter, Marc Connelly, Mary Ware Dennett, Walter Pritchard Eaton, Morris L. Ernst, Rabbi Sidney E. Goldstein, Paul Green, Louis I. Harris, Arthur Garfield Hays, Theresa Helburn, B. W. Huebsch, Sidney Howard, Rupert Hughes, Inez Haynes Irwin, Dorothy Kenyon, Kenneth MacGowan, H. L. Mencken, Lewis Mumford, Henry Raymond Mussey, George Jean Nathan, Rabbi Louis I. Newman, Rev. Robert Norwood, Eugene O'Neill, Maxwell E. Perkins, G. Shearman Peterkin, Llewlyn Powys, Aaron J. Rosanoff, Robert E. Sherwood, Claire Sifton, Paul Sifton, Harry Weinberger, Stewart Edward White, Ira S. Wile and Harry Leon Wilson.

Television Called Crude but Promising

Atlantic City

"Technically and commercially, television today is just as much of an experiment, just as crude, yet just as promising as the feeble attempts at propagating entertainment by radio telephony prior to 1920," M. H. Aylesworth, president of the National Broadcasting Company, said in a speech prepared for delivery before the National Electric Light Association Convention.

The idea of television dates back to 1884, when a German scientist, Paul Nipkow, patented a method of translating light waves into electrical energy, transmitting this energy by wires and changing it back into light terms and reassembling the image, he recalled.

They Say

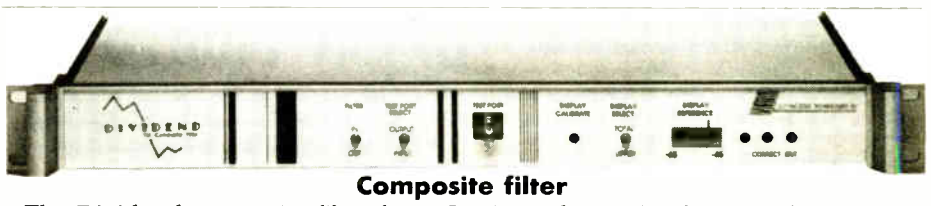
BEN H. DARROW, Director of the Ohio School of the Air, Ohio State University: "With millions of dollars being contributed each year to the endowments of the greatest galaxy of colleges and universities the world has ever known, it seems to me that some of these endowment funds ought to go into the educational broadcasting stations of the country. For example, why shouldn't Ohio State University have a radio station which will make the entire State her campus? Why shouldn't the faculty of the university gradually develop a larger and larger group of professors who can take their message, to which students must listen in order to get credits, and so suit it to the understanding that dad and mother back home may, for the first time, get an idea of just what is meant by the words, 'economics,' 'sociology,' and so forth?"

* * *

MORRIS METCALF, president Radio Manufacturers' Association: "It has been estimated that the radio industry spends approximately $30,000,000 annually advertising its products. Possibly $100,000,000 has been spent in five years. I venture to say that half this amount spent collectively in an instructive and educational manner, and without competitive selling arguments, would have doubled the sale of radio sets and scrapped two-thirds of the 5,000,000 obsolete sets now in existence."

MARKETPLACE

Radio World's Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide.



Composite filter

The Dividend composite filter from Cutting Edge Technologies reduces upper composite spectrum (53 to 99 kHz) noise from audio processing or STLs.

By reducing upper composite noise, modulation can often be raised up to 5 percent. Also, it reduces aggravated multipath distortion, increasing the effective range of a station.

For information, contact **Joe Foti at Cutting Edge: 216-241-3343; FAX: 216-621-2801; or circle Reader Service 46.**

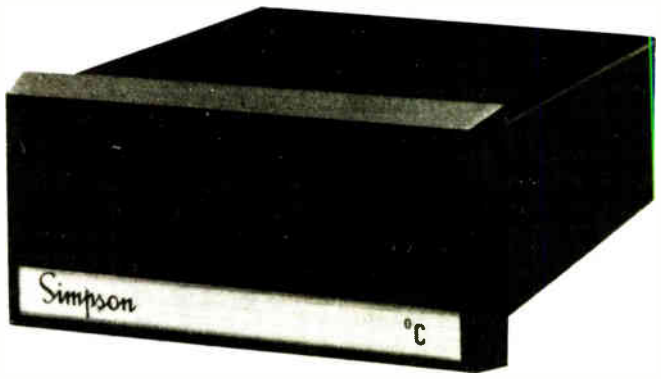
Sound effects library

The Valentino Production music sound effects libraries have been updated with seven new volumes.

New additions include country/western, broadway themes, horror/suspense, rock and roll, national anthems and two volumes of spot commercial length pieces, beds and bits.

For information, contact **Thomas Valentino at 212-869-5210; FAX: 212-869-6259; or circle Reader Service 38.**

Temperature reader



The models 2871/2872 temperature meters from Simpson Electric Co., are self-contained, panel mount meters designed especially for temperature measuring and monitoring applications.

The meters feature a large, orange LED display with 0.56-inch characters. The 2871 and 2872 also offer a choice of 120 VAC or 5 VDC input with four temperature ranges—0° to 200° F, 0° to 1200° F, 0° to 200° C, and 0° to 650° C—available for each.

For information, contact **John Deichl at Simpson: 708-697-2260; FAX: 708-697-2272; or circle Reader Service 110.**

RCA products and service

RCA Broadcast Services, part of General Electric Support Services Division, now offers products and services for broadcasters.

Product offerings include renewal parts, maintenance agreements, on-demand field service and refurbished equipment. Service offerings include 24-hour support, technical assistance, technical bulletins and exchange programs.

For information on any of these services, contact **Ron Ettinger at RCA: 609-866-3195; FAX: 609-866-3146; or circle Reader Service 19.**

Field meter

The model HI-3624 ELF magnetic field meter from Holaday Industries, Inc., is a convenient and accurate field instrument featuring a shielded remote sensor for easy environmental readings.

Frequency sensitivity is from 30 Hz to 2000 Hz. The meter also provides a switch-selected lower frequency limit of 5 Hz. All meters are powered by two 9 V alkaline batteries and include a comprehensive user manual.

For information, contact **Dave Baron at Holaday: 612-934-4920; FAX: 612-934-3604; or circle Reader Service 148.**

The new RS-700 from Radio Systems looks like every other DAT machine...

That is -- until you look closer! Because the RS-DAT 700 is made for broadcast use, with features that just begin with balanced ins and outs. • Automatic Cue-to-Cut • Automatic Fast Forward or Rewind to Next Cut • Automatic Cue-up on Tape Insertion • End-of-Cut Indication with Relay Closure • Drawer Open at End-of-Cut • Industry-Standard Remote Control Wiring • Balanced Audio on XLR Connectors • One Button Record for Network Applications.

Programmable logic functions automatically cue-up the tape on cassette insertion and after each cut has aired. Full remote wiring allows broadcast-standard pull-to-ground contacts and lamp drivers for console operator or network control.

And RS-DAT is still the only DAT featuring end-of-message tones, making it perfect for automation or live assist use.

The RS-700 -- the new affordable DAT machine from the makers of the famous RS-DAT 1000.

Call today to see how inexpensive professional DAT can be.

RADIO SYSTEMS INC.

Manufacturers of Professional Broadcast Equipment

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Circle 71 On Reader Service Card

STOP AT THIS SPOT..

...and take advantage of this sensational new program that will save your station hundreds to thousands of dollars!

RAMKO RESEARCH is introducing a new product line and marketing strategy that will enable you to enjoy new station equipment of uncompromised quality at amazingly low cost.

Examples: An 8 mixer stereo/mono on air console for only $2,204; or a 12 mixer console for only $84/month; or a dual 1 x 4 audio DA at an unheard of $171! And there are 91 different broadcast products (over 600 variations) in our line from preamps to audio DAs thru full switching systems: all available with super discounts and/or monthly mini financing.

What microprocessors did for computers, RAMKO's doing for broadcast.

Over three years ago we ●ed a trend that told us broadcasting was headed for some very rough times. With this premise, we set out to develop a product line that capitalized on all the latest technology to provide performance & quality exceeding any broadcast requirements *and,* deliver a dramatic cost advantage. The xL SERIES is the result of this intensive product development program with pricing, performance & quality that will put all other manufacturers on the ● and get ***you*** off of it.

EXAMPLE #1
MODEL: xL4S/8M: Dual 1 x 4 audio DA. XLR in & barrier strip out. Balanced in & out.

●Payment with order
LIST PRICE $.....$236
YOUR COST..... **$171.10**

● 3 year lease w/20% discount
LIST PRICE $.....$236
MONTHLY PAYMENT.... **$6.87**
(Minimum $1,500 package required)

EXAMPLE #2
MODEL: xL12/1S: Twelve mixer, 31 input, stereo/mono broadcast console.

● Payment with order
LIST PRICE $.....$4,043
YOUR COST..... **$2,931.18**

● 5 year lease w/20% discount
LIST PRICE $.....$4,043
MONTHLY PAYMENT.. **$84.09**

EXAMPLE #3
MODEL: DC38-10S: Ten mixer, 40 input, dual channel out, stereo/mono broadcast console w/ alpha numeric & custom backlighted readouts.

● Payment with order
LIST PRICE $.....$6,831
YOUR COST..... **$4,952.48**

● 5 year lease w/20% discount
LIST PRICE $.....$6,831
MONTHLY PAYMENT.. **$142.08**

EXAMPLE #4
MODEL: RS-1616FP (8 stereo in by 16 out):
Audio switching, mixing system expandable from 8 in 2 out to 250 by 250, stereo/mono. Remote, computer & front panel controlls.

● Payment with order
LIST PRICE $.....$3,850
YOUR COST..... **$2,791.25**

● 5 year lease w/20% discount
LIST PRICE $.....$3,850
MONTHLY PAYMENT.. **$80.08**

With 91 products you're bound to ● many other items to improve your stations performance & your bottom line

MIXERS ---- Portable, battery operated **CONSOLES** ---- Mini production/news room **CONSOLES** ----Studio 4,6,8,12 channels **AMPLIFIERS** ---- Audio interfacing/consumer matching **AMPLIFIERS** ---- Audio power **SWITCHERS** ---- Audio switching, routing, & mixing **PREAMPLFIERS** ---- Turntable **AMPLIFIERS** ---- Line level **AMPLFIERS** ---- Microphone **AMPLIFIERS** ---- Modular distribution/special function **AMPLIFIERS** ---- Audio distribution **MIXERS** --- Studio & sound systems

Put *us* on the ●. Call TOLL free today (800) 678-1357, for your free information package & product literature.

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Don't delay as this is the only ● where you will see this offer advertised and is for a limited time only.

This is part of a world wide marketing test and, although RAMKO reserves the right to extend this offer, the discounts and financing options outlined herein are for a ***limited time and are scheduled to end July 15, 1991.***

TOLL FREE (800) 678-1357
FOR ADDITIONAL INFORMATION & LEASE QUOTES.
OR FAX: (916) 635-0907

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Winner of the 1990 Arthur Anderson *fast track 25* award for the 25 fastest growing companies in Northern Calif.

RAMKO RESEARCH

Circle 16 On Reader Service Card

BUYERS GUIDE

Program Audio Processing

Unity 2000 Brings It Together

Processor Offers WSIA Complete Audio Chain

by John Correa
Director of Engineering,
Studio Design New York
Chief Engineer, WSIA-FM

NEW YORK WSIA is a mixed format of alternative jazz, new age and rock, owned by The College of Staten Island.

When asked by station management to recommend a more "complete" audio chain to replace our processing equipment, I went looking for several components that had a "full" sound rather than a system that delivered a lot of smashed loudness and distortion.

To me, the misuse of compression and stringing together the wrong components in an audio chain are the main reasons why many stations sound so horrible; it was my goal to avoid these pitfalls in purchasing a new processing chain.

Instead of adding several separate processing components, we found the Unity 2000 from Cutting Edge Technologies. The Unity is a digital processor that comes complete with a wideband AGC, a four-band compressor/leveler, a bass enhancing EQ, a four-band limiter, a clipper drive and a stereo generator.

A notable exception

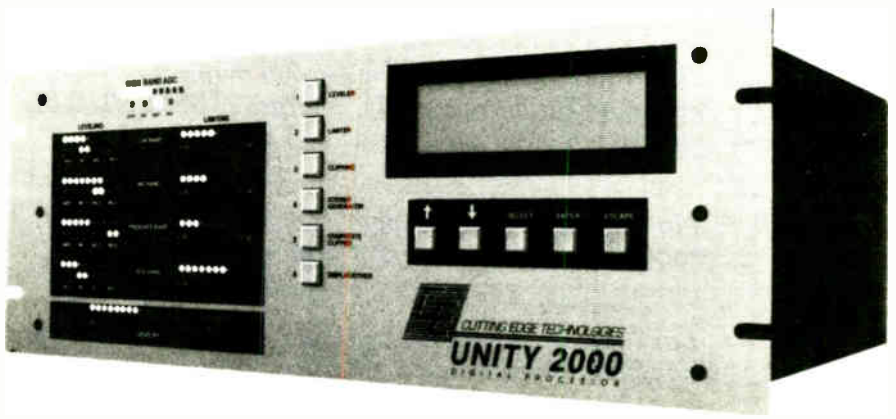
Although I'm normally not a fan of multiple processing setups, the Unity 2000 is a notable exception. Even with a total of six devices inside this one box, it doesn't squash the sound or the pilot, and the stereo generator works better than anything I've played with before.

We experienced no noticeable processing distortion or altering of sound, especially with music using synthesized bass. After some adjustments from the original presets, I get clean quality CD sound—and we're loud, too.

The Unity 2000 is extremely easy to use. With one keypad and screen controlling all components in the device, it's as easy to adjust the Unity as it is to use your bank's ATM machine. I was pleasantly surprised at how easy the initial setup was: simply set an internal jumper for your studio output level, set pilot level, set output levels to work with your exciter and go.

Settings are a breeze

Factory presets already installed make initial processing settings a breeze. I started with the jazz preset, then modified it to suit station management tastes. After completing modifications, I was able to save my custom setting in memory.



The Unity 2000 is the latest digital entry from Cutting Edge Technologies.

Having the entire audio chain in one box makes processing adjustments much easier and less time consuming. And since there is also no need to troubleshoot problems between different manufacturers' components, far less engineering time is needed for processing adjustment.

Having the audio chain in one box makes processing easier.

One of my favorite features is the keypad controlled system lockout. No more keys to worry about and no risk of other station personnel changing the settings I worked so hard to prepare.

Because our processing resides at the transmitter, we were glad to see the RS232 port on the back of the Unity 2000, so that remote changes can be made (the factory claims that the software for the RS232 will be available by winter of this year).

For less than $8,000 we were able to replace an entire processing chain with the latest technology available and sound great in the process.

■ ■ ■

For information on the Unity 2000, contact Joe Foti at Cutting Edge Technologies: 216-241-3343; FAX: 216-621-2801; or circle **Reader Service 49.**

USER REPORT

Correction

The telephone number for Environmental Technology Inc. was incorrectly listed in the May 22, 1991 Buyers Guide. The company can be reached at 219-233-1202; FAX: 219-233-2152.

BUYERS GUIDE INDEX

SYSTEL - 3000

DIGITAL MULTI-HYBRID TELEPHONE SYSTEM

- *Digital signal processed hybrid system.*
- *Microprocessor controlled via standard RS-232 or RS-422 interface.*
- *Up to eight telephone lines in full multiplex communication, due to the internal MIX-MINUS bus structure.*
- *No preliminary adjustment or line measurement is required; simply connect it and work!*
- *Easy to use: the control module can be either a small dedicated console or a standard PC or compatible.*
- *Line functions and controls are independent for each input module; the technician's job is made easier than ever, even in the software version.*
- *The switching section handles up to eight telephones, plus the control telephone and the studio telephone.*
- *Each input module includes:*
  - *Superb 60 dB sidetone rejection.*
  - *128 steps digital adaptive filter.*
  - *24 bits coefficients.*
  - *16 bits sigma-delta A/D converters.*
  - *Switched-capacitor antialiasing filter, with 80 dB rejection.*
  - *Line inputs safety protected against line transients and discharges, according to CCITT regulations.*
- *Some of the functions included on the digital processed section are:*
  - *Digital AGC included in the self-adaptive filter.*
  - *Doubletalk detection, without influence in the adaptive procedure.*
  - *Noise reduction procedure, using a white noise generator applied in the digital domain.*
  - *Noise free line switching, using stand by signal timing.*
  - *Supervisory function of line status, with detection of dialing tones and signalling (busy line, hanged, etc.).*

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Circle 77 On Reader Service Card

Prizm Is Home on The Audio Range

Gentner's Digital Prizm Helps KSOP Win the Range War with Unique Processing Technology

by Kim Hall
Creative Director/Air Personality
KSOP-FM/AM

SALT LAKE CITY In Salt Lake City, there's a range war on. And thanks to Salt Lake's Gentner Corp., and its totally digital Spectrum System products, KSOP is getting more audio range on the air.

For years, I thought it was a directional, down-home loudness war. FMs from all formats got into little border skirmishes as they tried to get more on-air volume without sacrificing dynamics or stereo image.

KSOP is winning the "range war" with Gentner's Prizm digital audio processor.

CEs marketwide have pushed the outside of the modulation envelope. Many of us have been sounding distorted and squashed for so long that fatiguing audio has become the rule, while kinder, gentler stations seem somehow off the mark.

War in full bloom

The loudness war is in full bloom in country radio. Both KSOP and its main competitor normally are rated among the top five in this 40+ station market. KSOP is a more relaxed, AC-style modern country station, while the competitors have a high intensity delivery and what sounds like maximum squash on their sound.

Unfortunately, despite the fact that they are loud and dense, listener perception has been that the competitors' audio was actually better than ours.

We were stuck in a classic audio dilemma. We needed loudness but didn't want to sacrifice quality. And it had always been an either/or situation.

USER REPORT

I'd used one system at a rocker two years earlier and liked its versatility and user friendliness, but never did get a natural sound; and volume still costs a lot of quality. Another system I used could be cranked, but all the disadvantages of high compression/distortion/clipping made that choice untenable.

Then KSOP met Gentner.

Our CE Bill Traue worked out a demo deal with Gentner for one—then two—Audio Prisms. The technology was an improvement over other systems we tried, but we were in for even more than we bargained.

In early 1991, Gentner gave us the go-ahead to test the newest state-of-the-art digital processing. Trust me, you ain't heard nothing if you ain't heard Prizm (yeah, a "z") and Lazer ("z," too).

Tons of flexibility

While the original Prism used pre-set parameters, the Digital Prizm has tons of flexibility. Like the old Audio Prism, it compresses and expands the dynamics of the source in a familiar four-band format. But the Digital Prizm processes totally digital audio and sets up that data for perfect digital processing and stereo generation in the Gentner Lazer.

The Lazer actually comprises two units, which communicate through fiber optics. The Optical encoder converts the analog program and sends it to the Prizm as digital data. The signal then is processed and fed to the tri-band limiter/stereo generator portion of Lazer. Lazer processes the data and reconverts it to composite stereo, ready to air.

By the way, the Lazer also has a digital output as standard equipment when digital FM exciters come into use.

The fact is, by processing digital information instead of analog, you can get the

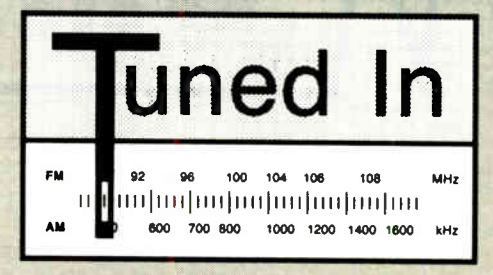
(continued on page 44)

Tuned In

Business ... **Northern Transdata Networks Inc.** received an order for Switched 56 circuits by the American Network Group, Inc.

Bonneville International Corp. will acquire KMEO-AM/FM in Phoenix from Group W Radio. Bonneville now owns five AMs, seven FMs and two TV stations.

Telex announced that it redesigned two of its most popular single-band Hy-Gain Yagi antennas. The newer models now offer improvements in front-to-back ratios and have minor changes in gain. Telex also announced that it has revised the gain specs of the Hy-Gain HF amateur monoband Yagi antennas.



People ... Broadcast Supply West announced the addition of **Walt Lowery** to its sales force. Lowery officially joined BSW at the 1991 NAB convention. He will serve as a sales representative servicing customers in the Southwest region. His experience includes nearly 20 years in broadcasting.

Barbara Dean was appointed VP/GM of KMEO-AM/FM in Phoenix after that station was purchased by Bonneville International Corp., from Group W. Dean comes to the stations from KBIG in Los Angeles, another Bonneville property, where she served as VP of sales since 1988.

Perry S. Ury retired as president of Chase Communications, Inc. after working for the company for 15 years. He will remain as a consultant with the company.

Robert Montgomery was named president and CEO of Catel Telecommunications Inc., which manufactures multichannel AM and FM processing systems for video, audio and data transmission over fiber optic or coaxial cable, and microwave or satellite links.

Montgomery formerly was president and CEO of Speech Systems. He also has worked with Warner Cable Communications and has spent more than 25 years managing technology-oriented businesses.

SMARTCASTER

DIGITAL AUDIO

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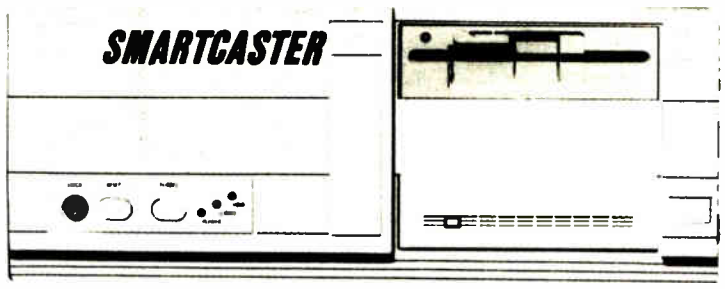

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HOW'S IT WORKING? HERE'S A FEW COMMENTS:

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Dear Staff,

I felt compelled to write you a note expressing my gratitude.....I still receive calls from people all over the country asking about Smartcaster. I'll continue to talk favorably.....Jeff Morgan, Program Director

THE CROMWELL GROUP, INC.

Dear John,

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WRVI

Dear John and Jan,

If you're a small market broadcaster, or even if you're not, the Smartcaster and SMARTS Broadcast Software are the way to go to keep your station running seven days a week.....Randall J. Miller, President and General Manager

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Circle 36 On Reader Service Card

The Optimod Debuts in Digital

Orban's Optimod-FM 8200 Incorporates Multi-Band and Two-Band Structures in Its Architecture

by Howard Mullinack
Director of Sales
Orban Division of AKG Acoustics

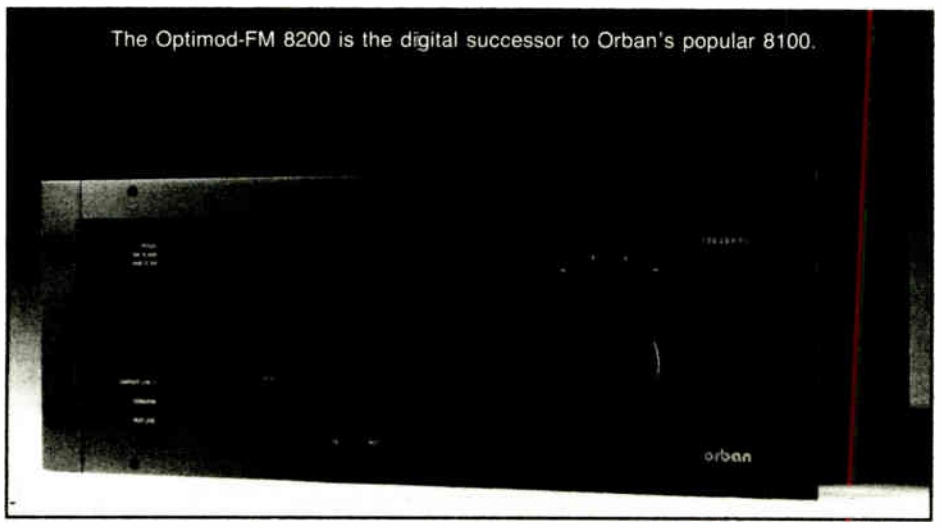
SAN LEANDRO, Calif. The new Optimod-FM 8200 Digital, introduced at the NAB show, improves upon our analog Optimod-FM, and adds changeable processing structures, programmability, expandability and computer interface. All audio processing in the 8200 is digital; all control is digital.

Think of a "processing structure" as a collection of circuits that make up a processor. In analog, to change them requires re-wiring a circuit or changing boxes. In the new 8200, to change them requires a push of a button. The fully equipped version ships from the factory with three processing structures:

Multi-Band structure. A new sound from Orban, designed by Bob Orban and Greg Ogonowski. Some of you may know Ogonowski as the designer of Gregg Labs processing and as one of the architects of the NRSC standard for AM.

protection, to prevent overmodulation, and totally inaudible in its operation.

More processing structures and enhancements already are under development. Since all processing and control software is supplied on a plug-in module, it's easy to upgrade.



The Optimod-FM 8200 is the digital successor to Orban's popular 8100.

Flexible user interface

We decided to take a major leap from traditional designs. The 8200 is a screen-based system. But we don't expect you to know computers to operate it. Five "soft keys" below the screen change function with different screens, and communicate to you in English, not computer talk.

The screens show the metering of gain reduction, input, output and composite levels. They're used to show you the position of the controls of the processing. And they are used for the wide range of control features not available in the analog world.

Audio processors have a lot of controls to allow you to get the sound you want. The 8200 is no exception. But many engineers tell us that after hours of twiddling, they return to one of the factory-recommended settings published in the manual. So we built these settings into the 8200.

Just choose your format from a list, and the processing will be instantly set to sound great on that format. Then use the "Less-More" control to get more or less processing, to suit your taste. If you want to further customize, a push of a button will get you to all of the knobs and controls you're used to, plus some.

You also can store your setting in one of 32 user presets with programmable user presets. Then make variations of that setting, perhaps more controlled for morning drive to overcome road noise, processed a little differently for the telephone talk show and less processed for the all-night show.

Recall these settings from the front panel, or through the remote interface using your transmitter remote control system. Or program the built-in "Automation" to switch the settings on a programmed schedule.

There's also passcode protection to control access, and interface to computers.

Input/output

The standard product includes analog left/right inputs and outputs, and two analog stereo baseband composite outputs. Digital input/output to the AES/EBU format is an option.

The stereo encoder is an all-new design for FM, an upgrade of our Hadamard-Transform Encoder, used in our stereo television generator. In most cases, performance specs are beyond the capability of measurement. Separation is typically better than 70 dB across the band. Distortion is less than 0.005 percent, noise is better than 100 dB below 100 percent.

But most importantly, the baseband spectrum is clean, with no spurious emissions or crosstalk above 57 kHz.

Delivery of the 8200 will begin in July.

■ ■ ■

For information on the Optimod-FM 8200 Digital, contact Jesse Maxenchs, sales manager, Western Hemisphere, at AKG/Orban/dbx: 415-351-3500; FAX: 415-351-0500; or circle **Reader Service 73.**

TECHNOLOGY UPDATE

Multi-Band, we feel, is the ultimate processing for the major market sound. It's loud and able to hold its own with the worst of N.Y. or L.A. radio. But it's clean. The Multi-Band has a speed control: "Fast" creates a synthetic sound, an illusion, with punchy bass and lots of presence. "Slow" is a very open sound, very life-like, but still competitive in any market. Or you can choose speeds in-between.

Two-Band structure. Similar to the 8100 processing, but with improved high-frequency response and transparency, optional noise reduction and an optional "purist" processing mode that's not as loud, but extremely clean.

Protection structure. Similar to our 4000A Transmission Limiter. It's just for

Titus Eases Monitoring Mania

by Larry Titus
President
Titus Technological Labs

GLASTONBURY, Conn. Perhaps the most aggravating thing that can happen to an engineer is to travel miles to his remote transmitter site in the middle of the night, only to find that he left one of his tools—the very one he needs—back at the studio.

Better yet, he arrives at the transmitter site only to realize that he wanted to bring the FM modulation monitor to set the clipping level on his composite clipper but it's back at the studio locked up in the engineering shop.

No problem, he thinks. The on-air jock back at the studio can read the modulation level off of the monitor.

But this is that same jock that has trouble starting his car in the morning and can't always find the studio or the "mic on" switch. Is this the jock who is supposed to assist the engineer in precisely setting the total modulation for the station and be able to determine at what point the composite clipper is sawing the audio to pieces?

This and other scenarios like it prompted Titus Technological Laboratories to develop the Composite Audio Monitor.

A unique blend

The Composite Audio Monitor provides a unique method of accurately metering and measuring an FM stereo station's composite signal at several points in the air chain. The signal can be measured prior to broadcast or after the signal has been received.

The monitor has balanced, bridging (and floating) inputs and can be placed in series with a stereo generator or a composite clipper prior to an FM exciter. It also can be placed on the output of a modulation monitor or the composite output of a stereo FM receiver.

The composite signal is measured on a peak reading 0 percent to 150 percent, 30 segment LED bar graph meter (at 5 percent per division), which can be changed to an 81 percent to 110 percent (1 percent per division) meter (in the "Magnify" position). This feature allows the user to "scope in" on the critical area surrounding 100 percent modulation. A times 10 function lets the user measure residual noise and injection levels present in the total composite signal.

The pilot injection level (or one of the two optional SCAs) is similarly measured after being digitally filtered on a 0 percent to 15 percent, 30 segment LED meter (1 percent per division) or, in the "Magnify" position, on an 8.1 percent to 11 percent meter (0.1 percent per division), duplicating the ability to "scope in" on specific injection levels.

A "peak hold" function is provided on the composite level display from 100 percent and above to provide for the measurement of high transient signals or to accurately assess the amount of composite clipping or signal limiting that is present in the composite stereo signal.

Quick response time

The Composite Audio Monitor offers a response time of less than three microseconds and a bandwidth of well over 500 kHz. The speed of the meter dramatically displays exactly what transients are present on the composite signal and how well any transient suppression, if present, is working.

The Composite Audio Monitor also provides a semi-demodulated, absolute value scope output of the composite stereo waveform for further precise signal analysis. The outputs of the digital filters for the pilot and SCAs can be monitored on a scope or a frequency counter. The monitor can be calibrated via the two "Level Set" controls on the front panel for any operating condition.

A typical radio station audio flow chart is shown in Figure 1. One place that the Composite Audio Monitor can be connected is at point "A" on the composite output of a modulation monitor. The monitor now adds a precision digital display to the modulation monitor, enhancing the old analog metering and peak flasher.

The analog meter on the modulation monitor will typically display 0 percent to 130 percent modulation levels. With the processing present on most radio stations today, the meter "hangs" at some point just below 100 percent.

TECHNOLOGY UPDATE

The monitor is like using a magnifying glass to magnify the area just surrounding the 100 percent mark, showing exactly what dynamic range is present and to what extent any audio limiting, compression and clipping is affecting the audio product.

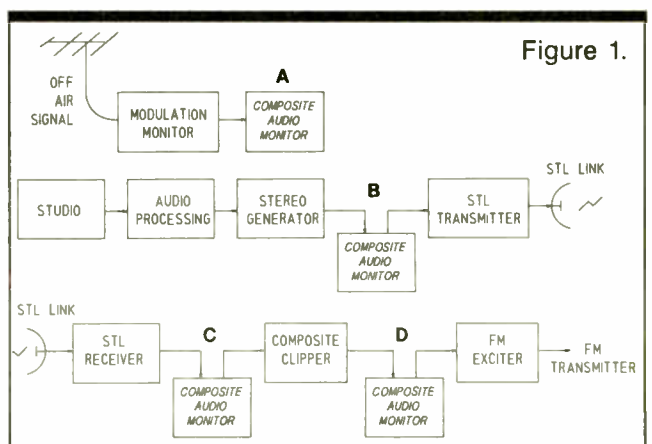
Measure the performance

Attaching the monitor to the output of a stereo generator ("looping" the signal through the rear panel BNC connectors), the Composite Audio Monitor can be set to measure the performance of the stereo generator. At this point in Figure 1, the monitor also is measuring the signal input to the STL transmitter.

If the monitor then is brought to the transmitter site and connected to point C in Figure 1, the exact level of the STL receiver can be measured and corrected to be the same as that present on the input to the STL transmitter. Redundant composite audio air chains can easily be matched using this method.

Attaching the Composite Audio Monitor to point D in Figure 1, just prior to the FM exciter, allows the user to set precisely the clipping level of the composite clipper and perform a final QC on the signal prior to broadcast.

Figure 1.



Composite Audio Monitor

The Composite Audio Monitor is designed to be either a portable or a fixed piece of test equipment. It measures 8½"×1¾"×8"—brief case size—and weighs less than four pounds. The half-rack unit can be rack mounted with another unit or by itself with the optional rack mounts.

A front panel input also is provided for a dual input system, letting the monitor reside in an air chain while still being used for testing other signals.

Now our engineer can conveniently bring the Composite Audio Monitor with him as he travels. He'll no longer have to worry about forgetting to bring his huge, heavy, old modulation monitor to the transmitter site, or be reminded of the pleasures of dealing with the overnight jock.

■ ■ ■

For information call Larry Titus, president, Titus Technological Laboratories: 203-633-5472; or circle **Reader Service 116.**

Somich DBE 1000: Clearly Louder

Box Gives KJLS Boost; Station Stands at No. 1

by Mike Rogers
General Manager, KJLS

The Somich DBE 1000 baseband enhancer helps KJLS get loud but stay clean.

HAYS, Kan. How do we get really loud? At KJLS, loudness is controlled by the Somich DBE 1000 Base Band Enhancer, which, simply stated, is a composite clipper.

Hold on now if you're grimacing at the idea of a clipper. Either you've listened to a hard-headed transmitter salesman's theory on loudness or you have listened to a clipper set by a program director trying to drive the composite audio to another planet. I think composite clipping can sound great if done correctly.

USER REPORT

The Somich DBE 1000 is unique. Jim Somich designed this unit with a separate pilot input, so there are two feeds from our modified stereo generator: pilot-free composite audio and raw, clean pilot. The audio enters the clipping circuitry and the stereo pilot enters a protection circuit.

Distortion canceling techniques

The clipper circuitry has a proprietary processing module employing distortion canceling techniques. Its main purpose is to truncate system overshoot, yielding improved bass response and loudness without the grunge normally associated with heavy clipping.

However, even the best clipping circuits generate harmonics as a by-product of the process. In the DBE 1000, the stereo correlated adaptive 19 kHz filter removes any of these residual components around 19 kHz before inserting a perfectly clean pilot signal.

The result—a perfect composite that differs from the original only in that it's louder. This enables the user to clip the audio portion harder than normal without assaulting the stereo pilot. At the output, the clean pilot is rejoined with the composite audio yielding audio that's larger than life.

We also installed the Somich Engineering OSC-1 overshoot clipper along the PL-1 57KZ Pilot Lok at our transmitter site. The OSC-1 strips the overshoot generated by our composite STL and the Pilot Lok protects our SCA paging service with the same circuitry that's used in the DBE 1000.

A great box

The DBE 1000 is a great box. It's clean and transparent. However, the DBE 1000 must be driven by a clean processing system. The cleaner the processor, the better the results. We use the Aphex Audiophile Air Chain (*see separate User Report in this issue*)—in our estimation, spec for spec the most transparent processor made today. The system is so transparent that we have the Aphex Audiophile Air Chain and DBE 1000 in their own room, highlighted with special track lighting.

This reminds us that we have a processor in between the console and STL. Our console allows us to A-B our CDs from the input channel of the console with the control room receiver output. The only difference between the two is the receiver output, which, to put it mildly, is louder than the original CD.

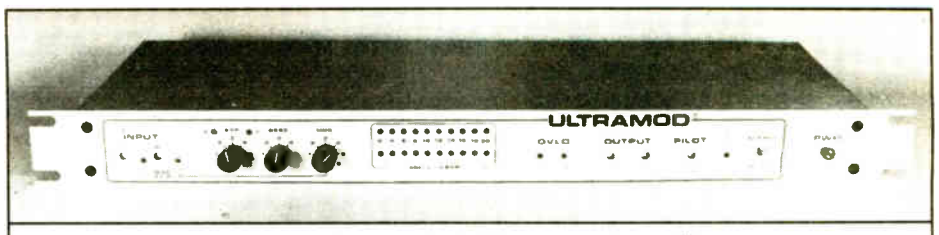
We sound fat and loud on a small boombox, many dB louder and cleaner than our competitors on car radios. The big test, however, was on my Carver Amazing Loudspeakers. The sound was rich, loud and smooth. No grunge. I now enjoy listening to the sound quality of our FM.

KJLS is located in a county with a population of 27,000 people and a total of four Class C FMs and one AM. Ninety-three percent of the county cume listeners tune in to—you guessed it—KJLS.

■ ■ ■

For information on the DBE 1000, contact Jim Somich at Somich Engineering: 216-526-4561; FAX: 216-991-1932; or circle **Reader Service 65.**

Hnat-Hindes Gets Hip with Ultramod



Hnat-Hindes' Ultramod UM-2000 was introduced this year.

Products Offer 60 dB Separation Digitally

by Bonnie Hnat
Secretary/Treasurer
Hnat-Hindes Inc.

THOMPSON, Conn. Hnat-Hindes Inc., has introduced two products for 1991, a digitally synthesized stereo generator (DSG-2001) and a self-contained FM processing package that is built around the DSG-2001, the Ultramod UM-2000.

Both of these devices utilize digitally derived sinusoidal multiplexing with buffer isolated multiplex ports. This method of current mode switching renders stray storage capacity within the CMOS gates insignificant, and results in generator separation with a smaller parts count than conventional generators. The separation provided by both of these generators is on the order of 60 dB with off-the-shelf components.

With today's FM receivers and the advent of "mono blend," separation beyond 60 dB tends to be a pointless and costly pursuit.

Two composite outputs are provided along with a pilot output, for phase lock with our composite processor. This ensures absolute pilot phase lock throughout the system.

Low pass filters, selectable pre-emphasis and a unique feedback clipper (less than 0.5 percent second harmonic) are standard equipment on both generators.

The UM-2000 utilizes an additional PC card to provide the necessary split band AGC functions. The main processor is essentially wide band and is capable of up to 30 dB of gain control. Its release function seeks its own ratio of slow and fast release, essentially not caring what kind of program material it sees. It is capable of reproducing artifacts (gain reduction envelope) of other processors. Audio bandwidth is in excess of 50 kHz.

Low frequencies are processed strictly as a reinforcement measure, providing a solid, non-fading bass response.

All AGC sections are controlled by a broadband downward expander with a complementary release function.

In today's marketplace, we can find many high-end systems that address the needs of the upper 15 percent of the radio industry. Both the DSG-2001 and the UM-2000 are designed to service the other 85 percent—and are priced to do so.

■ ■ ■

For information on Hnat-Hindes Inc.'s product line, contact Bonnie Hnat at 203-935-9066; FAX: 203-935-9919; or circle **Reader Service 119.**

TECHNOLOGY UPDATE

CRL's MBL-100 Is Talk of the Town

by Bill Ammons
Television Products/Marketing
Circuit Research Labs Inc. (CRL)

TEMPE, Ariz. Over the last year, a good number of AM stations have changed their formats to news/talk or sports programming. Quite often the format switch picks up additional listeners at night. Nighttime operation for many stations means reduced power, directional operation and increased interference.

Last year, CRL introduced a processing product designed specifically for news/talk type formats, the MBL-100. The MBL-100 is a complete processing system, containing a multi-band gain controller and limiter. This unit is designed to increase coverage and loudness of AM monaural stations over conventional NRSC-1 processing.

The question that gets asked most about the MBL-100, is: "How does it increase coverage?"

First, the MBL-100 has a lower audio cutoff frequency than conventional NRSC-1 processing. By lowering the audio bandwidth to 7.5 kHz, less high frequency sideband energy is transmitted. Since most AM radios have IF bandwidths of only 3 kHz to 5 kHz, higher frequency information is wasted power.

The MBL-100 from CRL has a lower audio cutoff frequency than conventional NRSC-1 processing.

Second, the tri-band and final peak limiter have been designed to augment voice, resulting in increased clarity and more loudness or modulation density than available in other processors.

Special equalizer sections match the MBL-100 to your transmitter, allowing better modulation control and increased density. The MBL-100 will help your transmitter work into narrow bandwidth or asymmetrical antenna systems.

TECHNOLOGY UPDATE

The increase in coverage that can be obtained from the MBL-100 varies with the type of transmitter used, the antenna system, dial position and the type of processing used before. Most of our users report an average gain of five to eight miles (based on 1 kW power level) at night, and much better filling of null areas and interference prone zones.

If your AM station has a news/talk format, the MBL-100 may be able to help you gain back listeners inexpensively.

■ ■ ■

For information, contact Bill Ammons at CRL Systems: 800-535-7648; FAX: 602-438-8227; or circle **Reader Service 150.**

Prizm Is Home on The Range

(continued from page 39)

loudness you've always dreamed of without the clipping and distortion that's always been the downside of processing for loudness.

Overnight, we were competing in loudness and presenting what I think is the warmest, most natural signal in town. From a pure listening standpoint, our audio is more human sounding, cleaner across the audio spectrum and less fatiguing than any processed signal around.

During testing we worked the system through a full range of processing settings —from massive metal squash to slight classical enhancements—and we always got clean, clear audio with remarkable stereo.

With Lazer and Prizm, we can simply put more frequencies on the air than any other station and tailor those frequencies exactly as we want. We are winning the range war—digitally.

■ ■ ■

For information on Gentner products, contact Dave Finley at the company at: 801-975-7200; FAX: 801-977-0087; or circle **Reader Service 79.**

KJLS Comes Clean With Aphex System

by Mike Rogers
General Manager, KJLS

HAYS, Kan. In my 20 years of broadcasting, processing an FM signal has been my toughest task. Try to sound clean and you disappear off the dial. Go for loudness and you wish you were not *on* the dial.

KJLS in the past has used some major players in processing. In most cases it was a trade-off—either loud or clean. We took a look at the techniques used in processing within a recording studio. Our task became to integrate those techniques in the world of RF.

USER REPORT

For us, the answer came with the Aphex Audiophile Air Chain, coupled with the Somich DBE 1000 Base Band Enhancer. My goal was to control the levels within the modulation envelope, not change the mix or frequency response of the program material.

Consists of three units

The Aphex Audiophile Air Chain consists of three units: The Compellor Model 300, the Aural Exciter Type III Model 250 and Dominator II Model 723 with pre-emphasis.

The Compellor, an extremely versatile device, is used to ride gain. It simultaneously compresses, levels and limits. No matter how aggressively you drive the Compellor, you can't hear the negative artifacts inherent in many other processing pieces. As a matter of fact, you can still hear the ambient studio presence around each instrument with the Compellor fully driven. Here at KJLS, we have the Compellor set to process about 4 dB.

Next is the Aphex Aural Exciter. We simply tune for the frequency of the vocals, set the peaking to about 60 percent, a slight amount of phase null, mix the excited material 50-50 with the original material, set the threshold at about 60 percent and the vocals come alive—without equalization. As a result, the vocals not only sound bright and clean, but the studio presence is preserved and enhanced, giving dimension and space to stereo image.

Finally, the Dominator II 723 can be adjusted to be a very loud and clean multiband peak limiter. Competitive with the big boys without compromise, the versatility of the front panel controls allows us to get very creative with our final limiting.

The front panel controls include the input level, tuneable low and high frequency cut and boost, 5 dB plus and minus and switchable crossover frequencies low to mid and mid to high. Also featured are variable release time and density control, which vary the amount of clipping to band limiting.

The "Coarse" peak ceiling control sets the peak output in 2 dB steps from +2 to 24 dbu (peak) and a range control switch subtracts 10 dB from the setting. The "Fine" control is ±1 dB in 0.2 dB steps. This gives a total range of 34 dB with 0.2 dB accuracy.

This is where our processing gets interesting. With processors I've used in the past, when drive is increased, there's an apparent increase in loudness.

Same holds true

The same holds true with the Dominator II. Speeding up the release time with the Dominator II, we noticed that the mid-range and the upper mid-range frequencies would get louder. However, slowing the release time on the Dominator II seems to smooth out the sound, while maintaining a sense of loudness.

If you choose to, you could add as much limiting as you wanted and still add or subtract "punch" by either speeding up or slowing down release time.

However, we use the Dominator II for peak limiting only. Even though KJLS is an adult rock music station, we use a very slow release time. We limit between 6 dB and 9 dB. Considering the slow release time, we disabled the stereo tracking. The sound is so smooth, so full and so natural, we believe we have increased our "time spent listening."

The Aphex Audiophile Air Chain plus the DBE 1000 from Somich Engineering gives us an incredible amount of control. Consider for a moment that the modulation envelope is just so big. If you increase the processing, the average amplitude rises to occupy more room than the modulation envelope can hold.

The operator then is forced to back off modulation, reducing apparent dynamic range. The solution seems to be more limiting, but if you limit too hard, the signal distorts. The Dominator II allows us to slow down the release time.

Rounder, softer, smoother

The resulting lower average amplitude yields a rounder, softer, smoother sound. With the average amplitude lower, the signal seems to take up less space in the modulation envelope with plenty of room to spare.

Now increase the drive of the DBE 1000 and fill the modulation envelope with rich, full sound. Competing in the loudness war is no problem. More importantly, we're able to successfully experiment with three-dimensional sound, because the mid and upper mid frequencies, so critical in the 3-D image, are not being hammered to pieces by a ton of processing.

The only problem we had was with the DJs' voices—4 dB to 9 dB is not enough gain reduction to control the wild men of the airwaves.

The solution was to purchase a couple of Aphex Expressor Model 651s, one for on-air and one for the production studio. Along with our Equitek 11 microphones, we install the Expressors and set them for high ratio. The voices are now fat and the levels are perfect.

At KJLS, our music is on CD and our commercials are on DAT. Along with the Expressor in our production studio, we also have a flat Dominator II 720 at the output of our production console. Our levels into the DAT machines are perfect. It's 0 VU every time, without ever crashing and without digital "grunge" due to low level recording.

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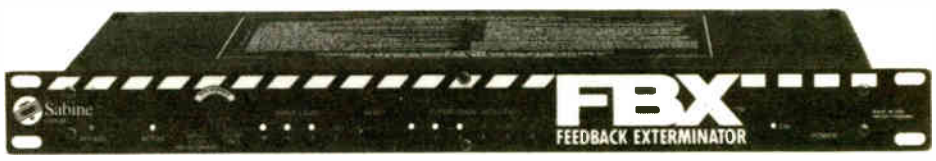
BUYERS BRIEFS

Innovations in Program Audio Processing



GAINESVILLE, Fla. The Sabine Musical Manufacturing Co. offers the FBX automatic feedback controller, a microprocessor-controlled filtering device that automatically finds and eliminates feedback in sound systems.

When feedback occurs, the FBX AFC microprocessor assigns one of six very narrow notch filters to the resonating frequency and quickly eliminates the feedback. The FBX is a single slot rack mount device and can be placed anywhere that a graphic equalizer might be used.

For information, contact John Annin at Sabine at 904-371-3829; FAX: 904-371-7441; or circle **Reader Service 45.**

FRANKLIN, Tenn. The Model 400 microphone processor from Valley International Inc. was designed to enhance an on-air personality's performance.

This multi-function, single-channel device consists of a low noise, low distortion, transformerless mic preamplifier; a three-band tone control equalizer specially contoured for the spoken word; a compressor section for increasing apparent loudness with a complementary interactive expander to eliminate noise "rush up" during silent periods or pauses; a de-esser with "normal" and "heavy" settings; an easy-to-read LED gain reduction meter; switch-selectable input/output VU metering; and a variable output gain control.

For information, contact Jason Dunaway, VP of engineering and marketing; Howard Toole, service manager; or Jay Nelson, VP of sales and operations, at Valley: 615-370-5901; FAX: 615-370-5907; or circle **Reader Service 111.**

KJLS Selects Aphex

(continued from page 45)

While digital audio processing supposedly is here, we chose not to go digital because the specifications and sound were far inferior to the Aphex Audiophile chain and Somich DBE 1000.

Why is a little radio station like KJLS going through all this work? A year ago, a listener asked, "Why does your radio station sound so bad?" I said, "You've got to be kidding. We have great equipment and state-of-the-art processing." I asked the caller his age. He answered, "I'm 16 and your station sounds nothing like my CDs."

That wasn't the only call we had. The writing was on the wall—deliver quality sound or lose our share rating and our future listeners.

■ ■ ■

For information on the Aphex Audiophile Air Chain, contact Marvin Caesar at Aphex at 818-767-2929; FAX: 818-767-2641; or circle **Reader Service 78.**

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Wheatstone's Bright Idea!

Just When You Thought All Furniture Was Alike

We've wedded the latest precision NC metal components to high grade solid wood trimmed laminated panels and counter surfaces. Added to this design breakthrough is the implementation of true 1-1/2" thick counters and vertical structural panels that put an end to warping, racking and delaminating problems. What's more, our wood trim comes flush to the counter surfaces to eliminate exposed laminate edges (so tempting to idle hands). In fact, the counters are separately trimmed to eliminate unsightly and short-lived formica seams.

Naturally, with all of our experience at building and interfacing consoles, we've worked out the details: like convenient hinged down punchblock panels for easy installation and maintenance, really generous cable pathways between enclosures, and equipment turrets with both back and side door access. Our rackmount base cabinets have mounting rails on both sides, so equipment can be mounted any way desired or even switched at a later date. Concealment doors can be placed on cabinets intended for future electronic installation. Continuous length floor risers assure even cabinet-to-cabinet alignment. We've even included heavy duty ground bonding terminals.

This furniture family is complete, with both stand-up and sit-down versions, angled equipment turrets in two heights (with or without risers), concealed, fully isolated turntable cabinets, auxiliary wallmount equipment cabinets, wall and cabinet mount cart and CD storage, utility and file cabinet pull-out drawers, reel-to-reel tape deck mounts, interview counters—practically anything you can imagine. With this much variety, Wheatstone's rock solid construction and major market look, there really is no comparison.

So contact Wheatstone, the people with the reputation and expertise you can count on.

Wheatstone® Corporation

Furniture

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Circle 32 On Reader Service Card

Wheatstone® Corporation

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

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

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

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

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A-500

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