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PO Box 1214, Falls Church VA 22041

June 15, 1987

Volume 11, Number 12

VOA Bids Raise Questions

by David Hughes

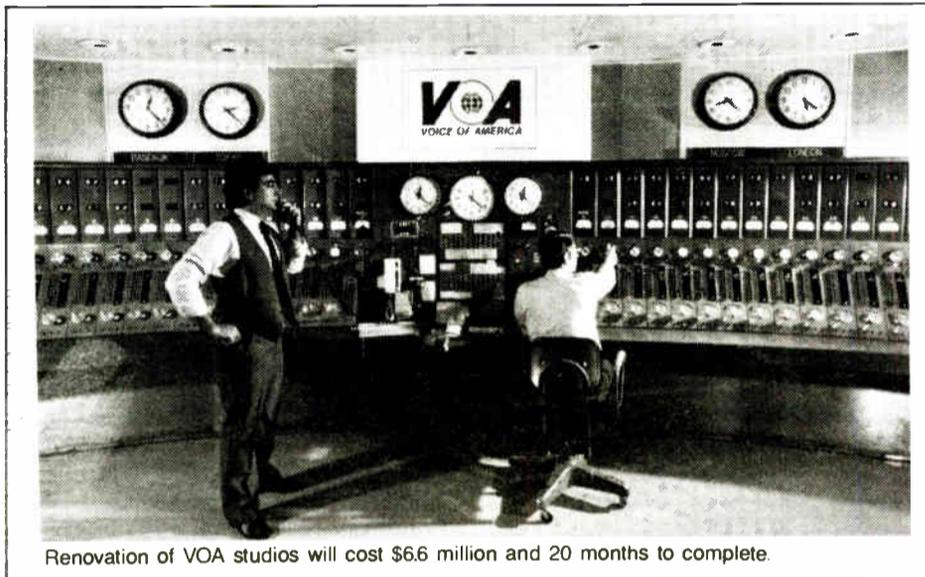
Washington DC . . . Work on a \$6.6 million, 20 month project to renovate 19 studios at the Voice of America's (VOA) Washington DC headquarters was scheduled, at press time, to get underway in late May.

However, there are indications from broadcast equipment firms that the relatively low price tag for the audio equipment portion of the contract—valued at approximately \$3.2 million—may make the electrical subcontractor's search for audio equipment suppliers difficult.

Additionally, before the renovations can take place, the contractor for the project, Rockville, MD-based Grunley-Walsh Construction Co., will have to remove deadly PCBs and asbestos from the existing studio facilities, which were constructed in the 1950s.

Upgrade effort

According to Edward DeFontaine, broadcast operations director for the VOA, which broadcasts shortwave programming in a multitude of lan-



Renovation of VOA studios will cost \$6.6 million and 20 months to complete.

guages around the world, the studio renovations are part of an overall modernization plan that will extend into the 1990s to revamp the VOA's aging facilities—from studios to transmitters.

The work is taking place in the "U-shaped basic studio core," he said, which is located only steps from the US Capitol.

DeFontaine said that the 19 studios will be renovated in two stages. The first stage will include 10 studios, which will take "nine or ten months," while the second stage will take the remaining portion of the 20-month period.

Much of the equipment is old, some from the 1950s, DeFontaine said. "We will salvage what is salvagable, trashing or selling equipment. The studios were

put together piece-meal as the place grew."

The work also involves renewal of the building's air conditioning system, he added. "This building is a historical monument."

Contractor, subcontractors

The renovation work was scheduled to start in late May, DeFontaine said, following bonding of Grunley-Walsh.

"We just received our notice to proceed last week," Project Manager Chuck Sanata, of Grunley-Walsh, told *RW* 18 May. The bid process took five months.

As is common with other governmental contracts it handles, Santana said Grunley-Walsh will subcontract much of the work. While the firm will handle a

required 15% of the work, such as some demolition and carpentry tasks, about a dozen subcontractors will be used to handle a wide variety of jobs.

While subcontractors will handle everything from glasswork and doors, to PCB and asbestos removal, the bulk of the total contract, valued at about \$3.9 million, involves the acquisition and installation of audio equipment, as well as wiring. That work will be handled by Dynalectric Co., of Vienna, VA.

Sanata said about \$3.2 million of Dynalectric's contract calls for the actual procurement of audio equipment, with another \$700,000 for installation and wiring.

Price too low?

However, several broadcast equipment firms contacted by *RW* said that the total \$3.2 million price tag is too low for them to supply gear to furnish the 19 studios.

Privately, they maintain that the low price could encourage Dynalectric to deal with non-broadcast related firms in order to obtain the audio gear, thereby complicating and possibly delaying the project.

There has also been private speculation that a low price could result in cost overruns farther along in the project's timetable.

"No one can do it for that price," said one equipment distributor who did not want to be identified. "The project was underbid."

Another firm—also requesting anonymity—said the audio gear portion of the contract should have been in the \$5 million range. Still another firm said that the project should cost about \$4 million, "but no way at \$3 million. That's outrageous"

Yet another official from a broadcast equipment firm maintained that the "broadcast community is very upset" at what increasingly appears to be the lack of involvement of non-broadcast related firms in supplying equipment for the VOA studio project.

Representatives of broadcast equipment firms also said there are other problems with the contract. One indicated that installed gear could be rejected if the VOA was dissatisfied. "There's no guarantee that (our) gear will be acceptable," he said.

According to the project as bid, the VOA retains the right to reject product "substitutions" that might help bring the project in at the price bid.

In the event of such a rejection, the broadcast equipment supplier would have to absorb any additional costs.

Lack of familiarity

Dan Braverman, president of Radio Systems, said his firm "brought" *(continued on page 8)*

Cutbacks At Harris

Quincy IL . . . Citing a weak broadcast equipment sales market, Harris Corp. has completed a second round of workforce reductions, as well as an employee pay cut, at its Quincy, IL-based Broadcast Division.

Eighty workers were laid off in April, according to Jim Murphy, a spokesman for the parent firm, based in Melbourne, FL.

This round of permanent, involuntary layoffs follows personnel cutbacks earlier this year in which another 80 workers were terminated in a "voluntary" reduction. In that instance, many workers opted for a retirement package.

The most recent cutbacks, according to a late April article in the *Quincy Herald-Whig*, bring the total number of employees at Harris' Quincy plant to approximately 350 down from 500 in late 1986. Harris officials would not comment on their current workforce figures.

Salary cut

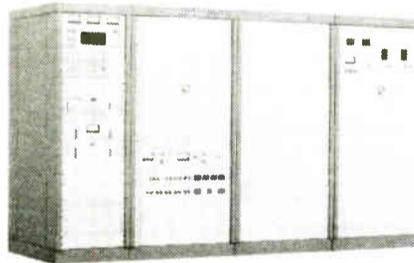
Murphy told *RW* that in addition to the reductions in force, the firm has imposed a 10% "temporary" salary cut for its most of its remaining Quincy plant workforce. The salary cuts will be "reviewed" in the early fall, he added, when the firm reassesses the business climate.

(continued on page 3)

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Continental: For a Sound Investment

Circle Reader Service 28 on Page 28

World Radio History

Engineering Program Dropped

by Alex Zavistovich

Annandale VA ... Prospective broadcast technicians will soon have one less educational resource to draw from—the Northern Virginia Community College (NOVA) plans to terminate its broadcast engineering program at the end of the spring 1987 quarter.

NOVA administration cited flagging enrollment and "campus and community needs" as prompting the program's elimination.

The broadcast engineering technology curriculum at NOVA was introduced in the early 1970's. It is one of only a scattering of such programs in this country, which provide hands-on mechanical and electronic experience in such areas as transmitter operation and tape machine maintenance.

Reduction in force

As a consequence of the program's end, NOVA Assistant Professor Ed Montgomery, the instructor of most of the school's broadcast engineering courses, will be leaving the college through a reduction in force. Montgomery has taught at the school since 1977.

Montgomery was informed of the decision to terminate the sequence in a 13 April 1987 letter from NOVA President Richard Ernst. The letter stated, "based on an assessment of enrollment trends ... , the administrative council determined that the broadcast engineering program and the (instructional) position at the Annandale campus should be eliminated."

Enrollment in the program did drop from 34 students in 1976 to 17 in 1982, Montgomery acknowledged. However, he said, since then, course enrollment has grown.

"Three of the four courses planned for the spring 1987 quarter had sufficient numbers of students signed up to allow (the courses) to go through," Montgomery said.

Ernst told RW in May that the termi-

nation of the program at NOVA was due to state policies, not the college's. A minimum number of students must be maintained in the program, he said.

Enrollment has increased in the introductory courses, Ernst explained, not in the program overall. NOVA could not justify retaining the program based on enrollment in the introductory courses alone, he contended.

Opposed by students

The decision by NOVA to do away with the broadcast engineering curriculum has been strongly opposed by students in the program.

A petition sent to RW dated 28 April and signed by 16 students maintained that the decision to eliminate the program was made "over the protestations of the students and the Broadcast Engineering Advisory Board (which includes two graduates from the program)."

The students blamed "short-sightedness" at NOVA for the decision to terminate the curriculum.

"One of the main reasons cited for the elimination of the program is its lack of graduates," they pointed out. However, they added, "students are absorbed into the local job market before they can graduate."

Ernst, while acknowledging that students may be employed before they graduate, said, "We (NOVA) must live within state guidelines and look at productivity in each program." The number of graduates has fallen below the state's requirements, he held.

Students not informed

Although the program will be finished at NOVA after this quarter, students contend the administration failed to inform them of the fact, leaving many enrolled in the school but unable to pursue the degree which drew them there.

"Nobody bothered to tell me when I was registering that these (broadcast engineering) classes weren't going to be offered anymore," said Ryan Remson, a

student at NOVA's Annandale campus.

However, Ernst said that all degree candidates were notified in February 1986 of the school's decision to terminate the curriculum. The notification was made to allow students who began in the 1985-1986 school year to complete their degree requirements by 1987, he added.

Students auditing the courses, or not placed in the broadcast engineering degree program, may not have been informed, Ernst acknowledged.

NOVA administration has announced that the broadcast courses will be made available through the engineering department, Remson said. However, he commented, the school will have no instructor in the practical applications of broadcast engineering after Montgomery's departure.

Remson added that many students in the broadcast engineering program enrolled because of those practical applications, rather than the abstract concepts taught in the engineering curriculum.

"They (the administration) are telling us they can fill the void," Remson said, "but they can't."

For additional information, contact Richard Ernst at 703-323-3000, or Ed Montgomery at 703-323-3496.

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World Radio History

FCC Clips

Comment Period Extended

The FCC said 5 May that it had granted an extension of time for comments on Docket 87-6, which would authorize the use of multiple synchronous transmitters by AM broadcast stations.

The plan would allow AM stations to widen their coverage area by simultaneously broadcasting their programming at the same frequency at a second transmitter site.

Responding to a request by the Association For Broadcast Engineering Standards to allow test data to be compiled from KROL, an experimental synchronous station in Laughlin NV, the FCC has extended the comment deadline to 7 July 1987. Reply comments are due 6 August, 1987.

For additional information, contact Bernard Gorden at 202-632-9660.

Transceiver Rules Relaxed

In mid-May the FCC announced a change in the equipment authorization required for the receiver portion of a type-accepted or certified transceiver, which will relieve applicants from filing two separate applications for equipment approval.

Present procedures require two applications for a transceiver—one for type acceptance or certification of the transmitter, the second for notification or certification of the receiver. The change would allow authorization for the receiver to be changed from notification to verification, the FCC said.

The transmitter portion, however, will still require type acceptance or certification to ensure compliance with rules.

FCC docket is GEN 86-339. For more information, contact George Harenberg at 202-653-7314.

Change Proposed

The FCC proposed in late April a modification to docket 87-100, which would have a station's public inspection file retained for one renewal term or until grant of a renewal, whichever comes later.

Broadcasters must currently keep applications on hand for seven years from the application date.

For additional information, contact Louis Whitsett at 202-632-7792.

New Appointments

Peter K. Pitsch, formerly Chief of the Office of Plans and Policy (OPP) for the FCC, was announced on 22 April as the new Chief of Staff for incoming Commission Chairman Dennis Patrick.

Pitsch came to the FCC following employment in President Reagan's 1980 transition organization, and two previous years as an attorney for the Federal Trade Commission. He held the position of OPP chief from May 1981.

The position vacated by Pitsch will be filled by Dr. John Haring, who since July 1983 has worked as an economist for the OPP.

For more information, contact the FCC news media information department at 202-632-5050.

Synchronous AMs Face Snag

by Alex Zavistovich

Washington DC ... Two AM radio stations—KROL, Laughlin, NV, and KKOB, Albuquerque, NM—which have been granted experimental licenses for synchronous transmission projects, have as yet been unsuccessful in completely synchronizing their main broadcast transmitters with their remote sites.

However, a spokesperson for Harris Broadcast Division, which supplied the equipment for both stations, noted that the problems are simply "part of the experimental process."

The stations are two of a handful of AM broadcasters which have filed for or received experimental licenses to use synchronous transmission to improve their coverage area.

Synchronous systems, which are already in operation in Europe, have been gaining increased attention at the FCC. The Commission in January listed an inquiry into the benefits of synchronous transmission as one of its top priority agenda items, and plans to investigate the system's technical operating standards.

However, problems in synchronizing the equipment have snarled the FCC's inquiry. On 5 May, the Commission announced an extension of time for filing comments on the synchronous docket,

Harris Cuts

(continued from page 1)

Murphy said that the personnel and salary cuts were due to "problems in the industry. Sales were not as strong as we had hoped."

He added that the result of the cuts, which are limited to the firm's broadcast division, is to make the division the proper size "so that we can be more competitive and be a leader in the industry. We want to have a stronger product, and make sure that our market investment is accurate."

Reduced revenues

The *Herald-Whig* quoted Harris Senior VP Guy Numann—who is reportedly in charge of the Quincy plant—as saying that reduced advertising revenues has forced stations to scale back their broadcast equipment purchases.

The firm is planning no changes in its product line directly related to the cut-backs, Murphy said.

Officials at the Quincy plant refused to comment on the layoffs and salary reductions. For more information contact Jim Murphy at 305-727-9126.

MM 87-6, due in part to a lack of data from KROL.

Unsuccessful first effort

KROL CE Gordy Alsum said his station is preparing to collect data on the effectiveness of synchronous transmission. He noted that collection of the data had been delayed because original attempts to synchronize the main transmitter with the remote one in Henderson had been "unsuccessful."

The transmitter in Henderson, approximately 60 miles from Laughlin, could not be properly synched using the sub-carrier on KROL's STL because of "the extremely long hop and the noise generated into the subcarrier," Alsum said.

"We are using three studio-transmitter links (STL) in each direction," he pointed out, adding the system "is just too unstable."

Still, Alsum said, while the transmitters are not fully synchronized, they still meet FCC specifications, being 0.2 Hz off in frequency with each other.

KROL also has an application on file with the FCC, which would raise the output power of its synchronous transmitter to 5 kW, Alsum added.

Not discouraged

Alsum was not discouraged by the failure of the first attempts at synchronization, however. At press time, he was completing the construction of equipment to be used in a second system for synchronizing the transmitter.

KROL will attempt to sync its two transmitters together by using the stereo pilot of KFMS-FM, which has a primary transmitter in Las Vegas and a repeater in the Laughlin area, Alsum said.

"KFMS's CE, Dan Peluso, has been very cooperative," he stated.

Peluso confirmed that Alsum had contacted KFMS for approval to use the FM station's pilot frequency as a marker. KFMS, whose carrier is at 101.9 MHz, has a pilot at 19 kHz, maintained within 2 Hz.

Beyond having KROL monitor the pilot, however, KFMS has no contribution to the AM station's synchronous experiment, Peluso said.

Alsum had not set a date for implementation of the second system, but he anticipated installation of the equipment to be finished by the end of May. The transmitters "should be in sync within a week of the installation," he said.

More synchronous problems

KROL is not the only AM station with synchronous transmitter woes.

KKOB Assistant CE Mike Creager said

the Albuquerque station was also experiencing difficulty synchronizing its primary transmitter with the second site at KV5F-AM, some 60 miles away in Santa Fe.

The station is having some unspecified problems with the "black box" which synchronizes the two transmitters, Creager commented. The problems were further complicated, he said, by KKOB's difficulty in getting the signal past Sandia Crest, an antenna farm approximately 15 miles east of the station.

The Harris synchronizing equipment was "not stable enough to lock up properly," Creager maintained, although he would not speculate as to a cause.

Creager suggested that other stations planning to use synchronous transmission ought to "overdesign the link from the main transmitter to the remote site, to provide a wide, safe margin which would take into account weather or spurious emissions."

Part of the process

Harris Director of Advanced Development Robert Weirather acknowledged that the two stations were having difficulties synchronizing their transmissions, but noted that the problems are part of the learning process.

In each case, Weirather explained, Harris is trying to go beyond the 0.1 Hz

synchronization criterion set by the FCC, to full locking, differing only by phase. Circumstances at the stations, however, have made such synchronization difficult.

KROL has a series of STLs to connect the transmitters, he said. The hops result in a less than desirable signal to noise ratio, he maintained.

Weirather acknowledged that using the FM pilot, as Alsum plans, is an alternative to the links. He added that the station is still operating within FCC standards.

In the case of KKOB, which also uses STL connections, the two transmitters could be locked, but produced "too much FM noise," Weirather said.

The units were brought back to Harris, where they were modified and returned, he noted. The transmitters are running on some "very accurate oscillators," and, like KROL's, are operating within FCC specifications.

For additional information, contact Gordy Alsum at 702-298-2989, Mike Creager at 505-243-4411, or Robert Weirather at 217-222-8200. The deadline for comments on FCC docket 87-6, regarding synchronous transmitters, has been extended to 7 July, with replies due by 6 August. For more information, contact the FCC new media information line at 202-632-5050.



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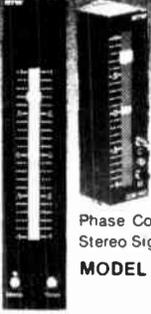
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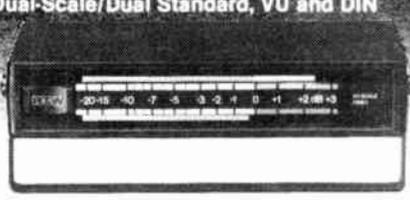
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AMs Speak Out on NTIA Study

by Judith Gross

Falls Church VA ... Neck and neck ... Will the NTIA study of multisystem AM stereo make a difference to stations considering taking the plunge? We asked you to tell us with a mail-in survey and 35 of you did ... 13 AMers said they'd go stereo if the study supported a single system ... 12 said they'd convert if the study backed multimode AM stereo ... seven stations said no way to AM stereo no matter what the study finds, and that included one station whose FM is still mono. By the way ... two said they'd go stereo either way the NTIA study comes out, although one of them stipulated that the single standard would have to be Kahn's in order for them to do that.

Two DJs said their station would not go stereo because "we can't even afford a \$50 cassette recorder" ... and one station pointed out that single- or multi-system was not the issue ... "We will go stereo when a majority of AM radios on the market are stereo. There is no point in doing it if only a few can hear" ... Back to the chicken-and-egg.

Hot hotline ... Faring much better is the NRSC preemphasis standard ... not even a tiny peep of real opposition to it can be found (and we know of some who have looked) ... The NAB sent a mailing to every AM station, and after a little more than a week, some 500 postcards have been returned. Michael Rau of the Science and Technology department tells us ... most of them say they intend to implement the standard ... about 23 stations say they already have and they represent a cross-section of the country, from New York to Atlanta to Los Angeles even up to Alaska ... only 11 said they would not go NRSC, and these were called by the NAB's regulatory review committee to find out why.

"Misinformation is the chief reason," says Rau, "more education may be needed" ... The response gives AM

reason to cheer, because the faster stations go NRSC, the faster the receiver makers will get wideband AM radios into the stores ... As for the new hotline—800-NAB-NRSC—Rau says he's been fielding calls steadily, about six to ten a day ... with a variety of questions, including compatibility, with older transmitters or AM stereo ...

Answer to the last question is a resounding yes, as anyone who stopped by the CRL booth at the NAB show knows ... if more listeners could hear AM sound that good no one would dare even hint that it was on its last legs ...

We ain't dead yet ... Every one of the



4800-plus AM stations in this country, their staffs and listeners should be outraged by a DC bank's newspaper ad trying to show how the bank has kept up with the times ... "From Go-Go boots and AM Radio to Reebok sneakers and Compact Disc (this bank) has grown up with you" ... Ad goes on to talk about trends and fads ... Okay, AMers, are you a bit surprised to learn you are now a mere passing fad?

What AM needs, besides the great technical improvement efforts already underway, is a Goodwill Ambassador, someone who'll spread the word that AM radio is alive and well, thank you very much. Someone to get the point across not just to SBE chapters and broadcasters' associations, who already know this, but to the public which apparently does not ... Any volunteers?

McMartin is back (AGAIN) ... Had a chat with Jerry Martin, a principle in

the new McMartin Industries (similar names, no relation) brought back to life in its old home in Omaha, NE ... You remember the original company went bankrupt a few years back and the McMartin family became involved in McMartin International, in CO ...

PRCC, a publically-held CA company acquired the assets of the original, and put them back in business ... Martin says only front-office people are new, and many old familiar faces are still around, including an engineer who had been with the previous company for 26 years and came back the day the doors re-opened ...

Martin, who refers to himself as "chief cook and bottle washer—but I don't do windows ..." says customers with McMartin equipment can call on the revived company for service ... "We're delighted to do it, we don't believe in rewarding faithful customers with poor service ..."

According to Martin, some of the product line, such as SCA gear is ready for market, but it won't be until the end of the year that 3.5 kW to 5 kW FM transmitters are ready ... The new owners are aiming to be more efficiency-conscious ... "Products will be built with much less folderol in manufacturing," says Martin, "and we'll take measures to force us into the 80-20 rule—80% of the profits come from 20% of the product" ... Martin also says to look for a new value-added arrangement in the future—the "widget program" ... and that's all he would say ...

Playing with numbers ... We were going to let the NAB off the hook on this one, until it got so much ink in no less than four stories in three industry publications ... but somebody up at 1771 N Street has apparently invented a new way of counting ...

NAB sent out a press release on a survey done by American Airlines Direct Marketing Corp./Donahue Research and Marketing of Dallas about stations' use of new technology ... 445 radio stations

were called, and from the calls, the NAB happily reports that there are now 700 AM stereo stations in the US ... Oh really? ...

The 445 stations called, by the way, are one shy of the total number of AM stations that said they were stereo back in August '86, the last time such a survey was done ... and this market research company is the same one which recently had to revise its findings because of a computer error when it reported how many stations are accepting condom ads (whoops) ...

What they did is talk to an incredibly small number of stations, get a percentage, and apply it to the total number of AM stations to get the 700 figure ... But, were all 445 stations AM, or was the percentage only for a portion of them? ... We don't know because the NAB says no more information about the study is available ...

Now nobody keeps an accurate count of AM stereo stations (pity), but even if you go by the claims of each system proponent, usually considered optimistic, you can't come close to 700 ... In the US we give C-QUAM 390 based on an announcement at Motorola's NAB show press conference ... Kahn claimed about 100 stations the last time he was speaking to us ... And the NTIA AM stereo report said that about 60 stations still use Harris gear ... Add it up ... it comes to 550 AM stereo stations at best ... So how can the NAB tell the world there are 700 AM stereo stations, and how can industry publications print such miscalculated numbers verbatim? ... Statistics lie ...

Station break for the Gipper ... It was either the tackiest move by a radio news department, or the cleverest radio promotion coup ... WSM Nashville, home of the Grand Ole Opry, got no other than Ronald Reagan, himself an old radio man, to record a station ID/promo ... A station newswoman procured the tape at a presidential news conference, after her boss told her not to come home without it ... The Prez acknowledged her raised hand expecting a question but with a little coy coaxing, was persuaded to declare that when he's in Nashville he listens to WSM ... Other reporters present groaned, but WSM's Nashville competitors thought it was a nifty station promotion ... Bonzo goes radio?

Quote from Tom Thomas in accepting the CPB Edward R. Murrow Award with his wife Terry Clifford: "Radio is the only medium of our age that has managed to escape the corporate influence" ... Take that, Cap Cities, GE, Black Rock, and Turner and Fox, et al ...

Heard something interesting? Spill your guts to Earwaves. Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted Radio World mug.

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Clarification

In the 15 May issue of RW, the principal community contour for FM stations was wrongly stated to be 0.16 mV/m. The actual contour for FM stations, as listed in the FCC's rules, is 3.16 mV/m. We regret the error.

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? 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).

Eliminate all calls

Dear RW:

I read with interest your report that the FCC is considering changes in its policies relating to assignment of call letters.

After devoting a few minutes of thought to the matter, the question that comes to mind is, "do call letters really serve any useful purpose?"

Why not treat broadcasting stations exactly the same as all other businesses and permit them to use any business name of their choosing?

Many stations already prefer to be known by descriptive slogans rather than by four letters that are all but devoid of meaning.

Think of all the thousands of tax dollars that are wasted by the FCC in administering call letters.

Why not totally deregulate call letters and abolish them outright?

Paul S. Lotsof, Manager
"CAVE 97.7 FM" aka KAVV
Benson, AZ

International AM standards

Dear RW:

With today's highly competitive international market, the United States finally has a viable product to sell worldwide—AM stereo! Yet we continue to fight among ourselves about a standard.

This question should have been resolved years ago.

I believe that a firm US standard can and will create tremendous marketing opportunities for our manufacturers. That translates into dollars coming into this country instead of flowing out.

Notice that the US FM stereo standard is used worldwide. We established a standard and ignored the "marketplace" approach in the interest of compatibility.

Sure, FM probably would have been technically better if we waited around for digital transmission, FMX and the like.

Instead, a standard was established and you can see the results. The entire world uses the US standard.

Why not repeat our success with the AM stereo opportunity?

I say we should grab the opportunity, set a fantastic standard for AM stereo and stick by it.

I'll bet the rest of the world will agree with us, especially if the AM stereo standard we establish as our own is of great quality and can be implemented worldwide.

Likewise, perhaps the NRSC preemphasis standard should be reviewed for applicability in the international marketplace. Is the 10 kHz stopband wise, when half the world's broadcasters go with 9 kHz spacing?

It's not too late to get our acts together for a worldwide standard.

David M. Sites
Transmitter Plant Supervisor
Voice of America
Munich Relay Station

The NTIA's study of multisystem AM stereo technology is finally underway in Colorado, and not a moment too soon.

The final hurdle—procuring the necessary equipment—was cleared when Motorola decided to cooperate by loaning C-QUAM equipment to the researchers.

It's an expansive gesture on the part of Motorola which clearly holds the edge in the number of stations that have gone stereo.

Like an incumbant office-holder who agrees to debate a challenger, Motorola has little to gain from the ongoing tests. There is still, in fact, some question as to just what is being tested.

Since there are C-QUAM only receivers, but no Kahn/Hazeltine ISB only receivers, the research team may be forced simply to compare the performance of C-QUAM AM stereo on C-QUAM only radios with that of multisystem receivers.

The NTIA's researchers have unfortunately been less than forthcoming about exactly what tests are being conducted and how.

But whatever the procedure, the NTIA owes the industry a full disclosure of the results of the research—both the performance and cost analyses of multisystem detailed with no secret data.

Technical performance tradeoffs should be explicitly discussed, and the NTIA should provide a thorough analysis of cost tradeoffs as well so the entire industry can evaluate the results.

Once the research is finished the NTIA has an obligation to draw a final conclusion on AM stereo: either a strong pro-multimode statement, or a clear endorsement of a single standard.

Recent reaction from AM stations has shown that a strong position in either direction will spark an increase in stereo conversions. This is crucial since a new statement on AM stereo from the FCC may be close at hand.

Any further delay or attempt to "straddle the fence" of the AM stereo standards controversy on the part of the NTIA would only stand in the way of a final resolution of the AM stereo war.

—RW

Hurry Up NTIA

Anti-Copying May Hurt Radio

by John Sunier

Ross CA . . . Of urgent concern to broadcasters should be a piece of misguided legislation which may soon go into effect. It could seriously affect both broadcasters and consumers of pre-recorded music in all formats.

You have probably heard of the many attempts by the movie and recording industry conglomerates to prevent consumers from taping pre-recorded material, or to heavily tax them if they do so.

Their claim is that millions of dollars of royalties are lost due to personal illegal copying of recordings.

I personally feel this argument is without merit, and that most of those who do make tapes of other tapes, CDs and LPs are doing so for personal compendium cassettes, and/or for their car listening and other purposes, using albums they have purchased themselves.

At least one survey has shown that such "illegal tapers" are likely to buy many more recordings than those who do not tape.

Taxes on recorders or blank tape also do not recognize the many persons who use their recorders for speech and live music recording.

But a brand new development should concern us all.

As previously reported in *RW*, two identical bills awaiting action in the House and Senate would mandate an anti-taping chip in all Digital Audio Tape (DAT)

John Sunier is host and producer of Audiophile Audition, heard weekly on a dozen commercial classical stations and over 170 public radio stations. He can be reached at 415-457-2741.

recorders, which are to be introduced in the US later this year.

The new development is that Congressman Florio of New Jersey has added to the House HR-3 trade legislation bill his own ammendment, Section 901.

This ammendment extends the copy-code chip requirement from DAT to all digital PCM processors such as those currently being used by more than 60 radio stations in this country for time-delay taping from the satellite and for live remote recording.

Guest Editorial

While with a lot of paperwork radio stations may receive exemptions from this new law, independent producers such as myself may not.

There is also evidence, according to Jack Hannold, a specialist in audio-related legislation, that the copy-code chip technology is far from foolproof, and can be triggered by certain frequencies in live music.

This would mean that stations using the PCM processors to tape live concerts could end up with part of their tapes blank.

Just what is this patented CBS copy-code chip technology?

With today's space communications electronic advances, it must be a very sophisticated system, probably with sub-audible or super-audible cue tones or perhaps multiplexing, right? Wrong.

The copy-code chip is triggered by a notch into the flat frequency response of all recorded music, in whatever format.

This notch is centered at 3840 Hz, or

around B-flat, above middle C on the piano. And it extends downward as much as -60 dB at center!

Demonstrations of notched and unnotched music have been made for congressmen and senators by both sides in the spotlight of this controversy—CBS and the Home Recording Rights Coalition.

Reports are that the CBS demo showed the effects of the notch *inaudible*, and the Coalition demo, carried out by audio writer Len Feldman, showed all present that it *was* audible.

Just look again at those figures above. Do you honestly think that would be inaudible?

According to Hannold, CBS has already sent the special chips to insert the notch in master recordings to the major record labels, urging them to start employing the technology immediately.

Stations could well be receiving such albums for airplay in a few weeks, probably without any notation about the notch in the frequency response.

There is some talk of having two versions of each new album—one mass market version with the copy-code protection, and one audiophile version at a higher price without it.

I feel this is a disastrous suggestion in view of the chaos previous examples of such "double inventory" have caused the record retailing business.

If you agree that the copy-code chip technology is something for both broadcasters and consumers to be concerned about, I suggest you call the toll-free number 800-282-TAPE in Washington to get the latest folder of information on the subject from the Home Recording Rights Coalition.

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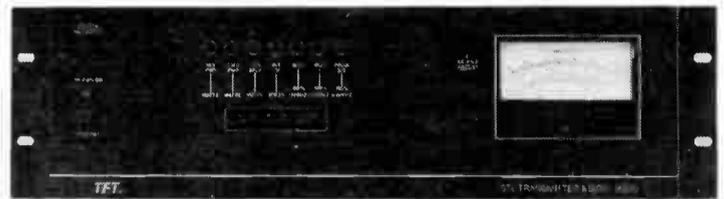
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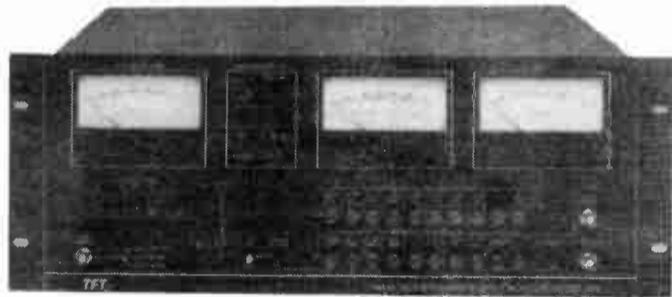


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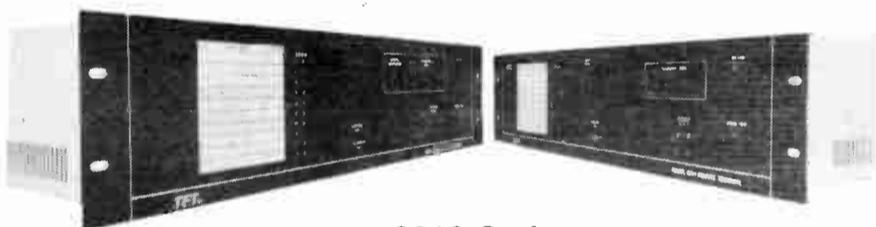


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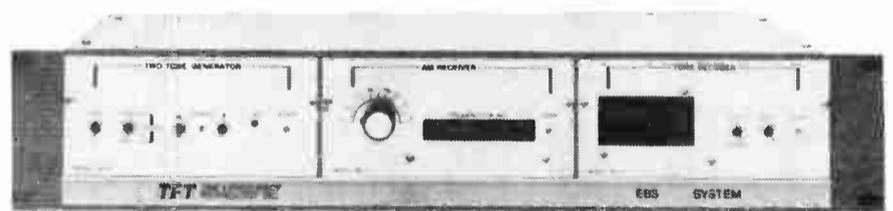
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Dial-Up Remote Gear Sales Up

In the third installment of our continuing series on dial-up remote transmitter control equipment, we take a look at the firms manufacturing and marketing the gear.

In previous installments, we have examined the FCC's rules governing dial up remotes. While dial-ups are legal, there is clearly some confusion in the broadcast community about the specific requirements, such as those applying to specified control points and Emergency Broadcast System (EBS) monitoring.

Yet, despite what some claim is the ambiguity of FCC rules, the dial-up remote industry is thriving, and, in some ways, the technology is being applied more aggressively to other "creative" uses such as remote systems for satellite networks.

by David Hughes

Part III

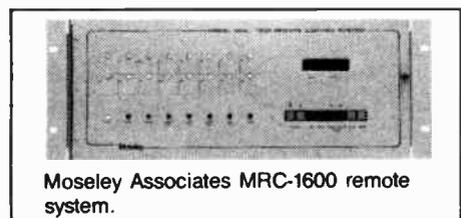
Washington DC ... Manufacturers of dial-up remote control equipment report increasing sales of their gear, as well as more "creative" uses from buyers. However, some report that sales, while still strong, have already peaked.

Special Report

While the equipment, which allows an engineer to access a transmitter via a dial-up telephone line, has been attractive to large stations with big budgets, there are indications that smaller stations are also welcoming the technology.

With the FCC's campaign to deregulate its rules, specifically the removal of the "how to" methodology behind the regulations, manufacturers are reporting that stations and, increasingly, stations fed by satellite networks, are now more apt to purchase dial-up equipment.

One manufacturer noted that he is witnessing an increase in demand for remote systems that permit a single control center, usually a network operations



Moseley Associates MRC-1600 remote system.

center, to monitor a series of station (affiliate) transmitters.

While most manufacturers report increasing sales, they are wary—for competitive reasons—about divulging price details and specific sales figures. Yet, as dial-up technology proceeds, it is evident that prices are coming down and the use in the field is increasing.

New uses

According to Gentner RF Products President John Leonard, part of reason for the rapid sales growth of his firm's VRC-1000 dial-up remote unit is that it is being used in "non-conventional places where remote has not been used before."

Approximately one-third of the "several hundred" units are in use at satellite network affiliates, he said. "Sta-

tions which take satellite feeds, particularly between 9 PM and 6 AM, are finding that remote control is affordable, and often less than typical costs."

The FCC has maintained that the satellite use of transmitter remote gear is legal provided that the station licensee had certified to the Commission that the remote site is a valid control point.

The remote site must also be able to shut down the transmitter and must be able to monitor Emergency Broadcast System (EBS) messages, although the FCC has made waivers in particular cases.

Several satellite networks including the Criswell Radio Network, South Dakota Public Broadcasting, the Bible Broadcasting Network and the new Willis Broadcasting Network are using the Gentner remote unit.

Leonard added that an increasing number of National Public Radio (NPR) member stations are installing the gear to monitor transmitter operations during the NPR overnight music service.

VRC-1000 sales have been above original projections, he said. The unit, which was available on the market in 1986, has achieved a 4% market penetration since then. Leonard notes that demand for the VRC-1000 has progressed from small market stations to large market stations, where many are used for back-up remote control.

More satellite users

Also in use in a satellite network capacity is Hallikainen and Friends' DRC-190 digital remote transmitter control/logging system, which has been available for about five years, according to Harold Hallikainen, president of the firm.

Hallikainen and Friends indicates that its system provides "continuous carrier control" to meet FCC regulations that the remote operator be in ultimate control of the transmitter. In case of a network failure, the stations' transmitters would be shut down by the loss of a specific network cue channel.

Several hundred DRC-190s, which are programmable in BASIC, are in use at stations, with about 30 being used by networks. The Skylight and Family Stations networks use the DRC-190 system to monitor affiliates' transmitters at night, he said.

Hallikainen reports increasing sales of the DRC-190, especially in uses with multiple sites such as group-owned educational stations.

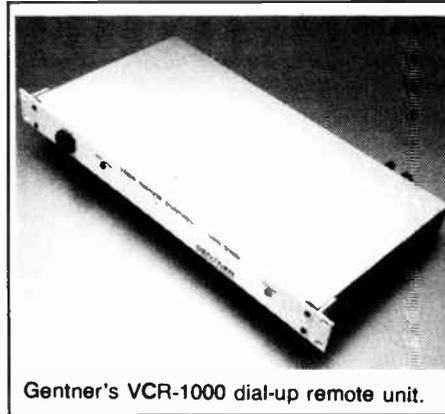
"We are seeing a move away from dial-up to multiple site uses." He said a system was recently installed by West Virginia Public Radio to monitor several stations from one site.

Strong sales

Other firms making dial-up gear also report strong sales. Peter Burk of Advanced Micro-Dynamics, said that sales of the TC-8 remote control system with the dial up option have been "steady" and "good."

He said the TC-8, without the dial-up option, has been on the market since January 1985 and is in use at "several hundred" stations.

Burk points out that the FCC has no problem with systems similar to the TC-8 because the dial-up operator makes changes with the full knowledge of the



Gentner's VCR-1000 dial-up remote unit.

on-duty operator at the notified control point. That on-duty operator can, at any time, break the dial-up circuit.

Figures on the number of TC-8s with the dial-up option were not available, however Burk said that recent sales "have not been so much for flexibility as for cost savings."

His firm's dial-up remote unit, which includes a fixed studio unit, is less expensive than "single ended" dial-up units, he maintains.

The Advanced Micro-Dynamic's unit is appealing to both large and small stations, Burk said. Larger stations, he said, use the TC-8 more for ancillary control and back-up, while smaller stations use it more for primary control.

Delta Electronic's RCS-1V remote control system, which has been on the market since July 1980, has 42 installations in the field, according to Delta Marketing Administrator Josephine Harriott.

Most customers of the Delta dial-up gear tend to be larger stations, she said. "Large stations with sophisticated remote control needs bought the gear early on."

Ups and downs

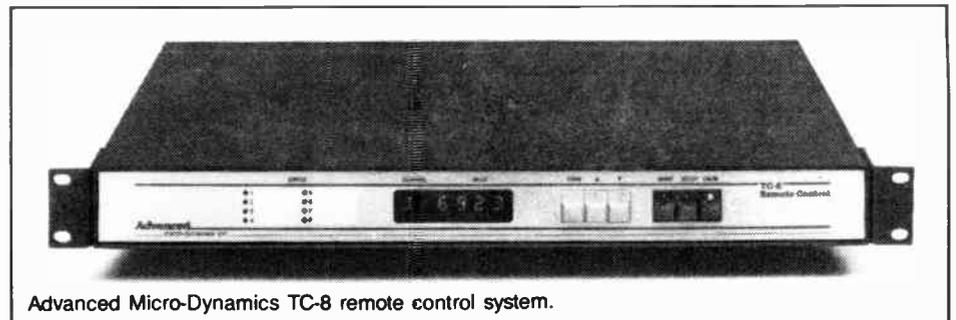
Despite some ups and downs in sales over the years, sales have been picking up lately, she said. "Still, I'd say the (dial-up) gear seems to be more popular with big stations."

Moseley Associates President Fred Zimmermann also reported strong sales of his firm's dial-up gear including the MRC-1600 and the MRC-2 microprocessor remote control system, as well as the MDU dial access remote control.

"We have noticed a peak in sales of dial-up remotes, and things are (recently) starting to level off in response to market saturation," Zimmermann said.

For more information about the various dial up remote control systems contact: Peter Burk at Advanced Micro-Dynamics, 617-456-3570; Josephine Harriott at Delta, 703-354-3350; John Leonard at Gentner RF Products, 408-926-3400; Harold Hallikainen at Hallikainen and Friends, 805-541-0200; or Fred Zimmermann at Moseley, 805-968-9621.

In our next installment, in the 1 July issue, we will look at some users of dial-up gear and examine why they purchased this type of equipment.



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VOA Bids Causing Concern

(continued from page 1)

Dynalectric officials to the March NAB show "to introduce them to the vendors. We wanted to introduce them to the broadcast industry."

But some industry sources say that lack of familiarity is two-sided, and that recent criticism stems from the fact that broadcast equipment firms are unfamiliar with government contracts.

Grunley-Walsh, regardless of who their subcontractors are, "is doing just what was expected. It's cost effective to negotiate with manufacturers to get the best deal," one broadcast equipment source said.

Broadcast consultant Ron Schiller, of Ron Schiller Associates, suggested that "the broadcast (equipment) community did not do its homework. Unfortunately, I do not think people sharpened their pencils (and) looked at alternate ways of doing things."

He maintained that the audio gear could be supplied for between \$3.4 and \$3.6 million—close to the price the contract calls for.

But Schiller added that there should have been two projects from the start, a construction project and a technical project.

"Government contracts," one equipment manufacturer said, "—it's a much bigger business than we're used to. It's apparent that other than broadcast



19 VOA studios will be modernized with installation of new equipment to the tune of \$3.2 million.



Although new radio studio gear is an important part of the project, to date no major broadcast firms have become involved.

equipment firms will be doing (the VOA project)."

Grunley-Walsh's Sanata said he had not heard any rumblings from the broadcast equipment industry. He said his firm, with its 30-year history, is well acquainted with government contracts and how to fulfill them properly.

He also stressed that Grunley-Walsh selected Dynalectric from among "competitive bids" from other subcontractors.

He maintained that Dynalectric is a large, experienced firm and that he has confidence that it can obtain and install the audio equipment at the price quoted and within the 20-month time frame.

Firm indicted

However, some questions have been raised after recent federal indictments against Dynalectric. The indictments allege bid rigging by the company in connection with electrical contracts involving a Kentucky power plant and a Geor-

gia sewage treatment plant.

Sanata said that federal indictments against Dynalectric should not effect the VOA project.

While Sanata said he was aware that Dynalectric had been determined to be at fault, he maintained that event would have "no effect" on the firm's participation as a subcontractor on this project.

Sanata said he was unaware if Dynalectric would itself obtain the audio equipment the VOA specified in the contract or whether it would hire another firm to handle that.

Dynalectric Assistant VP Denny Worch told RW that he did not foresee any problems with obtaining the equipment. He added that the firm is working with another company—Jullian Enterprises—to procure the gear.

Worch said that Dynalectric will immediately begin the installation of wiring at the VOA facility with the equipment installation to follow at an unspecified later time.

PCBs and asbestos

Before the actual VOA studio renovation work can start, toxic substances will have to be removed from the existing VOA studios.

The VOA's DeFontaine said that cancer-causing PCBs and asbestos will

have to be hauled away from the site. Yet, he maintained that both hazards had posed "no danger" for VOA workers before their removal.

Oil containing toxic PCBs—polychlorinated biphenyls—was originally used as lubrication to pull wires through conduits. Sanata said that in some cases the oil is starting to leak out of the conduits.

While the use of the PCB lubricant was "fairly extensive" around the cable in the VOA's master control, he said that overall its use was "not extensive."

DeFontaine added that the lubricant, which contained a "low grade" of PCBs, was "not volatile and not a major problem to remove."

Another potential cancer causing agent, asbestos, will also have to be removed before renovation can take place. Lung cancer can develop following chronic inhalation of dust containing asbestos fibers.

Asbestos is contained in many wall and ceiling tiles, Sanata said. "It's low grade, and not a major problem," he stressed.

Sanata added that the removal of both health hazards will be performed by subcontractors.

For more information on the VOA project, contact Ed DeFontaine at the VOA, 202-485-6303, or Chuck Sanata of Grunley-Walsh, 301-881-8500.

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Final Numbers Ready on

by David Hughes

Greenwich CT . . . Development of the "final numbers" that detail technical specifications of the FMX FM stereo coverage extension system, including recent modifications to reduce multipath problems, is scheduled to be completed this summer.

According to Emil Torick, who co-developed the system with NAB Science and Technology VP Tom Keller, work was taking place in late May on the final documentation for the system. The data is needed to continue the development of receiver chips.

"We are just dotting the last 'i' and crossing the last 't,'" he said. "Everything is going well." The work is scheduled to be completed in "June or July."

Torick indicated that the completion of the documentation is the latest step in a campaign to convince the industry—everyone from chip producers, receiver and generator manufacturers to radio stations—that previous multipath-type

Completion of the "final numbers" are a major priority for the development of receiver chips, Keller said. Chip development is more time consuming and needs "exact numbers," unlike the development of FMX generators, which will take place later.

He added that "98%" of the FMX project is now geared to foster chip production. "At this point it's our number one concentration."

At the March NAB show, Sanyo and Sprague announced that they would produce FMX chips. Keller said that the Sanyo chip is "right around the corner. There is a lot of work going on."

Torick added: "The timeframe for

receivers depends on Sanyo (and Sprague)—it's still up in the air."

Generator manufacturers are currently "in a holding pattern" while waiting for the final numbers and chip development, Torick said.

Before reports of the multipath problems in 1986, several firms had announced plans to manufacture FMX generators including Orban, Circuit Research Labs (CRL), Aphex and Inovonics.

All now say they are waiting for the FMX standards data from Torick. The manufacturers maintain that their work on FMX generator development will continue.

Once the data is formally released, work will shift to FMX generator development including related on-air tests, added Torick, who recently visited the manufacturers. He indicated that they "all plan to factor FMX into their plans. Right now, they're still waiting for the data."

Keller agreed that once chip development has progressed—a process which, he said, could take up to a year—the FMX team will focus on generator development, which he maintained is not as time consuming.

For more information about the FMX system contact Emil Torick at 203-622-2643, or Tom Keller at the NAB, 202-429-5346.

“ 98% of the FMX project is now geared to foster chip production. ”

interference problems noted during on-air tests last year have been solved.

Those modifications were highlighted at the March NAB show, along with a new organizational structure for FMX development.

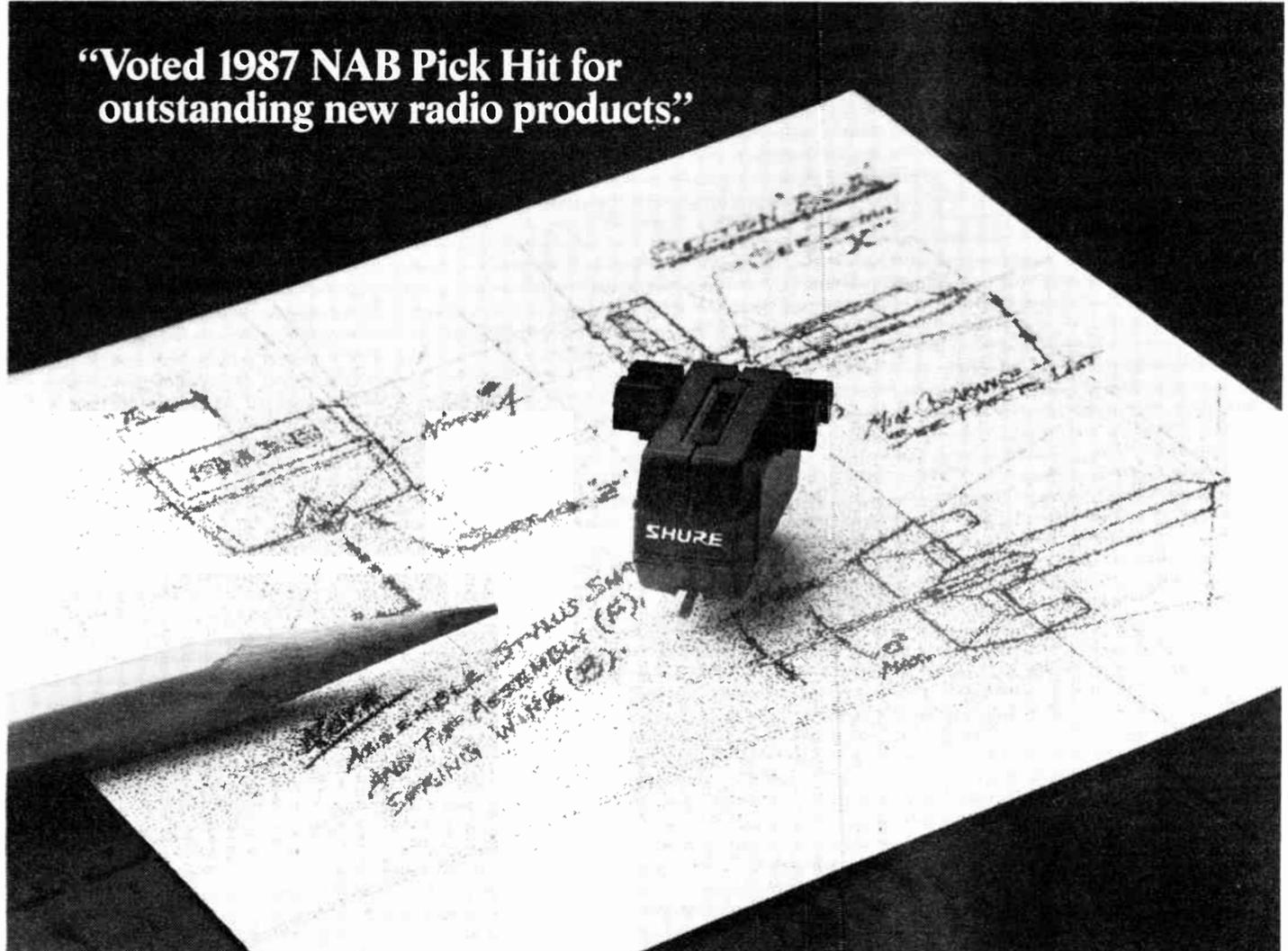
Broadcast Technology Partners (BTP) was created after last year's closing of the Stamford, CT-based CBS Technology Center, where the FMX research had been taking place.

Torick said that eight BTP engineers, formerly from CBS, are continuing the FMX work in nearby Greenwich, CT.

Progress has been reported on the development of FMX chips, which will lead to receiver development. Torick said he would not predict when chips would be available.

At press time, he said more details about chip development would be released at the International Conference on Consumer Electronics (ICCE) which follows the late May Consumer Electronics Show (CES) in Chicago.

Yet, Torick added that since system documentation probably would not be finished in time for the most recent CES, a major push for the next phase of FMX system development probably would have to wait until the next CES, in January 1988.



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NTIA Study Finally Underway

by Alex Zavistovich

Washington DC ... After several months of slow progress, the National Telecommunications and Information Administration (NTIA) is prepared to proceed with testing of multisystem technology for AM stereo, anticipating results by mid-summer.

Pivotal to the NTIA's study is the contribution by Motorola of C-QUAM equipment for the tests. As late as May, Motorola had been reluctant to participate in the study, opting to wait for further information on the nature of the government agency's testing.

Now, however, the NTIA's Institute for Telecommunications Sciences (ITS), in Boulder, CO, has received the required equipment, according to Val O'Day, the institute's executive officer. ITS has been charged with conducting the AM stereo multisystem tests.

O'Day said he was particularly pleased that Motorola agreed to participate by supplying the ITS with basic C-QUAM exciter equipment. With the equipment now in, he commented, the "first iteration of results" should be completed by July.

Although O'Day declined to provide details of the testing, NTIA spokesper-

son R.T. Gregg said the results would be sent back to the administration's headquarters in Washington, DC. An analysis of the test results should be published by the end of July, he speculated.

The NTIA's decision in February to conduct further testing of multisystem technology, rather than naming a de facto standard in the AM stereo battle, was met with a flurry of presentations, both supporting and opposing the tests.

Motorola, Kahn Communications, and Hazeltine each made verbal and written presentations to the NTIA staff at the ITS on the characteristics of their AM stereo systems, and on technical aspects of

multisystem receiver technology in general, Gregg said.

"Numerous" presentations were also made, he added, on the development of AM stereo and the practicality of multisystem technology.

Motorola, in particular, presented engineering statements on the subject of multisystem integrated circuits, and why such chips have failed in the marketplace in the past.

Motorola AM Stereo Manager Frank Hilbert told RW in early May that his company had put off sending C-QUAM equipment to ITS partly because there had been no response from NTIA to Motorola's presentations.

Gregg noted, however, that despite the presentations, NTIA "felt an obligation to follow through with the examination" of the multimode issue. Motorola was told that the NTIA wanted its cooperation in having the equipment tested in the ITS labs, he said.

In turn, Motorola responded by providing the equipment, but only "out of a desire to cooperate 100% with any government agency," Hilbert said. He stressed that Motorola's participation in the project did not signal the company's acceptance of multisystem technology.

"Because the NTIA has no test plan, or has not made it public, and is not allowing witnesses, Motorola will disclaim any results, regardless of how they will turn out," Hilbert said.

"There is no need to test a technique which has resoundingly been rejected by the marketplace over the last five years," he added.

Regardless of Motorola's skepticism over the NTIA study, the company's participation has eliminated the final obstacle to government testing of the concept of a multisystem chip which can satisfactorily decode both the C-QUAM and Kahn/Hazeltine ISB systems.

At press time, Kahn Communications President Leonard Kahn declined to comment to RW on the NTIA's testing. When the study was first proposed, however, Kahn promised complete support for the project.

For additional information, contact Val O'Day at 303-497-3484, R.T. Gregg at 202-377-1551, or Frank Hilbert at 312-576-4889. Contact Leonard Kahn at 516-222-2221.

Plans for AM Band

by David Hughes

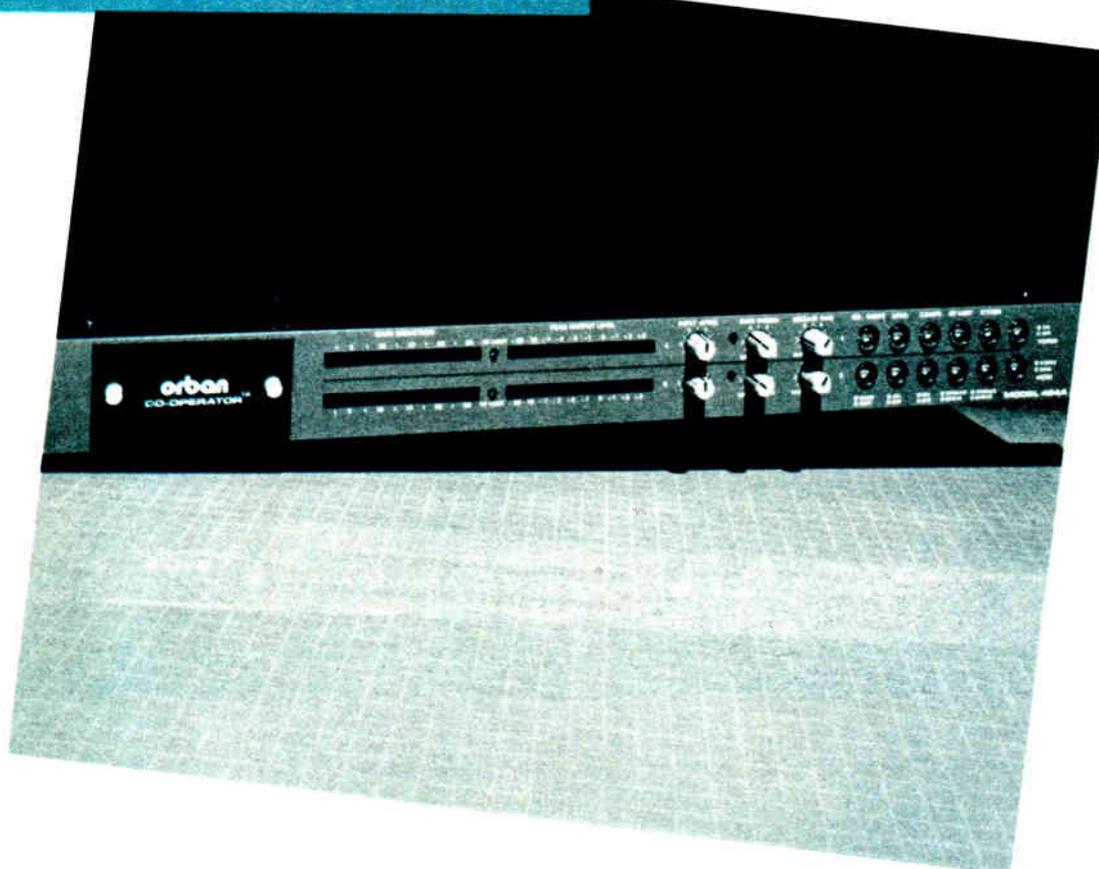
Washington DC ... Procedures about how and when stations will fill the new 1600-1700 kHz addition to the AM broadcast band were examined by the Radio Advisory Committee (RAC), when its Technical Subgroup met 4 May.

Technical Subgroup Chairman Wallace Johnson said the RAC, which is composed of FCC and industry representatives, is developing plans for the second session of the "Region 2" (western hemisphere) Administrative Radio Conference (RARC) sponsored by the International Telecommunication Union for the spring of 1988.

The first RARC session, which established the preliminary groundwork for the band expansion, including 10 kHz channel bandwidths, was held in April

(continued on page 12)

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Circle Reader Service 36 on Page 28

Study Cites Lack of Complai...

by Alex Zavistovich

Washington DC ... Static, or interference on AM radio stations caused by electrical devices, generally goes unreported to the FCC by the listening audience, according to a recent survey conducted by the NAB.

Results of the survey were released on 13 May, following a meeting by the NAB Executive Committee, at which topics including the National Radio Systems Committee (NRSC) preemphasis standard and the FCC's indecency standard were addressed.

The survey on AM interference was sparked, the NAB maintained, by recent FCC comments that interference to broadcast reception is not a problem. The Commission supported its position by citing a lack of complaints from the public, the association said.

However, some 60% of the respondents to the NAB's poll answered "Yes" when asked whether they ever heard static or interference to AM stations, the NAB said. Approximately 38% of those polled said "No."

According to the survey, listeners who hear static are most likely to fine tune the station, keep listening, or change to another station. None of the respondents listed contacting the FCC about the problem.

NAB Radio Board Chairman Bev Brown said the survey's conclusions show "there is a real interference problem, even if the FCC has not recognized it."

Brown commented that the Commission ought to set guidelines to prevent interference, "rather than await degradation of broadcasting that is suddenly recognized by emerging complaints."

Man-made sources cited

Power lines, other radio stations, and other man-made sources were most commonly cited by the survey's respondents as probable culprits in AM interference.

Complaints regarding such interference, as well as other types, fall under the purview of the FCC's Public Contact Branch. Sue Earlewine, the branch chief, told RW that complaints of electrical interference have remained constant over the past four or five years—approximately 8% of the total received by the Commission.

The majority of the complaints—roughly 90%—are traceable to devices in the home, such as light switches, furnaces, or VCRs, she said.

The FCC produces an interference handbook, a compilation of the most common problems and their possible solutions, Earlewine said. The booklet also includes a section

on equipment manufacturers and the services they provide to their customers.

Copies of the interference handbook are available at any FCC office at no charge, she added.

The FCC is also preparing a recommendation regarding emission limits for RF lighting device interference to AM radio, slated for the end of June.

Last year, the FCC proposed radiation limits on RF lighting devices at frequen-

cies below 30 MHz. Comments in response to the proposal included a statement by the NAB, which supported interim use of a more stringent restriction of $4.5/f(\text{MHz}) \mu\text{V}/\text{m}$ limit in the frequency band 0.45 MHz to 1.705 MHz, measured at a distance of 30 m.

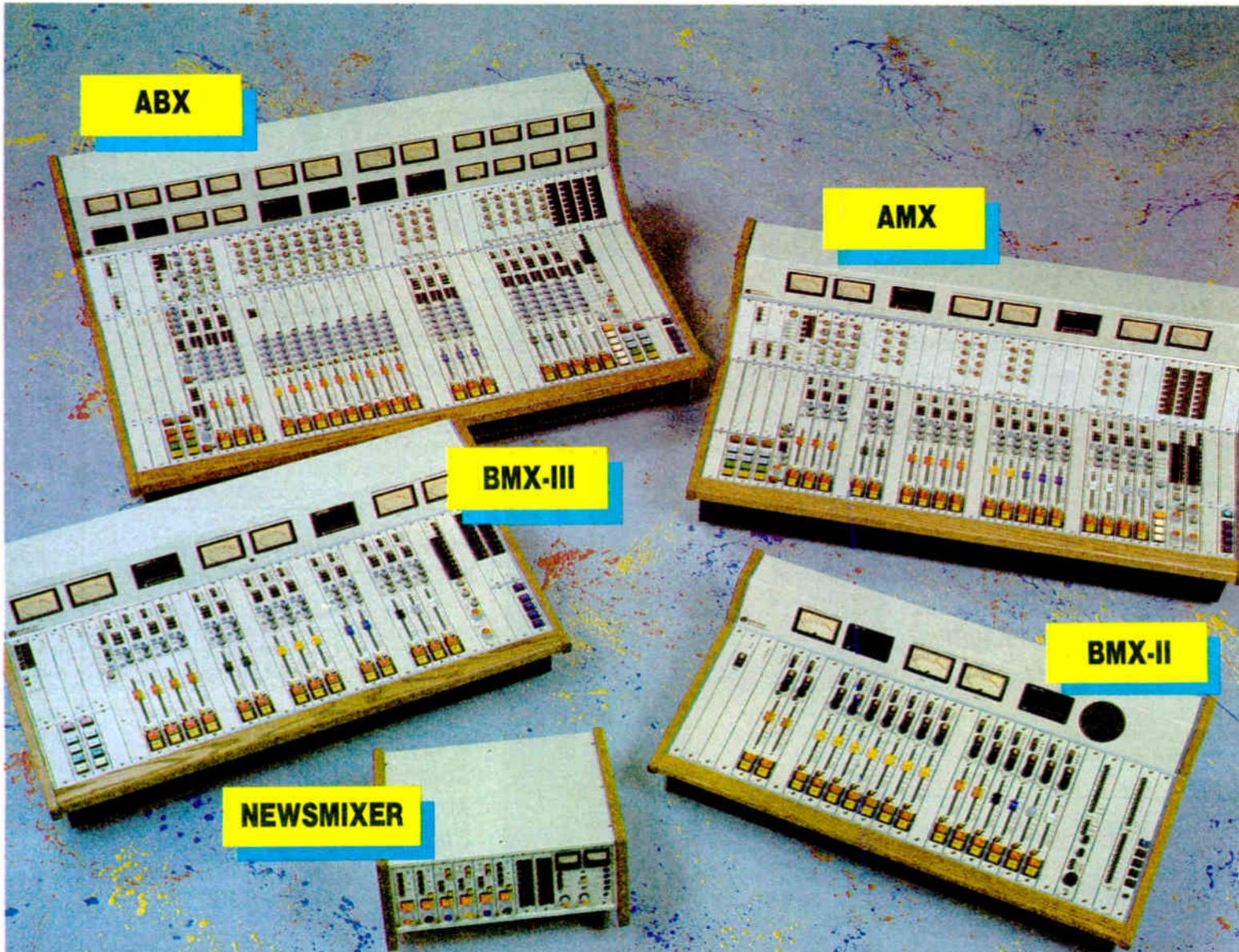
NAB Executive Committee action

The NAB Executive Committee, which met on the same day the interference

study was released, addressed a number of issues, including conversion of AM stations to the NRSC preemphasis/deemphasis standard. The standard calls for a $75 \mu\text{s}$ preemphasis, with corresponding deemphasis, and a 10 kHz band pass filter.

The NAB has initiated a mailing to every AM radio station in the country, said Brown. The mailing includes response

(continued on page 12)



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No RFI Complaints

(continued from page 11)

cards, to determine whether stations have converted or are planning to convert to the NRSC standard, he added.

Although when the Executive committee met, the mailing project had been underway for less than one week, Committee Chairman Ted Snider said that over 90 stations had responded in favor of the standard. Many stations indicated they have already adopted it, he noted.

"Our goal is for every station to adopt the standard as soon as possible," Snider commented. He said that radio manufacturers have to be convinced that the

NRSC standard is widely supported before they will begin to build compatible receivers.

Indecency clarification

In other executive committee action, Snider said the NAB will ask the FCC for a clarification of its recent indecency ruling.

"Not all broadcasters are fully aware yet of exactly what the new FCC guidelines entail," said Snider, who speculated that a clarification would answer many broadcasters' questions on the matter.

In addition to announcing the request for clarification, the executive committee

made a statement regarding indecency in broadcasting.

"The Association has condemned the broadcast of indecent or obscene material by broadcasters in the United States," the statement read.

The committee maintained such broadcasting is "contrary to the public interest and (has) no place in our system of free over-the-air broadcasting."

The statement did not directly mention First Amendment considerations, which the NAB has cited in the past on the indecency question.

Congress of Broadcast Organizations

In related news, Snider also presented the opening remarks at the meeting of the Congress of Broadcast Organizations, held later on 13 May at the

NAB.

The Congress, he said, is comprised of representatives from a variety of broadcasting concerns, including the NAB, the Radio-Television News Director's Association, and the Radio Advertising Bureau.

At last year's Congress meeting, members agreed to have broadcasters participate more actively on accrediting councils of communications schools, Snider said.

Although no details of this year's meeting were available at press time, the agenda again included broadcast organization representation on those councils.

For additional information, contact the NAB at 202-429-5300. Contact Sue Earlewine at the FCC Public Contact Office: 202-634-1940. The RF lighting dockets is GEN 83-806. Contact Liliane Volcy at 202-653-7316.

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KTGF—Great Falls, Montana Mr. Roy Dasher, Chief Engineer

"I'm very satisfied with the quality. It also frees-up the internal subcarrier channels on the existing system; one for control, the other two are for future use. I'm also able to feed a microwave link to the cable head without problems."



WTMV—Lakeland, Florida Mr. Bill Brister, Chief Engineer

"I've been using it for approximately one year now and I think it's great! I can get to it easily because it's in the studio; I can set levels and not worry about the signal quality at the transmitter."



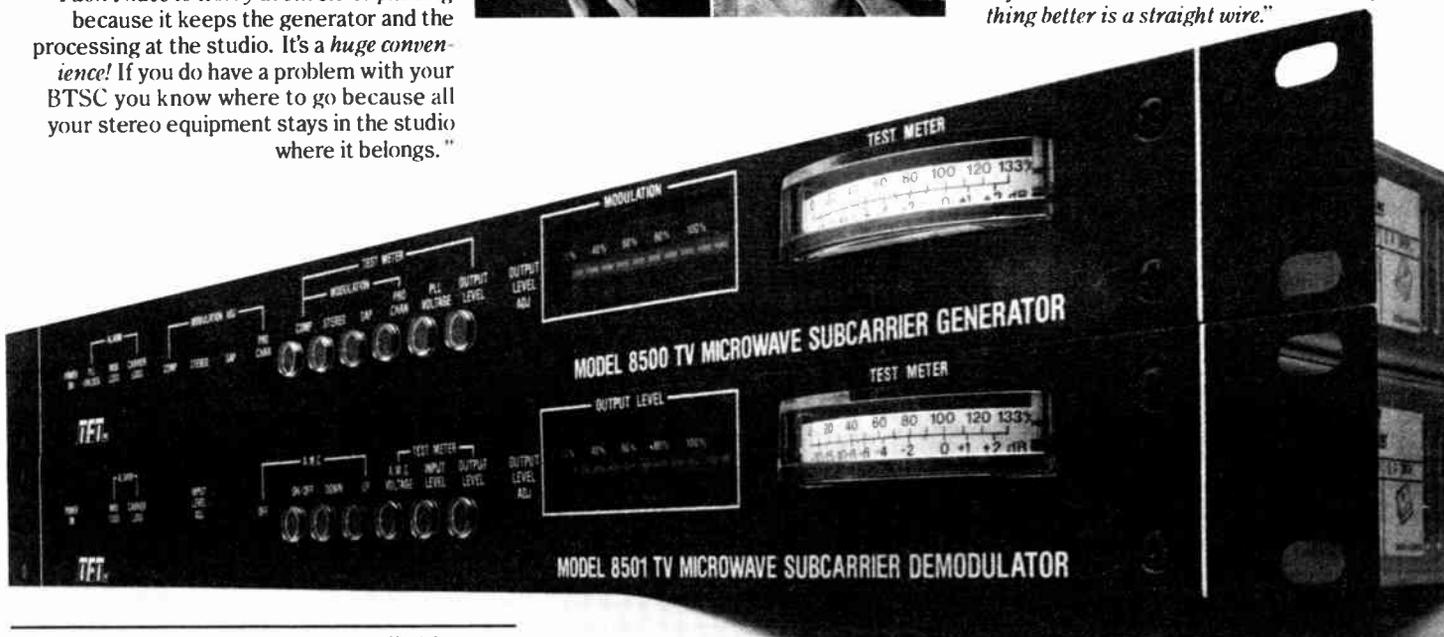
KXTV—Sacramento, California Mr. Rod Robinson, Chief Engineer

"It's transparent, with no problems at all; I don't have to worry about stereo phasing because it keeps the generator and the processing at the studio. It's a huge convenience! If you do have a problem with your BTSC you know where to go because all your stereo equipment stays in the studio where it belongs."



WYFF—Greenville, South Carolina Mr. Mike LaBoone, Chief Engineer

"I like the idea of having the control here; audio processing belongs at the studio, not the transmitter. The 8500 system freed-up 2 other subcarriers for me; one is for mono standby while the other is for remote. My recent tests have shown that the only thing better is a straight wire."



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New Band is Discussed

(continued from page 10)

and May 1986 in Geneva, Switzerland.

A major topic at the upcoming second RARC session, according to Johnson, will be the refinement of an allotment planning method for stations in the new band segment.

According to allotment method, which has been supported by the US and the FCC and discussed at the May RAC meeting, station locations and protection areas will be predetermined by specific geographical areas, with a minimum of negotiation needed to solve incompatibilities between neighboring countries.

This method differs from a assignment method, in which stations target areas where they want new stations, such as areas of high population, and then begin much more extensive negotiations with neighboring nations.

According to those gathered at the RAC meeting, Johnson said, there was a consensus that the favored allotment method "needs to be refined, with more attention paid to border area planning."

He also said western hemisphere nations will discuss at the 1988 RARC session plans of some nations to continue non-broadcast related services in the new 100 kHz of AM band.

However, Johnson added that the issue will not affect the US because the US, Canada and Mexico all plan to use the new band segment only for broadcasting.

Stations could begin using the 1600-1700 kHz band in the US by the early 1990s, he said.

During its May meeting, the RAC Technical Subgroup also discussed AM synchronous transmitters, specifically how best to exchange information with the FCC about on-air tests now being conducted, and other AM improvement issues being proposed by the FCC.

Johnson added that the FCC is planning to reevaluate its AM technical standards, including interference ratios and propagation curves, "in the next couple of months."

The next RAC Technical Subgroup meeting is scheduled for 11 June at the NAB headquarters in Washington DC. For more information about RAC activities, contact Wallace Johnson at 703-841-0500, or RAC chairman Larry Eads at the FCC, 202-632-6485.

Slow Going for RFR Law

NPR
14 Radio World

by Alex Zavistovich

Washington DC ... Two suits filed last year, claiming that radiofrequency radiation (RFR) led to the cancer-related deaths of persons exposed to it, are proceeding slowly—both cases are in the "discovery" phase, prior to actual trial.

On 1 May 1986, a suit was filed on behalf of Marie Lafferty in Kentucky's Floyd Circuit Court, against Continental Electronics and Collins Radio.

Two months after the Kentucky filing, on 30 July, attorneys for Thomas DiLuzio in Spokane, WA brought charges against KGA-AM, Spokane, and Price Broadcasting, the station's Salt Lake City-based owner.

In each case, exposure to high RFR levels was blamed for bringing about the death of the plaintiff's spouse.

The physiological effect of nonionizing radiation such as RF has become a source of public concern lately. In addition to the pending legal cases, citizens groups in the vicinity of broadcast antenna farms have requested surveys of RF levels emanating from the tower sites.

Trial this winter

Of the two RF law suits, the Lafferty case has seen the most progress to date. Stuart Lemle, Marie Lafferty's attorney, said the claim is slated for trial this winter.

Lafferty's husband, William, was employed for 22 years as a radio engineer for WDOC-FM, Prestonsburg, KY, which uses a Collins-made transmitter. He died 11 August 1983 of leukemia.

The suit against Continental and Collins Radio alleges the latter company did not adequately warn William Lafferty of the possible harmful effects of prolonged exposure to radiofrequency radiation.

Continental spokesperson Steven Claterbaugh had no comment on the case, except to point to an inaccuracy in the suit's listing of defendants. The case names both Continental Electronics and

Collins Radio Company.

There has been no Collins Radio since the early 1980's, Claterbaugh explained. The company, now simply referred to as Collins, currently manufactures avionics and related equipment, he said.

Lemle commented that if there was no legal relationship between the two companies, it may be the basis for a defense against the suit. However, he said, the nature of the relationship has not yet been settled.

Collins' legal counsel, Linda Hopgood, would not comment on the case.

Moving slowly

The suit filed by Thomas DiLuzio in Spokane is also moving ahead, though slowly. At press time, DiLuzio's attorney, Richard Eymann, said no depositions had been taken; however, both the defendants and the plaintiff have been "doing independent investigation" on the case.

The suit maintains that DiLuzio's wife, Janice, died as a result of prolonged exposure to KGA's 50 kW signal. Janice DiLuzio was diagnosed in 1982 as having cancer of the blood plasma cells.

The complaint further charges that KGA maintained a nuisance, and alleges that the station did not warn nearby residents of possibly harmful effects of RFR. The suit, in addition to KGA and Price Broadcasting, also named Spokane County and the county school district as defendants.

Eymann noted, however, that summary judgments have eliminated the county from the complaint. The school district will likely be removed from the suit as well, he said.

KGA's attorney, Richard Kuhling, said the case was "speculative" and the medical information pertaining to it was "voluminous."

At the heart of the two cases is the question of whether RFR can, in fact, cause harmful health effects, particularly cancer. The medical community has

varying opinions on this issue.

Dr. Kristian Storm, a surgical oncologist with the UCLA School of Medicine, has stated that "no human cancer has been known to occur from nonionizing radiation at the low end of the spectrum."

"To my knowledge, RF radiation is not a carcinogen in man," said Storm, who is also chairman of Committee C95.1 of the American National Standards Institute (ANSI), the group charged with the development of RF exposure standards.

However, Dr. Bill Morton, professor of environmental medicine at the Oregon Health Sciences University, maintained that "there is a growing amount of evidence" of the harmful biological effects of RF radiation.

Prolonged exposure to RF energy may affect tissue growth in situations where tissue is growing rapidly, such as fetal development, or is out of control, as in cancer, he said.

Concerns over such possible ill effects have led citizens groups to request measurement studies by the FCC and the Environmental Protection Agency (EPA) of RFR levels emitted from radiating elements at broadcast antenna farms.

Two such studies have been completed this year—one in Portland, OR, the second in Denver, CO. While results of the surveys have indicated that energy levels

at the sites gene.

limits, some remain particularly in Portland, where lines are only one-fifth the standard.

EPA branch chief resigns

In related news, Rick Tell, chief of the Las Vegas-based Electromagnetics Branch of the Environmental Protection Agency (EPA) will resign his position at the end of August.

The Electromagnetics Branch provides technical support for EPA's RFR regulation development, instrument evaluation and environmental assessments. Most recently, Tell's branch made the measurements for the joint FCC-EPA radiation studies in Portland and Denver.

At press time, Tell's successor had not been selected. Tell said branch officials are undecided about whether or not to choose a replacement from within the organization.

Following his departure, Tell is expected to launch a private RF consulting firm, headquartered in Las Vegas. The firm will serve any group with concerns related to RF energy.

For additional information on the RF suits, contact Stuart Lemle at 202-785-1020 or Richard Eymann at 509-838-6800. Contact the EPA's Electromagnetics Branch at 702-798-2440.

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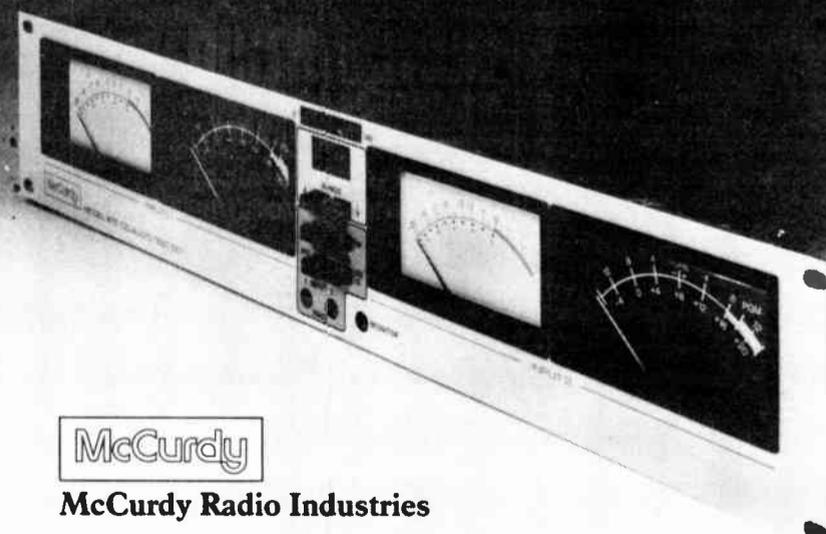
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CPB Considers "Unbundling"

by Mike Starling

Washington DC . . . National Public Radio has endorsed the concept of "unbundling" its programs and authorized plans to do so in a major policy reversal during the 29 April-3 May Public Radio Conference.

Unbundling permits local stations to purchase individual programs without paying full membership dues.

Just two years ago during an impassioned seven-hour meeting the membership rejected a proposal to "unbundle" program offerings by a resounding 95% vote.

The network then became embroiled in financial restructuring to help eliminate the \$9.1 million debt amassed in 1983.

Having repaid the \$9.1 million loan to CPB on schedule last September, the focus this year shifted to measures aimed at doubling the '86 national audience levels by 1990.

Audience growth for NPR News was up 22% during the past year, but against ever-present funding uncertainties NPR President Doug Bennet told the membership, "Audience growth continues to be the most promising key to future revenue growth."

The move to unbundle was reinforced by several positive indices of station and market acceptance and loyalty.

Mike Starling is CE of KPBS in San Diego. He can be reached at 619-265-5025.

For one thing, the increased cost of NPR programming has not resulted in the wholesale abandonment of the network some members feared.

There was a net loss in fiscal year '87 of only four stations versus contingency estimates of nearly twenty.

At the 1985 and 1986 conferences, concern was voiced that a substantial affiliate drop would create a bottomless spiral whereby the increased share of costs for remaining members would cause even more to withdraw, resulting in a crisis in NPR's ability to survive.

Though the "spiral" has not materialized, the loss of KUSC and KLON in the Los Angeles market, plus funding cuts

at many smaller stations, did fuel concern over the need to modify membership requirements for stations wishing to purchase selected NPR offerings.

Stations in Alaska have been particularly hard hit due to the drastic curtailment of state support and a limited potential listenership.

Speaking on "enlarging the tent" Bennet observed that the over 1,000 non-commercial stations which are not among the 300-plus NPR members, "collectively control an enormous quantity of noncommercial spectrum space and represent a multi-million dollar investment in facilities and programming."

He added, "We need to see these sta-

tions as an opportunity to expand and diversify our service."

In the end the resolution authorizing plans to unbundle passed by a 135-45 vote. The membership resolution requires a final vote on unbundling not later than July, 1988.

Engineering concerns

Technical sessions at the PRC were dominated by preliminary research on remodeling of the public radio satellite interconnection system in anticipation of the loss of Westar IV in 1992. (See 1 June RW.)

This year's conference was also preceded by an intensive, five-day engineering workshop sponsored by NPR and held at its Washington headquarters.

The workshop covered state-of-the-art operation of satellite systems, digital recording, field recording techniques and transmitters.

Digital conversion was the principal topic in a session called "State-of-the-Art in Radio Technology" given by Skip Pizzi, NPR's Training Coordinator.

Pizzi predicted that the rapid influx of digital storage on CDs is just the beginning of a revolution and will be followed by a transition to digitally encoded signal paths (such as STLs), and eventually digital transmission.

Pizzi noted that many stations are already using CDs and video for digital audio recording and that some have digital STLs. He suggested that the next area will be R-DAT (rotary digital audio tape), already available in overseas markets.

(continued on page 22)



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And because the 42B probably offers more features per dollar than any equivalent machine, it makes everything else seem downright expensive, too. (+4 dBm balanced inputs and outputs, plus easy-access calibration are just a few of its standard features.)

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And your budgets. **TASCAM**

Mark of a Leader is Training

by John Cummuta

Downer's Grove IL . . . Somewhere in the Pacific, as you read these words, the Supercarrier USS Chester W. Nimitz and her battle group protect our lives and our interests.

Carrying about 90 aircraft and enough firepower to singlehandedly alter global geography, the Nimitz is a magnificent tribute to the man who commanded the Pacific naval forces in World War II.

But to my knowledge Admiral Nimitz never once fired a shot against an enemy. Neither did he ever drop a bomb or launch a torpedo.

Why then do we pay such homage to a man who didn't so much as get a serious scratch during the war?

Because he was the person who called the shots—and he *made sure that his men were properly trained to successfully accomplish the tasks he assigned them.*

Had the men of the Pacific Fleet failed, Admiral Nimitz would have been considered a failure as a manager.

Since they succeeded, he is considered a brilliant manager. In both cases, he would have succeeded or failed from his offices in Hawaii.

The difference was simply the performance of his personnel; and that was

John Cummuta is president of Marketline, a broadcast management and marketing consulting firm, and a regular RW columnist. He can be reached at 312-960-5999.

determined by their preparation to do their jobs.

As a manager you're in the same boat. Your performance will be much less judged by the particular things you do as opposed to the things your people do.

You are now evaluated on your department's performance. Even if you're a solo engineer your success or failure will in part be decided by how well the jocks understand how to operate your equipment.

Engineering-Manager

You will no longer be rated solely on your ability "to do" but much more on your ability "to teach."

The first principle we must agree on is that, with few exceptions, people really do want to succeed at their jobs.

They want to do a good job as the boss would describe a good job.

There are managers out there who think that people are basically lazy and want to do as little as possible.

They believe that you will only get the performance that you beat out of people. These managers are absolutely wrong.

Laziness is not the nature of the average worker, and that type of management mentality results in mediocre performance at best—and usually a high turnover rate.

What gets high performance from em-

ployees is leadership. And one of the key facets of true leadership is the willingness and ability to impart knowledge: the ability to train your people to do the better job that they really want to do in the first place.

There are basically three main aspects to leadership: example, guidance and training.

You cannot effectively lead if there is hypocrisy in your example. You must lead by example.

You must also provide guidance, and this sometimes includes discipline.

The third and vital component of true leadership is the ability to train and develop your employees.

The first step in an effective training program is the establishment of objectives for the training.

These objectives should include both overall goals for your long-range training program and specific goals for each training session.

When you begin each training, you want to start by telling the attendees exactly what you feel they should know by the end of the session. Tell them where you're taking them, and what knowledge they will gain.

Setting these goals will also help you crystalize your thinking, so you won't go trailing off the track during the training itself.

Next you'll want to write an outline of the overall training program; then an individual outline for each training

session.

This individual training session outline should be given to each trainee as part of the handouts at the beginning of each session.

Again, writing the outlines will help you focus your thoughts in a logical pattern so that the information will build on itself in a meaningful sequence.

The outline will also help the trainee to review the things you teach in the same order you taught them, giving your efforts double value.

If the idea of actually making your people handouts sounds silly to you, then success must seem absolutely foolish to you.

Handouts are very important for two reasons: they will cut down the writing required of each student, so they can pay more attention to you; and they give the trainee more review material to reinforce the actual training.

The individual session outline you generated earlier is, of course, one of your handouts.

Another should contain any diagrams or math examples. Anything that would add visual impact to the information. Copies of any pertinent regulations or procedures would also be good.

You want the trainees watching and listening to you, not busy trying to copy your artwork or furiously taking notes.

Complete visual handouts can also make up for lack of a chalk or marker
(continued on page 24)

Put the Tascam CD-501 next to any other broadcast compact disc player, and you'll find there's no comparison.

Nothing can compare to the purity, clarity, and accuracy of its sound, thanks to breakthroughs like Tascam's proprietary ZD Digital Circuit and double oversampling.

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Which figures, since the CD-501 is not an adapted consumer deck, but a highly-engineered system that's built for broadcast. Nothing else offers its combination of professional features, including 19" rack-mountability, balanced outputs, and a hard-wired remote that lets you completely control and program either of two decks in any mode.

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Math Replaces Trial and Error

by Floyd Hall

Crestline CA ... Did you know that ...

In the early days of radio communication, the mathematics required to obtain a solution to some practical problems were almost prohibitively cumbersome?

As a result it was usually less time-consuming to rig up a circuit by trial and error (or, by-guess and by-God, we used to say).

Old Timer

As far as a calculator was concerned, we didn't have anything much better than an abacus! Except for the slide rule, of course.

I'm talking mostly of the determination of not only reactance, and hence the values of capacitance and inductance in usable terms, but also the solution of resonant circuits.

The formulae presented to us in those days were something like: Capacity Reactance equals 1 over $6.28NC$, where N was the frequency in cycles per second and C was the capacity of a condenser in farads.

As I write this, I can't for the life of me

Floyd Hall is a regular RW columnist and an engineering consultant at Consulting Radio Engineers, Crestline, CA. Call him at 714-338-3338.

remember what a farad is!

In the '20s, in the discussions of radiated energy, we seldom talked about frequency—only wavelength in meters.

Early Hams like us talked about 600 m, 300 m, and much later the HF Ham bands were always called by their wavelength: 175 m, 80 m, 20 m, and much later the 10 m and 2 m bands.

In those days, we did not visualize a vibratory repetition, but rather the distance from the top of one wave to the top of the next, in meters.

This gave us an indication of the length of wire needed!

Finally somebody came up with the formula for a resonant circuit. This was quite a step forward for the times.

Now, the inductance and capacity terms were almost imaginative. I don't think, at that time, anyone could have conceived of micro-micro-farads, or picofarads, as we know it today.

Lost language

Now, for your continued consternation, let me quote from the wireless operator's bible, the following definition: *Measuring the wavelength of a transmitting set.*

"For this purpose, the wavemeter is usually fitted with a current indicating device such as a Hot Wire Ammeter, Thermocouple Galvanometer or wattmeter, D.C. millimeter and crystal rectifier, neon tube, flashlight bulb or with crystal rectifier and telephone receiver!"

As a parting shot, down the paragraph it says "that the decrement of the wavemeter circuit is kept low!" How many of you can tell me what that means?

Or, how about a Hot-Wire ammeter? Or a current squared Galvanometer?

All of these were highly technical devices when I was beginning in this business, and we were required to know how they worked, and what their indi-

cations meant!

Now, I have had a number of inquiries concerning my article on keeping a transmitter cool, and they almost all question the efficacy of using refrigeration air conditioning.

Heck, if you can afford it, by all means use refrigeration.

Now, I'm no air conditioning mechanic, but the average 5 kW AM or 10 kW FM transmitter will radiate 8 kW or more of heat (to say nothing of the heat radiated from the walls of the building from the sun).

(continued on next page)

Ten Years, Oh My...

With this issue RW completes its 10th year. Readers may remember the original version as an 8x10 magazine called "Broadcast Equipment Exchange." Our newspaper format was adopted in '79, and the name changed to Radio World in '80. Reprinted here is the top of the first page 1 (July '77). The first ten readers whose files go back that far and can send us a copy of the full page 1 will win a RW mug. Any takers?



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VOL. 1 NO. 1 JULY 1977

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TASCAM

Radio Systems Hosts Mini-Show

by Douglas W. Fearn

Edgemont PA ... It wasn't large and overwhelming like the NAB Convention in Dallas. Instead, the atmosphere at the "Mini NAB" that was held here on 28 April was relaxed and downright intimate.

This open house sponsored by Radio Systems Inc. (a broadcast equipment manufacturer, turnkey installation company, studio furniture fabricator, and equipment distributor), allowed attendees to get close to the latest equipment and renew acquaintances without the crowds, long distances and confusion of a major show.

Two hundred engineers and managers from radio stations in Pennsylvania, New Jersey, Delaware, Maryland, West Virginia and Washington DC attended the day and evening event, which featured exhibits by a dozen manufacturers, tours of the Radio Systems' plant and a buffet dinner.

Radio Systems' huge wood shop was turned into an exhibit hall for the day. The exhibitions included numerous products of particular interest to radio broadcasters.

A potpourri

Broadcast Electronics' Bill Harland had a 3.5 kW FM transmitter with BE's video

Douglas Fearn is CE at WKSZ-FM and an occasional contributor to RW. He can be reached at 215-565-8900.

diagnostics operating on the exhibit floor. He also demonstrated the new PhaseTrak 90 cartridge machine.

TFT showed its full product line of STL transmitters and receivers, AM/FM/TV modulation monitors and remote control units.

QEI's president Charlie Haubrich had a 691 FM Modulation Monitor/Test Set on display, as well as the company's remote control equipment and low power FM transmitters.

Mark Antennas' Derek Mummery set up a four-foot grid STL dish antenna for

inspection.

Glenn Clark of Texar answered questions about the Audio Prism.

Shively Laboratories was represented by Charles Peabody. He displayed a scale model of the half-wave spaced 6813 FM antenna.

Large surge protection devices made by Eagle Hill Electronics were shown by Bill Johnson.

Stanton's Pete Bidwell was available to answer questions and talk about Stanton disc playback products and headphones.

An a-
sor-based
exhibited by

Otari was re-
of ASR. In addi-
well-known reel-to-1.
Mike brought the new C
machine for us to look at.
is loaded with interesting fe

Behind the scenes

In addition to the exhibits, attendees had the opportunity to see what goes on behind the scenes at an equipment manufacturer's factory.

All of Radio Systems' employees were on hand to help attendees find their way
(continued on page 22)

Math Much Better Than Guesswork

(continued from previous page)

My tables say that 1.0 kW equals 3,428 BTU per hour. So you are talking about 27,000 to 30,000 BTU per hour just to hold the transmitter's radiated heat at ambient!

Now, your ambient air temperature rises to 37 or 38° C, (100° F or more) and you figure the amount of refrigeration required to keep that transmitter cabinet from rising to 90 or 95° C (194 to 203° F).

Most manufactureres will tell you the transmitter cabinet should never exceed 50° C.

Too much hot air

Now listen carefully! A transmitter can stand 150° F (65° C) without hurting it much, but if you have 100° F ambient, you must get that hot air from the trans-

mitter and the walls out of there fast!

It's simple. If you remove that hot air as fast as it is radiated, then the transmitter won't get any hotter than ambient, and anywhere except Death Valley, this won't hurt it!

But remember—the "comesinta" must be equal to or more than the "goesouta!"

Just a quick note before I quit. John Cummuta's article in the 15 April RW was not only appropo, but brought back a lot of memories.

Many years ago, I once worked with Paul W. Litchfield, of the Goodyear Corp. It would take a book to tell you about him, but take it from me he was one of America's greats.

However, in all Goodyear plants and offices, and whatever, every once in a while the head men from the smallest

group up—i.e. lead man, supervisor, foreman, plant manager or whatever—would be called up and asked if they had trained one of their crew to replace them.

They were also told that if not they could not be promoted since there was no one there to replace them! In all the Goodyear organizations, there is no "indispensable employee!"

I once went into a large station's transmitter to analyze some trouble, and in a rack there were four double row jack strips; none of which were labelled!

I asked the operator on duty why, and he said the Chief wouldn't let them monkey with those! Well, they finally found out he was "indispensable" and so they fired him!

See you next month.

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Circle Reader Service 47 on Page 28

Time to Consult a Consultant

by Tyree S. Ford

Baltimore MD ... In last month's column, we took a close look at the high tech=high touch equation, and the importance of complete verbal communication, both face-to-face and on the air.

Face-to-face communication requires that we speak *and* listen. It has been observed that while most of us have the speaking part down, the listening part could use some practice.

Listening itself is an art. It is often underestimated because there are fewer visible moving parts involved than in speaking.

Experienced listeners, therefore, don't look much different than inexperienced ones. The difference between the two is one of timing, or knowing how long to listen, and when to stop.

The concept of less talk/more communication can also be very useful when applied to what is said on the air. In a future column we'll take a closer look, but for now let's move on to the need for consultants.

Sea of consultants

To begin with, there are many types of consultants: engineering, production, programming, sales, promotion, and more. Some consultants offer a broad range of services, others specialize.

A few years back, there were so many

Ty Ford, a radio audio production consultant, and regular RW columnist, helps stations optimize their use of production equipment and airstaff skills. He can be reached at 301-889-6201.

consultants around I came up with the idea of starting a consultancy for consultants.

In theory, I would consult with radio stations to determine which consultant would be best for them. I thought the idea was just a joke until somebody I mentioned it to seriously asked me if I needed help getting it started.

Producer's File

The first thing to do is determine if you really need a consultant. One major mistake inexperienced managers often make is overlooking the intelligence of the station's own staff, as well as their own ability to fuse ideas.

While not every idea which emerges from your staff may be a home run, don't overlook the possibility of it being a stand-up triple which you may be able to "coach" into a home run.

Your mindset must always be, "How can I make this work best?" Only after you've figured out several ways to make an idea work, can you begin to judge whether an outcome will serve a useful purpose.

The possibility that it doesn't get the results you originally had in mind doesn't mean it was a bad idea. Note the concept and use it later.

As you continue to develop this mindset you will begin to develop the consultant's stock in trade, a bag of tricks.

Perhaps one of the most overlooked and underutilized qualities of management is leadership. Some people are born

with it, some can learn how to use it, and some will never get a handle on it.

In radio, the two most important factors are leadership, and a great signal. You can buy a great signal.

But leadership cannot be bought. It can be salaried, by hiring someone who has it, or leased through the services of a good consultant. Before trying either, take a close look at yourself.

Can you cultivate an environment at the station where positive growth can occur? Do you believe that positive reinforcement and freedom to fail are important? Have you recognized that negative feedback is often a symptom of insecurity?

Imagine that you are the consultant for your own station. This is a great exercise for people who have a tendency to close-focus and lose perspective.

The best managers, ones who have developed a sense of empathy, use that empathy to construct more accurate overviews of their station and their people.

If the results of your internal expedition still leave you feeling that something's missing, it may be time to call for help.

Consult-o-phobia

The very word consultant can strike fear into the heart of even a seasoned radio person. Images of that episode of WKRP quickly come to mind.

The two main reasons for this reaction are loss of control and expenditure of money. The final fear relates to what happens if a consultant is hired and things get worse.

If you establish your objectives before talking with a consultant, it's a lot easier to make a decision as to which one will work best for you.

Know what areas you want to improve and how much you expect to pay. In short, do your homework. Don't expect the consultant to be psychic, and don't be sold a bill of goods.

Program consultants, among all others, are the most difficult to choose

and track. This is due to the highly complex nature of programming position battles. Things often change too quickly and radically to be anticipated.

A consultant with a client in one market may be successful. The problem arises when the corporation which owns that station also owns a competing station in your market, and you want to use that particular consultant.

Even though most consultants attempt to minimize these conflicts, they are not always successful.

With all the money at stake, I'm suprised that someone hasn't come up with "ratings insurance," which would operate the same way medical malpractice insurance works.

Production results

As a production consultant, the proof of my work is usually more obvious. The station sounds better.

Although each station is unique, there are three areas into which expected improvements will fall; technical/mechanical, performance, and systems/policies.

Regardless of format, each station's air-sound is comprised of these elements. Combined, they are the produced air-sound.

As a production consultant, I inspect the equipment in the studios, and any pre-transmitter audio processing.

“ “

The first thing to do is determine if you really need a consultant.

” ”

I evaluate how the airstaff produces and performs those elements that constitute the air-sound. I also trace internal paper flow and inspect existing policies to make sure they are not getting in the way.

I ask a lot of questions about why things are the way they are in an effort to get as full an understanding of the station as possible.

I do this before any changes are made so that each person's valuable input can be considered. Often the answer to many problems is just below the surface, waiting to get out.

The technical/mechanical and systems/policies areas are easiest to improve.

PD's role

In many cases the most difficult but most rewarding improvements come from helping the airstaff do a better job. Here the PD plays a vital role.

While it's relatively easy for me to explain how to get a better sound, it's up to the PD to dig in and work with each person to achieve the desired results.

(continued on page 25)

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More Video for Digital Audio

by William Spurlin

Boston MA ... dbx is a name usually associated with noise reduction, but a digital audio system developed by the company has helped make the digital STL a reality for some quality-conscious stations.

dbx 700 has been in use at WGBH for five years for the transmission of live Boston Symphony Orchestra concerts, and will soon, thanks to the generosity of one of our listeners, be employed as a fulltime, fixed STL.

The practice of using a video signal encoded with digital audio is growing. VFDA (video format digital audio) has found applications in live and recorded productions, and digital transmission.

VFDA uses pulse code modulation, or PCM processing, to encode digital audio onto a video signal. The signal retains video characteristics such as syncing and blanking, but is used to convey audio.

Any of the three VFDA systems used at WGBH convey the startling fidelity associated with the sound of CDs.

The dbx 700, while not a pulse code format like the two Sony VFDA's, is equivalent to the 16-bit PCMs in fidelity.

To date, the use of VFDA at WGBH has been in location recording and live concert transmission.

William Spurlin is engineer in charge of maintenance and transmission for WGBH-FM. He can be reached at 617-492-2777.

The Sony F-1, because of its portability, is the format of choice for remote recording, where it is backed up by Nagra IV-S analog machines.

The Sony 1630, a professional VFDA format, was used by us in collaboration with FM Tokyo to broadcast a live Boston Symphony Orchestra concert to Japan.

The 1630, while possibly the most advanced VFDA, deviates considerably more than the other formats from RS-170 video.

Because of these deviations, the 1630

can be vulnerable to stripping of essential information by a typical television microwave transmission chain.

We have also used dbx 700 and Sony F-1 in intercontinental transmissions from Austria and East Germany, which are transmitted over ordinary satellite television transponders.

The relatively high cost of television transponder time is balanced by the incomparable fidelity of the digital link.

The dbx 700 and Sony F-1 are also relatively immune to the effects of video processing amps and other devices

found in television transmission.

The configuration of dbx 700 at WGBH depends on the requirements of production and post-production.

It may be recorded on ordinary 1/2 Beta or VHS recorders (the former, because of their higher bandwidth, are used at WGBH, but others have had good results with VHS).

The dbx 700 with balanced line-level inputs and outputs, as well as sturdy rack-mounted modular construction, is easier to service than the consumer oriented Sony F-1.

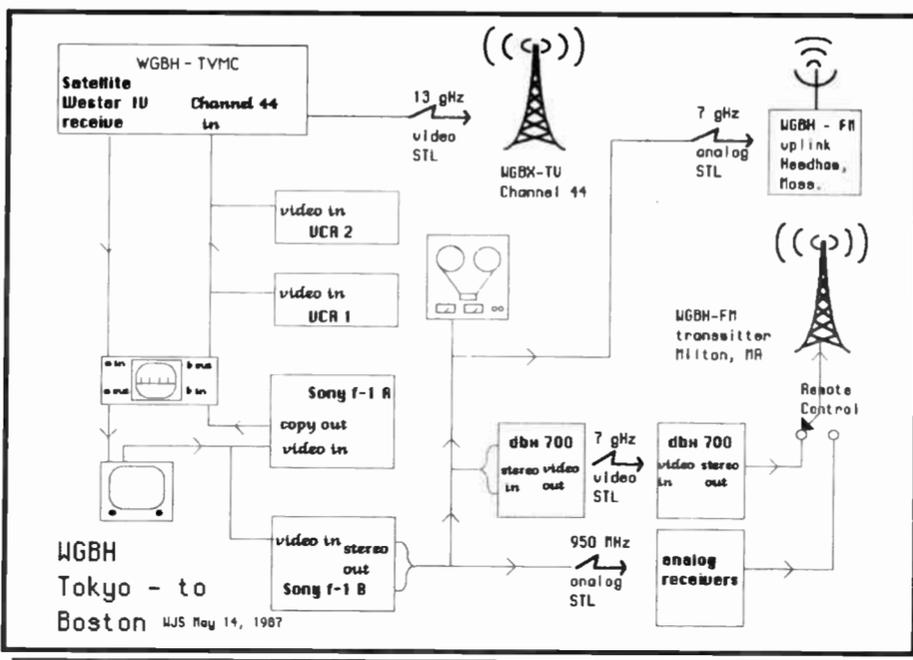
However, because of its consumer orientation, F-1 has been chosen by WGBH for broadcast trials over WGBX-TV, channel 44, which has been experimenting with digital audio transmission after regular program hours.

Decoders for F-1 are relatively inexpensive and widely available. In this application it should be noted that VFDA is not television, and that no television set is needed to receive it.

dbx and the other VFDA systems have found wide use at WGBH because of the intimate association here between the radio and television operations, and because WGBH owns an extensive regional microwave network.

For the smaller operation, VFDA may be confined to remote recording or possibly STL. But, where the bandwidth is available, there is no place VFDA can't go.

For the radio listener, the benefit is the kind of listening experience that almost puts one in the concert hall, and which utilizes the capabilities of FM broadcasting better than any other recording or transmission medium.



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Here's why Blane Webster bought Auditronics for WLAK-FM



Blane Webster,
Chief Engineer, WLAK-FM



“**W**hen I prepared the budget for our new facilities on Chicago's Michigan Avenue, I could have included any console I wanted, be it Ward-Beck, Neve, you name it. So I looked at and listened to everything the industry had to offer, from the Harrison to the Harris Medalist, and I bought Auditronics.

I bought the Auditronics 200 primarily for its audio quality, by which I mean its waveform integrity, freedom from distortion and low noise floor. The quality of its sound is remarkably transparent. I think Auditronics' VCA technology is really good too, maybe the best on the market.

I also looked for reliability. The console's the most important link in the studio chain because it's on the air all the time. We just can't afford a failure, and I recalled that our old Auditronics console at Sears Tower never had an on-air failure.

Features were important too, like the modular concept that lets me pull a module out and pop another one in almost

as fast as making an Indianapolis pit stop. If I need another mike channel or cart machine channel, I've got it right here on the shelf for immediate use. The layout of the Auditronics 200 is almost self-explanatory so our on-air people can use it without making mistakes, and the 200 is rugged enough to withstand the jocks' abuse and coffee spills.

One of the things that sets WLAK apart is that we're the number 1 adult contemporary station in the Chicago market, and to us being number 1 means more than just winning in the ratings. It means being the best both on and off-the-air. This includes the kind of equipment we buy and the way we use it. We're a winner and we're proud of it.”

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Tower Arrays From Ground Zero

by Tom Osenkowsky

Brookfield CT ... Over the years a number of methods have evolved for array tune-up. In this installment, we will examine how to set up a new array from ground zero.

If your array has sample loops located at the current loop (approximately 10° down from the top of each tower, but at least 10' above ground for short towers) and equal-length sample lines, the first step would be to adjust for the theoretical parameters as indicated on the antenna monitor and match all lines for close to 10 ohms to start.

When severe mismatches exist, the overall RMS of the pattern may be reduced.

If you match up the lines after your proofs are completed, you may need to establish new parameters to bring in the nulls and of course, redo the DA proof.

One of the most important parts of the start-up process is the non-D proof.

It will serve as reference for DA proofs, establish monitoring locations on all pertinent bearings and determine the inverse distance field and conductivity value(s) on each radial.

First, detune

As a first step, all unused towers must be detuned properly. Simply floating or shorting unused towers is not good enough!

A very accurate method of detuning is to locate a tower climber approximately 30% up the tower, and using an FIM, adjust a series coil from base to ground for minimum current.

This "30% rule" must be precisely determined. The DETUNE computer program specifies the exact location when given height, top-loading (if any), and

Tom Osenkowsky is a radio engineering consultant and president of MASTER Software, and a regular RW columnist. He can be reached at 203-775-3060.

frequency.

Once the unused towers are detuned, adjust the ATU for the non-D radiator for a perfect match and measure the base impedance ±25 kHz from the carrier at 5 kHz intervals.

Energize the transmitter to the proper power level. Monitoring points must now be chosen. This must be a very careful process, with good judgement being the key to a successful proof.

Each point must be precisely laid out on a topo map, be examined for easy and future accessibility, be precisely determined for distance and accurately described for repeatability (remember, these will be the DA points as well).

The location should be away from overhead power lines, underground pipes and other large metallic objects (highway guard-rails, fences, etc.).

Each point should be examined for a good null (-20 dB or more).

This is accomplished by rotating the meter 360° and observing the maximum to minimum signal ratio.

For each measurement, the calibration of the instrument should be checked and adjusted, if necessary.

When making the actual reading, make certain to point the loop antenna towards the array. A good compass is an invaluable tool here. Do not rotate for maximum signal.

This becomes most important when taking measurements in deep nulls. In that case, reradiators in the main lobe may produce a higher reading than the actual signal from the array itself.

In severe reradiation conditions, the offending structure will have to be detuned.

Once the non-D proof is completed, it must be analyzed. All readings should be plotted on metric graph paper.

Now you can determine the conductivity(s) and inverse distance fields. The array must be set up for DA operation. Remove the detuning apparatus, reconnect the non-D ATU back to the tower

Equation 1. Far end open
$\text{Elec length} = \frac{F_{\text{carrier}}}{F_{\text{null}}} \times 90$
Equation 2. Far end shorted
$\text{Elec length} = \frac{F_{\text{carrier}}}{F_{\text{null}}} \times 180$
Equation 3.
Zero field phase = 180 minus spacing

divider and so on.

For those with equal-length sample lines and rigid loops (or toroids if all towers are of equal height and 90° or less) you can adjust the phasor to the theoretical operating parameters and match all circuits for starters.

Many consultants have specified sample systems such as the above as a matter of routine.

What if you wanted to be more precise and insure that your sample system was properly "calibrated?"

An early method of system "calibration" involved the use of an RF generator and scope or RF-VTVM.

The far end of the sample was either shorted or open and the RF oscillator/monitor was adjusted for minimum

output as the frequency was varied (i.e. a short circuit across the oscillator output).

The electrical length of the line was determined as shown in Equations 1 or 2. The appropriate line(s) was trimmed to produce equal results on all lines.

Alternate method

A second method of "calibration" involved the energizing of two towers in the array, detuning unused towers and adjusting for a complete null on the tower line.

This process was repeated for three or four points on the TL azimuth. Equation 3 shows the theoretical phase angle necessary to produce a complete null on the tower line. The field ratio would, of course, be unity (1:1).

For towers taller than 90°, the loop ratio equals the field ratio divided by 1-cos(G).

For equal height towers, the base currents would be expected to be equal.

This process would be repeated until every tower was paired and the system "calibrated" either physically (trimmed lines for proper phase angle, to match to the theoretical) or with algebraic correction factors applied to future readings.

While this method presents a valid approach, it has shortcomings in that the

(continued on page 24)



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RF Specialties Group

NPR Program Plans

(continued from page 14)

Pizzi predicted that by 1990 digital conversion will spark the need for digital open reel recorders (currently available but costly), digital editing, RAM and hard disk systems, digital dubbing, processing, phone interfaces and even digital mixing consoles.

Digital satellite distribution may also occur in the public radio system about five years from now, coinciding with the replacement of the public radio transponder.

The final frontier affecting station conversions will be digital transmission, which Pizzi said he could not foresee before some eight to ten years since regulatory delays in allocating spectrum and

defining systems are likely.

WGUC in Cincinnati has already begun offering digitally transmitted broadcasts on the local cable system.

Radiation concerns

Doug Vernier, of KHKE and KUNI in Cedar Falls, Iowa discussed OST/ANSI radiation standards at the conference.

Vernier said that of the up to 7% of the stations that may exceed the standards, most will be able to demonstrate compliance by taking real field measurements rather than relying on predicted signal density calculations.

Of those still not meeting the standards, he said a modification of FM bay spacing from full to 1/2 wavelength and

a simultaneous doubling of the number of elements would drastically limit the amount of downward radiation.

Vernier reported notable success in extending the range of his station's RPU by dbx type II encoding the audio onto a Marti system.

Several prominent public broadcasting figures received honors for their work during the conference.

Sharon Rockefeller, a former CPB board member, was the recipient of NPR's Edward E. Elson Award for outstanding contributions to public radio.

Rockefeller currently sits on the Board of the Public Broadcasting Service and was instrumental in CPB's agreement to loan the \$9.1 million that gave NPR breathing room to formulate a total restructuring of its funding mechanism.

Public Radio's highest honor, the Corporation for Public Broadcasting's Ed-

ward R. Murrow Award went to Thomas Thomas and Theresa Clifford, co-founders of the National Federation of Community Broadcasters.

The NFCB now boasts some 175 members in 42 states after operating out of the Thomas/Clifford kitchen for three years after its founding in 1975.

Thomas is credited with masterminding the new plan for funding public radio production whereby monies go directly to producers of national radio productions via CPB's National Program and Production Acquisition Grants.

The 1988 Public Radio Conference will be held in St. Louis with a final go/no-go vote on unbundling proposals expected to top the agenda.

Mini-Show

(continued from page 17)

through the exhibits, as well as to explain their own products.

A wave soldering machine was in operation in the equipment manufacturing shop. It was fascinating to watch the machine solder an entire printed circuit board in a matter of seconds.

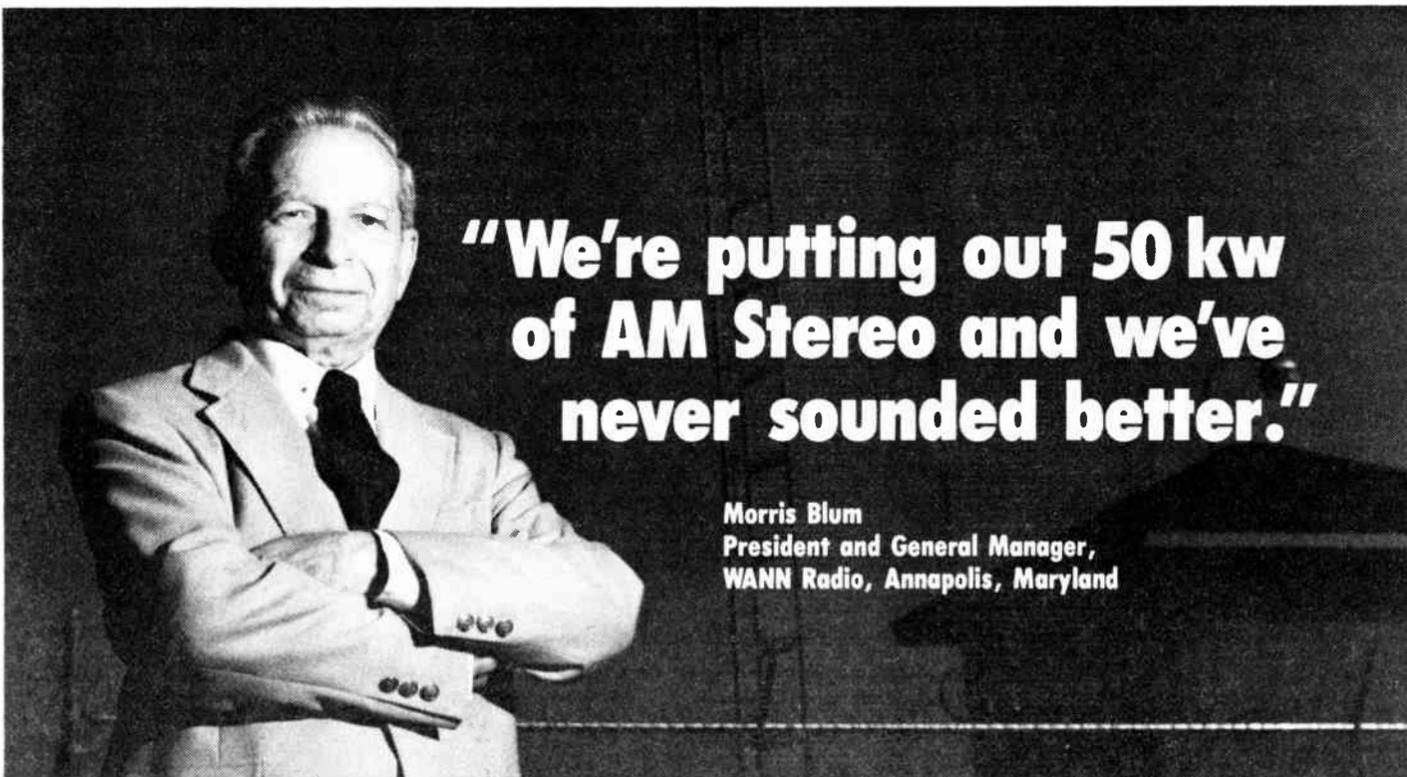
All the Radio Systems' products were on display: the PA-1 Phono Preamp, DA-8 and DA-16 Distribution Amplifiers, the entire DCX line of low cost amplifiers, and the ESA-10 console. An ESA-10 was set up in the final test station and actual performance measurements could be made.

Cabinetry and a buffet

A relatively recent addition to Radio Systems' product line is custom studio furniture.

An impressive wood shop turns out very attractive furniture, CD and cartridge racks, equipment cubes and turntable pedestals. Several representative designs were displayed with operating equipment.

Radio Systems president Dan Braverman was delighted by the enthusiasm of the "Open House" attendees. "We're planning to do it again next year," he said. "We hope it will be bigger and better."



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Questions on Troubleshooting

by Thomas L. Vernon

Harrisburg PA . . . My recent series on troubleshooting modulators has drawn many comments and questions from readers.

There is greater interest in this subject among engineers at small and medium market stations than I had anticipated.

Before concluding this series, I'd like to answer in print some of the most common questions I've been asked.

The first involves replacement modulation transformers in 1 kW transmitters. Some people called in with complaints about oscillation in the modulator, typically around 50-150 kHz.

This usually occurred when the replacement transformer was not supplied by the original manufacturer.

The reasoning was that all 1 kW transmitters with 4-400As in the modulator and PA are basically the same, therefore the modulation transformers are basically the same. Isn't this true? The answer is yes and no.

All modulation transformers possess a certain amount of leakage reactance.

Leakage reactance occurs because not all of the flux produced in the primary is linked to the secondary.

At some frequency above the audio range this leakage reactance will cause a reversal of the feedback polarity.

Thus instead of negative feedback, which reduces gain and improves stability, you get positive feedback, which produces oscillations.

The modulator will oscillate at the lowest frequency where the feedback becomes possible. This condition does not necessarily indicate a bad mod transformer, or a defective transmitter.

Now let's return to the original question: Are all mod transformers for 1 kW transmitters with 4-400As the same? In

Tom Vernon, a regular RW columnist, divides his time among broadcast consulting, computers and instructional technology. He can be reached at 717-249-1230.

some of the basic characteristics, they are. There are some more subtle characteristics which may differ however.

The "tightness" of coupling between primary and secondary windings, for instance, may differ from one manufacturer to the next.

Add to that differences in the type and gauge of wire used to wind the transformer, differences in formula for insulating varnish and potting compound, alloys used in the core material, and other factors, and you can begin to see that it's not as simple as it first seems.

I have heard stories from manufacturers who sent engineering drawings for a mod transformer to two transformer companies.

Station Sketches

Each built a transformer that conformed to the engineering specs. One worked perfectly, the other not at all.

What do you do about this problem? Usually low pass filter components are inserted at various places in the modulator section.

One word of warning: unless you are thoroughly comfortable with filter and transmitter design, such a task is best left to a consultant.

Botched filter design can result in degraded transient response, and damaged components. This is *not* a place for trial and error procedures by the inexperienced.

Some callers with oscillation problems noticed an inductor between the high voltage end of the mod transformer and mod reactor in their transformer.

In some cases, there's also a capacitor paralld across the inductor (see Figure 1). Could changing the value of this inductor, they asked, eliminate HF oscillation problems?

From the foregoing discussion you may surmise that the answer is no. Oscillation takes place in the trans-

former itself, and changing the value of anything after it won't help matters much.

What then is the function of these components? They are there to compensate for an entirely different problem.

This series inductor is really an audio bandpass filter between the modulator and PA stages.

It rolls off the PA's ability to modulate at higher frequencies. Were it not there, you would have excessive modulator currents at 10 kHz and above.

If you have just installed a new mod transformer, it may be necessary to tweak this circuit for optimum 10 kHz response, but don't confuse this with correcting oscillation problems.

Now on to the topic of this month's column, testing modulators at full power. This should be used as a last-ditch effort, when other methods to isolate the trouble have failed.

All safety precautions normally associated with work around high voltage circuits should be followed.

There are two parts to this testing procedure. The first is to operate the modulator into a resistive load so that its performance can be evaluated while isolated from the rest of the transmitter.

The second step is to operate the PA with the modulator disconnected. This will tend to reveal any power supply problems which show up as audio problems.

The first step is to determine the proper load impedance for the modulator and construct an appropriate resistive load.

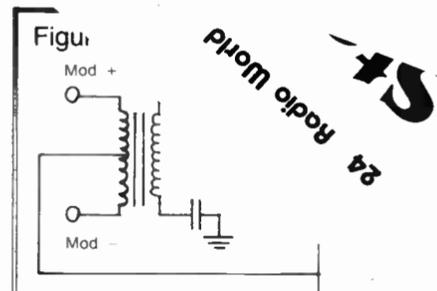


Figure 1. An inductor between the mod transfer and reactor functions as an audio bandpass filter between the modulator and PA stages. Sometimes, a capacitor is paralld across the inductor.

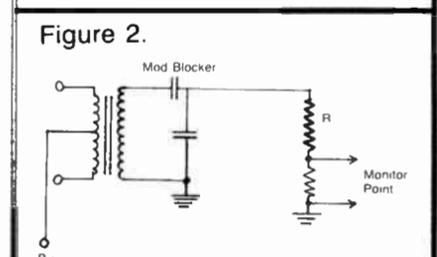


Figure 2. Connecting a load resistor as show allows the modulator to be tested independently from the transmitter. See text for details.

To do this, divide plate voltage by plate current at your rated carrier output. For example, a 1 kW transmitter with an E_p of 2500 V, and I_p of 0.580 amps would have a load impedance of 4310 ohms.

For a 1 kW transmitter the load should handle 800 W. A 5 kW transmitter would need 3500 W, and a 10 kW would need 8000 W.

The load should be connected as shown in Figure 2. A 15 ohm 50 W resistor should be connected between the load and ground to provide a monitor point for the distortion meter.

Note also that a capacitor of the same *(continued on page 25)*

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Steps For Training

(continued from page 15)
board.

Educational researchers have determined that as much as 85% of new knowledge reaches the conscious mind through the eyes.

That means that every diagram, chart, picture or sample you can include in your training session dramatically increases the potential retention of what-ever you're teaching.

You can usually produce overhead projector transparencies on your copy machine.

The transparent sheets are available at any good office supply store, and you simply produce the visual on paper then copy it onto the transparency.

You can use an erasable marker board and your visuals can contain a rainbow of colors.

Slides are always good, and there are companies who can make slides from some of the graphics produced on most personal computers.

Or you can buy blank, frosted slides and markers to make your own.

Effective training follows the principle of "tell them what you're going to teach them—teach them—tell them what you taught them."

In other words: set objectives, do the training, review.

The outline and handouts should give you the material for a quick and orderly review, and using the handouts more

sharply implants their contents into the trainees' minds.

When they later review the material on their own they'll actually be replaying your review.

The review is also a good place to answer questions.

At the start of each session ask the trainees to hold their questions until the review because chances are you'll answer most of them somewhere during the training anyway.

When you're looking at your training goals break each down into digestible nuggets for each lesson.

Don't try to bury your people under your entire vat of knowledge in

one sitting.

The more you tend to feed them the information in building blocks, the more you'll see your desired results in their performance.

If you're not sure that training is your bag, visit your local library.

There are a host of good books on training and teaching that can take you each step of the way.

Good luck in developing your people. It will, in the long run, be one of the most rewarding aspects of your career as a manager.

And who knows, if you're real good at it, they might name an aircraft carrier after you someday.

DA Arrays From Scratch

(continued from page 21)

current distribution on the radiators will not be the same for the actual pattern as it was for the two-tower pattern.

This means the correction factors previously developed may not be entirely valid for the real pattern. This can be especially frustrating when unequal length sample lines are employed.

There are two methods widely used by consultants today for initial array tune up.

Talking down nulls

The more common involves "talking down" each null radial to zero field and developing error-vectors which are then applied to the theoretical parameters. I developed the TALKIN computer program for this purpose.

Here's how the process works. We position a radio-equipped field person on one of five or six points on each null radial.

We then crank the phasor for zero (usually 100-200 mV in the real world) field on each point.

Taking the characteristic antenna monitor readings for each azimuth and plugging them into the program, we find the modified theoretical parameters which should produce the required pattern.

The TALKIN program first determines the theoretical parameters which produce zero field on each null azimuth with all radiators energized.

By applying the actual antenna monitor readings for error vector calculations, very realistic correction factors are developed.

The final result of the program is a list-

ing of antenna monitor readings which should produce the desired pattern.

Two advantages are present in using this approach. First, minor reradiators are taken into account as nth towers in the array during the talk-in process.

Second, since all towers are illuminated in the process, the current distribution is not expected to drastically change from the complete null value to the filled-in (usual) case.

Another advantage in this method is that only one field person and FIM are required. The field person need not be an engineer, either.

Since the distances are not very great, 5 W walkie talkies usually suffice.

Some consultants prefer not to use the talk-in procedure. An alternative to talking in complete nulls is to tune each phasor control and observe its effect in the field.

A vector diagram is then constructed and analyzed. This approach is valid, but requires more field time and a knowledge of vector math.

By using the TALKIN program, no mathematical knowledge is required.

Initial array tune-up can be complicated by reradiators, which in severe cases where they are located in the main lobe(s), may require detuning.

The importance of a good non-D proof, accurately plotted and described radials and proper use of the FIM cannot be overstressed.

It is of utmost importance in the talk-in process to orient the FIM toward the array and not for maximum signal.

Next time, we'll examine existing array adjustments and undesired nulls.

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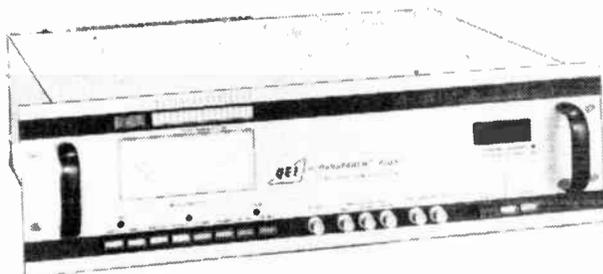
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Circle Reader Service 10 on Page 28

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Circle Reader Service 38 on Page 28

Troubleshoot Queries

(continued from page 23)

value as the RF choke input bypass cap is also placed across the secondary.

This is placed here because the RF bypass cap appears across the transformer during normal operation.

Try to avoid removing the RF bypass cap from the PA stage and using it for these tests.

If this cap is bad, it would erroneously lead you to the conclusion that the problem was in the modulator when it is not.

Next, some simple math to determine the modulator output power for 100%

modulation is in order. To get the modulator output power, divide the transmitter output by twice the PA efficiency.

At some point, you should have already noted the audio input level for 100% modulation.

Feeding this audio level in should give an output fairly close to the calculated power output. The output can be measured easily via Ohm's Law.

Now perform frequency response and distortion measurements in the normal manner.

A bad mod blocking cap will reveal itself with poor low frequency response. Substitute a known good cap and

continue.

The mod reactor may be checked by paralleling it across the mod transformer and rechecking low frequency distortion.

If it has increased noticeably, the reactor is suspect. When doing these tests, remember to keep the mod blocking capacitor isolated above ground, as it is during normal operation.

If everything looks OK so far, the modulator is probably good, and troubles are waiting in the power supply and/or PA stages.

Remove the mod reactor and connect the PA HV lead where the mod reactor is normally connected.

Once you do this the power supply is now loaded by both the modulator and PA, but the modulator is still isolated and working into a "dummy load."

Check response and distortion again.

If it's b...
pect.

If it's still go...
are indicated. Car...
it's bad, look for low
load, or improper neut...

Again, these procedures c...
gerous if safety precautions are
lowed. Avoid working alone, and
shorting stick to discharge all points be
fore changing connections.

If a methodical approach is taken, di...
stortion problems can be quickly isolated
to the modulator, power supply, or PA
stages.

Since the topic of modulator
troubleshooting, and finding sources of
replacement parts seems to hold high in...
terest, I will try to have more informa...
tion in upcoming installments of *Station
Sketches*. See you then!

Radio World 98

Choosing a Consultant

(continued from page 18)

Hopefully the PD will be able to find new ways to unlock the talent in the air-staff, showing them first how to maximize their strengths, then how to improve on their weaknesses. Not every PD can handle the job.

Sometimes circumstances prevent a good PD from being effective.

At stations where the PD has come up through the ranks, the transition from one of the staff to management must be made very carefully.

I've seen candidates go through totally unacceptable changes which alienate them from the very people they need to be close to. These people are good systems managers but lack leadership.

It is personal human chemistry that is responsible for any group of people outperforming another otherwise similar group. The manager who has a full understanding of this concept will have a winning team.

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Circle Reader Service 21 on Page 28

Circle Reader Service 39 on Page 28

Build A Cable-Identifier Circuit

by Scott Roberts

Sunnyvale CA . . . Finding the ends of cables in large installations can be a real nightmare.

Using a "toner" described by Kirk Harnack (15 January RW) can be a real help, but sometimes the job requires something more.

I spend a lot of time tracking down RG-59 coax lines, with some runs of 1000' or more.

Connecting the toner between the outside shield and earth ground will insert a "chirping" signal that can usually be detected with an inductive amplifier along the entire length.

This connection is important, since the cable will not radiate if one uses the inside conductor. On long runs, some interesting problems can show up to confuse you.

I find the most common one to be cables that are laid close together over considerable distance, producing cross-coupling into other lines.

There's nothing like having 5+ coax ends in your hand, with an equally loud

Scott Roberts is an aerospace industry professional with close ties to the broadcast industry. He is SBE certified as a Senior Broadcast Engineer AM/FM, and can be reached at 408-749-0113.

and clear toner signal on each!

After one particularly frustrating cable tracking job, I got an idea to build a sort of "cable identifier" box using the circuit in Figure 1.

This slow speed 555 timer circuit drives a small relay that provides an alternate open-short on the cable that can be easily read with a VOM, or reflectometer, should you be fortunate enough to have one.



By carefully choosing the components used, the battery current drain can be kept quite low. I use a standard 9 V battery, and tests show it will function properly 24 hours/day for over five days!

The biggest power consumers in this circuit are the 555 chip, and the indicator LED.

The LED is not essential, but adds a nice touch to determining the condition of the internal battery. A special 555CP low power chip is required for portable operation.

By carefully selecting the series resistor for the LED, along with using the chip, power load is under 10 mA. It is

also important to watch the connections used for the FIA005C relay, since there is an internal diode across the coil leads.

The resistor values for the 555 timer produce a cycle time of approximately one second, plenty of time to see the action on a meter.

The whole circuit with battery can be built in a small plastic box. I have installed on the outside of my box the various connector jacks needed to hook up with the different types of cables I encounter in the field, such as BNC, F, and 70 V audio.

The use of this with a toner device is quite simple.

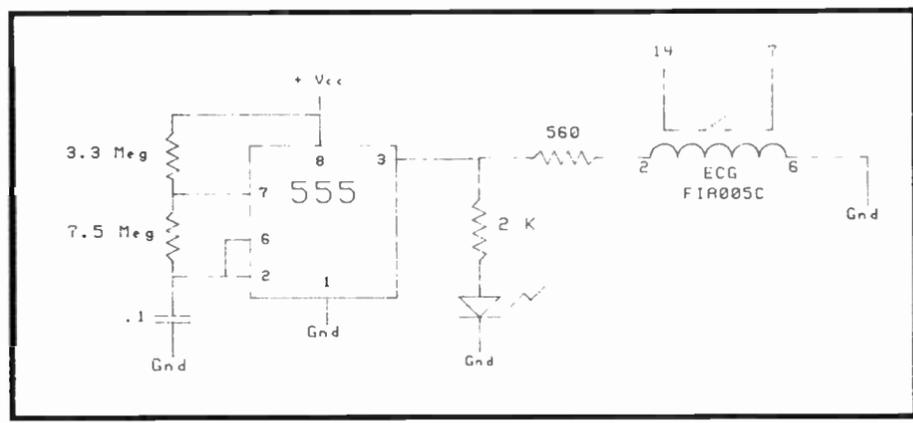
While the toner will allow you to follow the coax run, it is only the relay ac-

tion in the box that will allow positive confirmation by continuity as to the identity of the line.

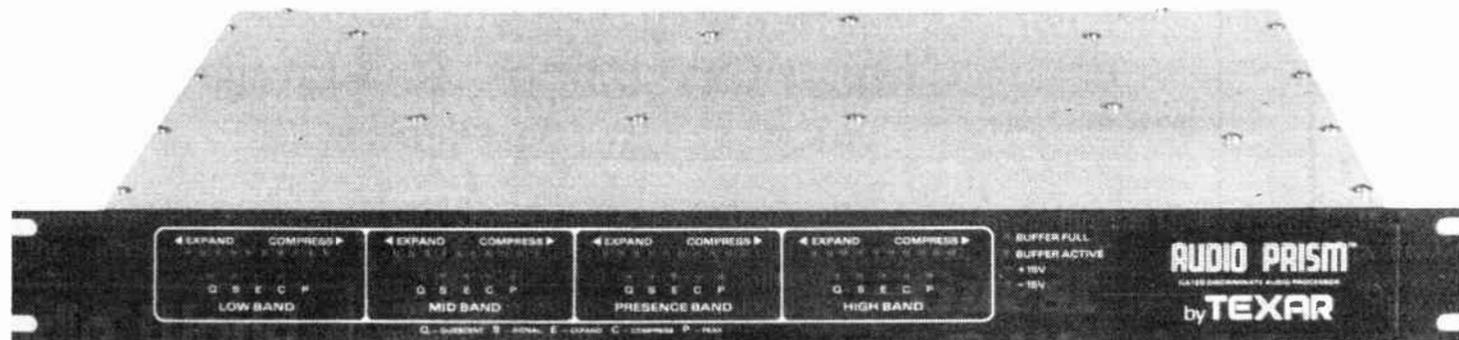
The relay does not affect the operation of the toner, since the "identifier box" is shorting between the inner and outer conductors, and the toner is connected between the shield and earth ground.

Note: RW has not constructed the circuit in the above article and cannot verify its workability or safety. Readers should build the projects printed here at their own risk or contact the author for more details.

Do you have a build-it yourself project that other radio engineers would find useful? Send it to "Project File" and earn \$25 if we publish it. Send to Radio World, P.O. Box 1214, Falls Church VA 22041.



ALL CD BY THE END OF THE YEAR!



That's the goal that many stations have set for themselves: to generate 100% of their music programming from CDs by the end of 1987. Using copyrighted station identifiers like "Lazer 104," broadcasters are able to position themselves in the listeners' minds as the high-quality music source. One promoted slogan is "Declare your independence from vinyl on July 4th 1987!" Surprisingly, it's not necessarily the big chain stations in major markets that are leading the charge. Medium and small market stations have shown themselves just as likely, if not more likely, to become leaders in their market.

Many of the early hurdles to on-air use of CDs have been removed. While early CD players were difficult to cue to music, making it impossible to run a tight air show, and were user-unfriendly, this has changed. Today's CD players (such as the Technics SLP-1200 and the Studer A725) feature instant start and incremental cueing, making it possible to cue exactly to any desired point in the music.

Many stations also questioned whether sufficient material, both oldies and current, existed on CD format to support all-CD operations. Oldies have come a very long way in the past few months. Several of the Beatles' albums have been released in CD format in just the past

few weeks, with more to follow shortly. And literally thousands of oldies titles are available on CD from Century 21 Programming in Dallas, Texas (214/934-2121). Each disc contains cuts from many different artists, so you don't pay for the album cuts that weren't hits. Each cut is a hit.

And more and more of the new release hits are being made available as a single-title CD. Under intense pressure from stations and also from influential program consulting firms like Burkhart/Abrahms/Douglas/Elliott, record firms are putting new emphasis on making hit releases immediately available on CD. Some record companies are getting the message slower than others, and are also finding themselves at a disadvantage when trying to get airplay for their new releases. Some stations simply won't add a title that is not on CD.

Why the big deal over CDs? Because today's listener has better equipment and is more quality-conscious than ever before. A higher-quality air product can translate into higher ratings and higher station revenues.

If you do or will originate a significant portion of your music from CDs, you should also consider the quality of your audio processing equipment. CDs deliver crisp, clear audio, but not all audio processors can preserve that quality. The digitally controlled TEXAR AUDIO

PRISM delivers the cleanest, powerful audio money can buy. All three networks have made multiple purchases of the AUDIO PRISM for their Owned and Operated radio stations. And the AUDIO PRISM has been the audio processor of choice for the top three rated FM stations in America's number one market, New York City, for seven Arbitrons in a row!

The secret? Digital control. Using digital technology allows the AUDIO PRISM to preserve the brilliance and quality of CD source material. On FM, the plug-in TEXAR Replacement Card Five (RCF-1) can add even MORE signal punch with no loss in quality.

For the complete story of how digital control can make you the quality leader in your market, contact your favorite distributor of high quality audio equipment, or call Barry Honel at (412) 85-MICRO.

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*Summer and Fall '85, Winter, Spring, Summer and Fall '86, and Winter '87 ARBITRON Ratings. Total Persons 12+ Share, Mon-Sun, 6AM-12M. (Used with permission.)

Multi-Task Software Packag

by Peter Burk

Harvard MA ... What kind of computer person are you? Broadcast engineers are perhaps one of the most diverse groups of computer users, with full-blown computer scientists at one extreme and self-proclaimed skeptics at the other.

A few years ago, you had to be a dedicated hacker to derive any benefit from a microcomputer.

Operating systems were so difficult to learn and the documentation so scarce that it was next to impossible for a newcomer to learn the system.

Then, to get an application running, you had to suffer through program development in BASIC or at the very least, copy verbatim from a long program listing, only to find that it wouldn't run on your system.

Fortunately, that picture has changed. In particular, MS-DOS has become a standard operating system which behaves more or less the same on a wide range of so-called compatible computers.

This makes it possible to distribute standard software to users with similar needs but different computers.

Much of this software is in the public domain. It is yours to use and in fact copy for others (as long as you don't sell it).

The *Broadcast Computing* section of *RW* will keep you informed of sources of such material as we become aware of it, so let us know if you have a program (or programs) already on disk that you wouldn't mind contributing to your fellow broadcaster.

One such collection of programs was sent by RF Specialties of Washington state. It's a very complete set of engineering tools, all put together in one menu-driven package. From the first menu, you can perform any of the following:

- Calculate the ERP of an FM station.
- Display and print the vertical radiation pattern of an FM antenna.
- Calculate the distance to the null of an FM antenna.
- Calculate VSWR, or print a VSWR table.
- Calculate path attenuation and Fresnel zone clearance of a 950 MHz STL.
- Calculate and print a report of inter-

Peter Burk is president of Advanced Micro-Dynamics and long-time computer user. He can be reached at 617-456-3570. For more information on the RF Specialties disk, contact John Schneider at 206-363-7730.

DECIBEL CALCULATOR

Enter 'V' for Voltage, 'P' for Power: VOLTAGE

Input Voltage: 1.5 Volts
 Output Voltage: 3 Millivolts
 Change in dB: -53.979 Decibels

Listing 1. Sample run of the decibel calculator
 Enter E, R, P, In Watts: 100000 Watts.
 Enter The Frequency In mhz: 106.5

PLEASE IDENTIFY TRANSMISSION LINE TO BE USED:

1. Air Dielectric
 2. Foam Dielectric

ENTER CHOICE: 1

AIR DIELECTRIC LINES:

1. 1/2 Inch	Andrew HJ4 500
2. 7/8 Inch	Andrew HJ5 500
3. 1 Inch	Cableways HJ678 500
4. 1 1/8 Inch	Andrew HJ7 500
5. 1 3/8 Inch	Cableways HJ115 100
6. 1 1/2 Inch	Andrew HJ8 500
7. 1 3/4 Inch	Cableways HJ120A-100
8. 1 7/8 Inch	Cableways HJ112 500
9. 2 Inch	Andrew HJ11 50
10. 2 1/4 Inch	Cableways HJ4 1 1/2 50
11. 2 1/2 Inch	Andrew HJ9 500

ENTER CHOICE: 0 Cableways HJ112 500, 1 Inch

Transmission Line Length In Feet: 1100

Number Of Antenna Bays: A

Antenna Power Output:

1. 50 W
2. 40 W
3. 70 W

ENTER CHOICE: A

ANTENNA MANUFACTURER:

1. Jampro
 2. Cellwave
 3. Shively
 4. ERP
 5. Other

ENTER CHOICE: 1 - Jampro

ANTENNA MODEL:

1. JSCP
 2. JBCP
 3. JHCP
 4. JSLP
 5. JICP
 6. JLEP

ENTER CHOICE: 2
 CALCULATION NUMBER: 1

Transmitter Output: 41.9807 kW

Transmission Line: Cableways HJ112 500, 7-1/2 Inch

Length Of Line: 1175 Feet

Line Efficiency At 106.5 mhz: 74.42%

Power Dissipated In Line: 10.1347 kW

Power At Input To Antenna: 11.2500 kW

Antenna Make Model: Jampro JBCP

Number Of Bays: 1

Polarization: Vertical

Max Antenna Input Power Rating: 40 W

Antenna Gain: 2

System ERP: 100.0000 kW

Listing 2. Calculation of FM Station ERP or TPO

modulation products between a table of frequencies.

- Calculate the size of a parcel of land needed to hold a guyed tower of given dimensions, and place the tower within the plot.
- Calculate the distance and bearing between two geographic coordinates, or calculate the destination coordinates when source coordinates and a distance and bearing are known.

In addition, an Electronics Math program is included. It allows the user to perform:

- Ohm's Law calculations.
- Series/parallel resistor, capacitor or inductor networks.
- R/C or R/L time constants.
- Series or parallel L/C circuits, resonant or non-resonant.
- Series resistor voltage dividers.
- Transformer voltage, current and impedance calculations.
- Decibel conversions.
- Frequency to wavelength conversions.

A sample run of the decibel calculator is in Listing 1. The input is handled very consistently and conveniently by this set of programs.

In the sample shown, 15 was entered, followed by a return. The display then presents the options for units. In this case, M=millivolts, V=volts, and K=kV. After typing "V" for volts, the display

is "cleaned up" and the cursor moves to the next item. This is probably the most user-friendly input convention we've used.

Any two of the three values can be entered; the remaining parameter will be calculated and displayed.

As an example of a more complex application, Listing 2 demonstrates the selection of appropriate transmission line, antenna and transmitter power for an FM station. Either TPO or ERP can be calculated.

In the example, TPO is calculated for a given ERP. The user is prompted along the way for all necessary information. Choices can be made from a wide variety of available antennas and transmission lines.

If the required TPO is too high, you can recalculate using different choices

until you come up with the most efficient combination.

The rest of the programs use similar structure to lead you through the choices with a minimum of difficulty. This is a trait that is worth looking for in a software package.

Most of the programs will only be used once in awhile. If it takes too long to learn how to use the program, or if it requires external documentation to operate, it is likely to end up unused in some forgotten sub-directory.

This collection of programs is exemplary and could find frequent use in almost any radio station.

Next time, we'll compare some programs for distance and azimuth calculation. If you have a favorite, send us a copy, preferably on disk so we can easily try it out.

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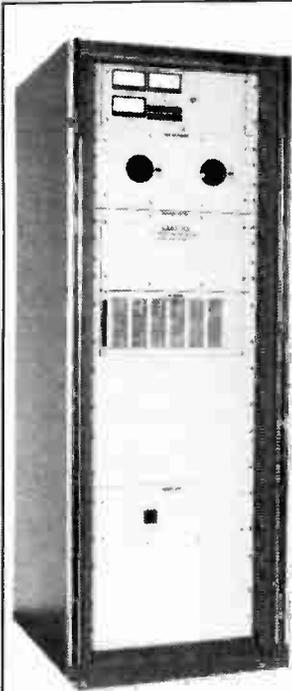
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Radio World Marketplace

If your company has a new product you wish us to consider in *Radio World Marketplace*, please send a press release and black and white photograph to Radio World Marketplace, P.O. Box 1214, Falls Church, VA 22041



Solid state transmitter

Continental Electronic's new 100% solid state 1 kW AM transmitter features plug-in modules, VSWR protection circuitry and stereo interface. It was designed for unattended operation and easy maintenance.

All important circuits, including the exciter, transmitter control and power amplifiers, are mounted on plug-in circuits.

For more information, call A.V. Collins at 214-381-7161, or circle Reader Service 75.



15 kHz mono STL

TFT Inc. recently introduced a new 8600 series of discrete 950 MHz Aural STL systems. Two 8600 systems, each with a full 15 kHz frequency response, may be used for FM or AM stereo.

The built-in phase adjusting provision ensures proper phase matching between the two links, according to TFT.

In congested metropolitan areas, the 8600 link with its ± 25 kHz deviation and 125 kHz channel spacing permits the use of two links for discrete left and right audio in a minimum amount of occupied spectrum.

For more information, call Kevin Tam at 408-727-7272, or circle Reader Service 79.



Pro recorder

Studer's A812 is a mid-sized professional audio recorder. It offers programmable fast wind speeds and vari-speed operation. Options include serial remote port and center track time code with high speed reading.

For more information, call Bruce Borgerson at 615-254-5651, or circle Reader Service 76.



Headsets

Beyer Dynamic Inc.'s single sided DT 108 and double-sided DT 109 headsets feature high output levels and acoustically sealed earpieces. Both models use modular construction. They are available in both black and light grey.

For more information, call Mike Solomon at 516-935-8000, or circle Reader Service 72.

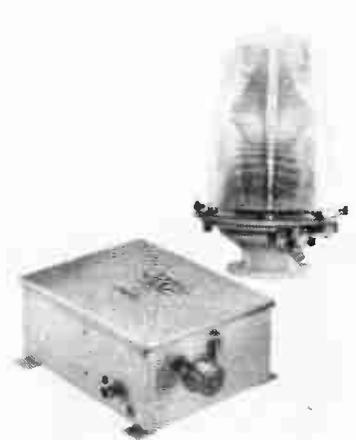


Control unit

Henry Engineering's new Telecart is a phone line-to-cart machine control unit that permits a standard broadcast cart machine to answer a phone line.

It is suitable for radio station "information lines," such as concert lines and ski reports.

For more information, call Hank Landsberg at 818-355-3656, or circle Reader Service 74.



Obstruction light

EG&G Electro-Optic's new beacon system was designed to meet the new FAA Obstruction Marking and Lighting Standards. It eliminates the cost of painting most obstructions while providing about 80% in savings in electricity.

For more information, call Donald Rowe at 617-745-3200, or circle Reader Service 71.

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- | | |
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Buyers Guide

Program Audio Processing

WQXR's Dominator Sparkles

by Herb Squire, CE
WQXR AM/FM

New York NY ... The Apex Studio Dominator Model 704 has permitted WQXR-FM to become loudness competitive in New York City's "modulation wars" without sacrificing the audio quality the station's audience has come to depend upon from its classical programming format over the last 48 years.

User Report

Major Edwin H. Armstrong provided a transmitter on a "temporary loan" basis to W2XQR when it went on the air on 8 November 1939 as New York City's first FM station.

Following the tradition started a few years earlier when WQXR-AM began its high-fidelity broadcasts of classical music, WQXR-FM led the marketplace with many firsts, including binaural broadcasts of live concerts in 1952 and the first FM stereo station in New York in 1961.

However, when the masses discovered FM radio in the 1970s, the battle for loudness began. With the help of the Max Brothers, Audi and Volu, the AM loudness fight moved to FM.

As modulation density increased, WQXR-FM could not follow the trend for several important reasons:

1. People knew the music. They knew the texture, the dynamics and the sonic subtleties.
2. Many listeners had expensive high-quality receiving equipment that rivaled

or exceeded the quality of broadcast equipment.

3. WQXR-FM was located in New York City. There are professional (and even many well-known) musicians, conductors, and even some composers, in the station's regular listening audience.

4. Listeners could go to Lincoln Center, Carnegie Hall and other places regularly. They knew how the music should sound.

As the years went on and technology improved, WQXR-FM tried to put a number of processing systems on the air. They did not work.

Each in its own way changed the quality of the music. Any time anything was changed a storm of protest would emerge from the listeners with the

"golden ears."

When I joined the station two years ago, the loudness problem was even more acute. Compact discs were rapidly becoming the mainstay of the station's recorded programming. This meant more dynamic range than ever before.

Apex Compellers had been added to the program chain which provided a smooth leveling action, keeping the long-term average program content consistent.

But, there was no adequate peak control device which would prevent over-modulation without noticeable high frequency compression and artifacts that would offend listeners.

I remembered seeing a demonstration of the prototype Dominator at the 1985

NAB convention. It was very impressive but not ready for production.

Then in the late spring of 1986, I got my chance to try out one of the first Model 704 Dominators available. After putting the unit through its paces, it was put on the air for a brief test. It has been on the air ever since.

The Model 704 Studio Dominator is similar to the standard Model 700, but includes a circuit card which provides both 75 μ sec pre-emphasis and de-emphasis and a low noise overshoot-corrected 15 kHz low pass filter.

There are several minor component changes on the main board to accommodate the different audio dynamics with pre-emphasis processing.

(continued on page 39)

Loudness Has Reached its Peak

by Marlene Petska Lane

Falls Church VA ... Radio stations have long looked to loudness processing as a key factor in assuring that listeners will tune in to their stations. But there is increasing consensus among audio processing manufacturers that loudness processing has "peaked out." Being loud is no longer enough.

"You've got all the cumes, you've got all the loudness you're going to get," says Texar President Glen Clark.

Bob Orban, Orban Associates Inc., agrees. "There's not technology available to get things any louder without getting them unacceptably grungy," he says.

But just because loudness is no longer the main goal in audio processing doesn't necessarily mean that there is a trend towards less processing in general.

Industry Roundup

"The trend is definitely towards more processing," says Eric Small, vice president of engineering for Modulation Sciences, Inc.

One industry spokesman even suggests that talk and reality about processing are two different things, that "people talk about less processing and then

put more on the air."

Whether or not that's true, stations are clearly looking for a cleaner, more distinct sound, one that goes beyond loud.

And manufacturers have been quick to respond to this new call for improvement.

Modulation Sciences recently introduced StereoMaxx, which enhances the stereo signal spatially. Because the sound field is widened, a unique, "big" sound is created. A station can achieve its own distinct sound.

Circuit Research Labs has redesigned its entire AM and FM product line, upgrading the packaging and bringing the circuitry up to the latest analog technology, according to Ray Updike, marketing director for CRL.

"Processing for a sound that is closer to what would be heard off of a CD in a home environment is increasing," says

(continued on page 30)

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Buyers Guide

Audio Processing Going Digital

(continued from page 29)

Updike. "In response, we added a stereo enhance circuit to expand the stereo image in our FM final limiter."

Texar's Card #5, for use with FM systems running the Audio Prism in conjunction with the Orban Optimod 8100, is the company's answer to improving the processed signal.

"The card more closely matches the Optimod 8100 to the characteristics of the Audio Prism and makes the two play to-

gether better as a system," says Clark.

All of this activity, say the manufacturers, is in response to the demand for "adjustability" during the current interim between analog and pure digital processing.

Stations are seeking a way to sound unique within the parameters offered by today's processing units.

Virtually no one denies the fact that sooner or later, pure digital processing is coming.

As Joe Shapiro, marketing services director of Eventide explains, "There are a whole lot of things you can do digitally that you just can't do any other way. Digital is the way to go, even in loudness processing."

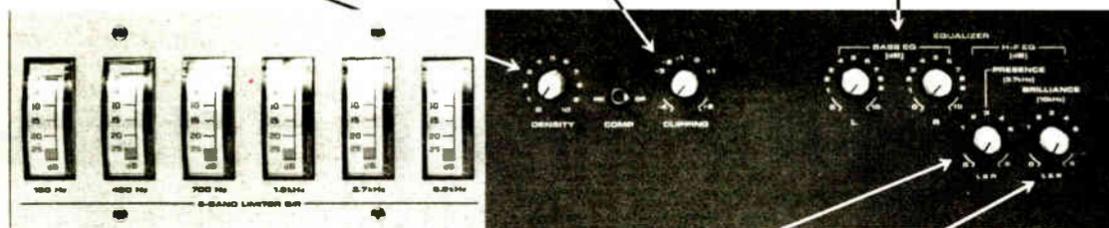
On the road to digital

Several manufacturers, such as Dorrough, Modulation Sciences and Texar, have already incorporated digital circuitry into their products.

DENSITY determines the input drive level to the Six-Band Limiter. Lets you have it your way—open and transparent, or solid and dense.

CLIPPING adjusts the drive level into the multi-band clippers, determining the loudness/distortion tradeoff.

BASS EQ provides peaking boost at 65Hz, making it easy to get the solid punch you need for many contemporary music formats.



Gain reduction meters for each band: they provide the information you need for accurate setup.

PRESENCE boosts the 3.7kHz band to achieve midrange balances right for your format.

BRILLIANCE boosts the 10kHz band. Use it to increase the sense of "air" and "transparency" in your music.

**THE NEW ORBAN
6-BAND FM LIMITER.
(WE LISTENED.)**

Many FM stations perpetually seek "the perfect sound". OPTIMOD-FM alone does it for many. The OPTIMOD XT Accessory Chassis improved results for some. Still, some seek even more from OPTIMOD-FM.

We listened.

Our **NEW 8100A/XT2 Six-Band Limiter Accessory Chassis** (which works with any 8100A OPTIMOD-FM) features two new high-frequency equalizer controls: PRESENCE and BRILLIANCE. They complement the original 8100A/XT's bass EQ controls, and give you *twice the flexibility* of the single HF EQ control typical of other add-on multiband processors.

With an XT2, your OPTIMOD-FM system is totally immune to operator gain-riding errors because the dual-band compressor in the main unit is converted into a smooth, slow AGC to ride gain ahead of the XT2. Any reasonable input level operates the XT2 in its "sweet spot," so there's never any need to add external, potentially incompatible compression.

This is good news because the time-constants and other processing parameters in a pure, integrated Orban system have been carefully harmonized to achieve an overall sound that's *loud and bright*, yet remarkably *open* and free from audible side-effects.

The XT2 also excels in the most difficult of processing tradeoffs—delivering loudness on music while keeping speech free from clipping distortion. Credit this uniquely capable performance to Orban's patented multiband distortion-cancelled clipping system—which we were able to implement in the XT2 system because the XT's circuitry is fully *integrated* into the processing system, not just tacked onto the front.

The XT2 lets you have it all: natural sound, source-to-source consistency, loudness, clean voice, and adjustability that lets you tailor bass and treble to your taste and format requirements. And thanks to its efficient single-chassis construction and its use of the main 8100A power supply, it lets you have the next step in Optimod processing at an exceptionally reasonable price: **\$2075** (suggested list).

We listen to our customers. Listen to our new XT2. We think you'll like what you hear.

Orban Associates Inc.

645 Bryant Street, San Francisco, CA 94107
(800) 227-4498 or (415) 957-1067 Telex 17-1480

orban

Circle Reader Service 20 on Page 28

World Radio History

"Using digital circuitry allowed us to maintain maximum modulation and yet produce a clear, non-fatiguing signal," says Clark of Texar's Audio Prism.

But a pure digital processor—one that executes an algorithmic function that does something to the audio based on the audio itself—is, with the exception of Eventide's reverberation unit, still in the future.

What is taking the development of pure digital processors so long? Unfortunately, there are several problems to be overcome. One major problem is that the algorithms are unknown.

"Broadcast equipment designers don't work with algorithms, they fiddle with a circuit until it sounds good," says Small.

Even though computer programs are infinitely tractable, according to Small, the designer must have some idea of what he wants to accomplish.

The process of changing a few lines of code, recompiling and going through all the steps before actually running the processor is difficult.

"And you can't use a potentiometer with a computer printout—there's no place to stick the screwdriver," says Small.

Problems to overcome

There are also problems to be worked out in the process of converting an audio signal from analog to digital.

"There are side effects due to sampling that you don't get in the analog domain," says Orban.

*Broadcast
equipment designers
don't work with
algorithms, they
fiddle with a circuit
until it sounds
good.*

Another hindrance to pure digital processing is the cost of developing the algorithms. Some doubt that initial development will be taken on by the broadcast industry.

"The resources required to design such a thing are large and the (broadcast) market is small. I don't see how the dollar equation is going to work right," says Orban.

"I could build one," says Clark, "but it would cost \$40,000 and there are only three stations in the country that could afford it."

But, says Orban, the initial research could come from a number of other sources.

"The technology could come out of a university where there's a bunch of kids fooling around; they don't have much cost compared to industrial researchers," he says.

So if you've been thinking of holding off the purchase of a processor until pure digital comes along, you may want to reconsider. According to the manufacturers, pure digital processing is anywhere from "several years" (Modulation Sciences and CRL) to "five or even ten years" (Orban) away.

Buyers Guide

Texar Box Offers Digital Control

by Rob Meuser, CE
CHAM

Hamilton Ontario ... I first met Glen Clark, Texar's president, in 1982. I wanted to buy some antenna software from his then unknown company.

During our discussion, he kept promoting his new magic box, the Audio Prism. I was somewhat skeptical of this box because I had built my own processing system.

I finally agreed to try the unit, but warned Glen that he might be wasting a trip if he expected a sale.

Well built, good response

To make a long story short, we kept the Audio Prism and bought four more. The only time it was taken off the air was when I allowed two assistants to try out another processor to see if it could sound as good as the Audio Prism.

User Report

The Texar units were not defeated.

From a mechanical point of view, the Audio Prism is an extremely well-built and well-laid out unit.

The single-rack space package is of excellent quality and attractive, if you like LED type bar graphs illuminating your rack (which I do).

Electronically, the Audio Prism is as transparent a processor as I have ever tested, and I have evaluated many on the market.

With the correct mix setting, the response is quite close to a square wave out for a square wave in.

The control of the signal is passive. Photoresistors are used, and five nearly transparent op amps and a nearly passive bandpass filter separate audio input from output.

Digital control

From a performance aspect, the secret of the Texar unit lies in its digital control.

Digital control, quite simply put, allows for control of level via a servo loop style system. The gain tracks from maximum expansion to full compression without any alteration of attack or release characteristics.

When control is not needed, the loop stops wherever it is, then turns on again when needed. This control is precisely why the Prism is so successful, especially in FM.

It can pass old singles from the '60s and hardly operate at all, and then immediately take on a CD!

The really amazing thing about the Audio Prism is the fact that it constantly produces major market audio quality with small market ease of adjustment.

Easy to install

I have installed the Prism in major stations that were in pursuit of a "hot, competitive sound," and I've been able to ship them across the continent almost pretuned!

Setting up the Prism is quite simple. There are measurement points for each and every adjustment of the unit. A small AC voltmeter is all that is required.

The adjustments comprise input level, gate threshold, a control called "density," and the return mix of the four separate audio bands as well as the output level.

Only the input does not have a specific measurement point, except for the gain reduction of the four audio bands. This is indicated on the front panel, with all the brilliance that 60 LEDs can produce.

Once you obtain a reading in one Audio Prism installation, you can measure the result and duplicate it many times

over for similar situations.

The instruction manual gives both the AM and FM broadcaster suggested starting points that work with various types of transmitters and exciters.

Improving performance

The Audio Prism has come a long way since the first one I saw. It has become a hot item in the fast lane of audio processing.

Texar now offers a retrofit Card #5 for

instances when the Audio Prism is used with Orban's Optimod 8100. It gives the whole system that open but powerful digitally-controlled sound. The Audio Prism may also be used in front of the Optimod 8000.

I have had superlative results with both of these units as well as with other FM limiters of both American and European manufacture.

For AM stereo with NRSC pre-emphasis, the units are set up and perform in a manner very similar to the FM setup, using another well known AM stereo limiter.

(continued on page 39)

HERE'S WHY Professionals Choose CRL for AM Audio Processing

Recognized world wide as the leading manufacturer of AM audio processing systems CRL has introduced a standard of performance and flexibility that has yet to be matched.

Our contribution to the establishment and definition of the recently adopted NRSC Voluntary Transmission Standard demonstrates our strong commitment to AM broadcasting.

Now that industry wide acceptance of this standard is rapidly spreading, the AM listening audience will enjoy fuller fidelity receivers and reception. As this occurs, the demands put on the audio processing equipment to deliver accurately controlled audio program material become much more stringent.

CRL's combination of intelligent Multiband AGCs, Four Band Compressors and Multiband Limiters/Clippers allow for maximum modulation while maintaining full bandwidth tonal balance and program integrity.

The new CRL AM audio processing systems have been upgraded to reflect the latest advances in technology and incorporate many additional desirable features.

The new CRL Audio Processing Systems Include:

- Wide Range Linearized Input AGC capability
- Selectable Audio Input Asymmetry Removal
- Programmable 3 dB Gain Reduction Steps
- Programmable Attack/Release Time Controls
- Switchable Processing Operation, Wide, Multi, or Combined
- Exclusive, Patented Dynafex® Noise reduction
- Pulsed (NRSC) or Static USASI Noise Calibration Generator
- Selectable AGC Gating Threshold
- Adjustable Four Channel Output Equalization
- Selectable NRSC Pre-Emphasis
- Selectable NRSC (9.5 kHz) or Optional 11 kHz Patented Overshoot Compensated Output Bandwidth Filtering
- Adjustable Low Frequency Transmitter Tilt Correction
 - Programmable 1 dB step Peak Limiting/Clipping Control
 - Adjustable Stereo Enhancement (Stereo Systems only)
 - Patented AM Stereo Single Channel Limiting (Stereo Systems only)
 - Auxiliary Monaural Output (Stereo Systems only)
 - 20 dB Range, 10 Segment Input Peak Indicators
 - Rack Slide Mounts are available for all broadcast products

These features and more are housed in versatile modular packages. This allows specific systems to be configured to satisfy any program or budgetary requirements of the station and provides for easy interfacing into any transmission system.

See for yourself why more professionals choose CRL AM Audio processing systems. Call us now for more information or to arrange for a free trial.



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Buyers Guide

BBE Restores Sound Character

by Steve Keating, CE
KTWV FM

Los Angeles CA ... In our modern era that future historians may well name "The Computer Age," advances are made daily in the electronics field.

The broadcasting industry has shared in this spectacular explosion of technology, benefitting from the availability of a broad range of sophisticated devices developed specifically to enhance and streamline the hardware part of the broadcasting business.

Leaving footprints behind

One such technical tool is Barcus-Berry Electronics' Model 802 audio processor, introduced to the market just a few short months ago.

Intended for PA sound reinforcement, recording and broadcast use, the purpose of the 802 processor is to restore the natural acoustic character of audible sound information that has been electronically conveyed.

No matter how efficient an active electronic audio amplifier may be, the "feel" of reproduced sound always contains the footprints left from the transfer of acoustic to electrical energy and back again.

As stated by the manufacturer in its brief but concise instruction booklet, the action performed by the device

"... (helps to) counter the effects of the speaker/amplifier interface ... (by 'preconditioning') the signal going to the amplifier. A predetermined phase shift ... is applied across the audio frequency spectrum."

The broadcast engineer might well wonder how such a unit could benefit a system where the final product is converted back to acoustic energy only once it is outside of his domain.

User Report

The practical reality is that the placement of this unit in the broadcast audio chain just ahead of the final peak-limiter(s) results in an amazing increase in program clarity.

Through a unique manipulation of program harmonic content and phase correction circuitry acting primarily on higher frequencies, the Model 802 "realigns" the harmonic and fundamental audio frequencies to their natural balance. In essence the sound source returns closer to its original shape.

Because the upper portion of the audio spectrum appears boosted by processing activity, a screwdriver adjustable control is provided for each channel on the front panel. Labeled "low

freq. control," it can boost 50 Hz by more than 6 dB for "balancing" the processed output.

Similarly, another screwdriver adjustable control accessible from the front panel marked "line gain" is provided. It can reduce the overall apparent loudness produced by the effect of the device so it more closely matches the output level when the bypass switch is engaged. The incoming signals are routed through relay contacts to the output terminations.

Unity gain for both controls is found at opposite ends of the controls' respective positions.

Other than the bypass switch, on-off power switch, line gains, low frequency gains and process controls, the front panel contains only a few LEDs which serve to indicate operational status.

Individual indicators show power supply output, in and out bypass condition, process clipping levels, and low, moderate and high levels of processing activity on each of the two channels. The latter may be used in a dual-mono configuration, or left and right stereo application.

Electronically balanced high impedance input and low impedance output terminations are made to back panel connectors via 3-pin XLR type connectors internally parallel with the tips and rings of standard 1/4" phone jacks.

Shield ground connections are made

through the phone jack sleeves, and on pin 1 of the XLR connectors. Nominal incoming and outgoing program levels are +4 dBm at 600 ohms.

Primary AC power is made through an IEC standard three-prong receptacle which also houses a common 3AG type fuse. The unit can be wired to operate from a broad range of primary input power voltages.

Defies static testing

Upon receipt of a stock Model 802 unit shipped to me by the manufacturer, I chose not to bench test its static performance capabilities.

I have found that audio processing devices which substantially alter sound waveforms' fundamental and harmonic frequency content as well as their phase relationships often defy static performance measurement scrutiny.

Frequency response bandwidth, transient and fixed frequencies intermodulation and harmonic distortion tests usually result only in revealing the high levels of performance our industry has come to take for granted since the introduction of premium solid state integrated circuits.

Test measurement standards yielding tangible product performance and operational characteristics have yet to be established for modern audio processing equipment. Until then, there remains a single method of final evaluation—listening.

(continued on page 34)

To Find The Best-Built Broadcast Audio Amplifier... You've Got To Look "Under The Hood."



From the outside, most broadcast power amplifiers look pretty much alike. (After all, audio power amps are designed to be heard, not seen.) And this might lead you to suspect that the major brands are pretty much alike on the inside as well.

So you buy the best-known brand, right?

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Choice of active or transformer balanced input options	YES	NO Transformer input option NOT available
Full complementary discrete circuitry for optimum performance	YES	NO Quasi-complementary circuit design
Plug-in modular design for fast, easy servicing in the field	YES	NO Hard-wired, precludes module swap

While the other brand is a competent performer, as a broadcast engineer you can readily appreciate the extra care in engineering we put into the model 85. And every BGW amplifier is built with the same total commitment to engineering excellence.

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Buyers Guide

Delta AMP-1 Boasts Adjustability

by Joey Sainton, Des Eng
JSA

Dallas TX ... With the introduction of its new AMP-1 audio processor at the NAB convention held here recently, Delta Electronics celebrates its 25th year by becoming the only manufacturer to offer a complete C-QUAM™ AM stereo package, including the exciter, monitor, audio processor and installation.

Out of necessity

In late 1985 Delta expressed to me its concern over the high number of AM stereo related service calls it was having to make.

In the vast majority of cases, the problem was a misadjusted audio processor. Thus it seemed quite logical for Delta to opt for manufacturing its own audio processor, rather than continue readjusting others.

Obviously, one of the main design goals for the AMP-1 was ease of adjustment. Competitive loudness, signal fidelity and absolute control of the audio peaks were other goals. To meet each of these, a tri-band matrix approach was decided upon.

Most audio processors have some form of slow-acting wideband AGC on their input and the AMP-1 is no exception. Left and right audio signals are applied to individual two-op amp differential amplifiers.

The gain of these amplifiers is con-

trolled digitally by the level of the L+R signal to preserve mono loudness. The range is purposely limited to 10 dB, so as not to cause any wideband processing artifacts.

Tri-band filtering

Next, the left and right audio signals are matrixed into L+R and L-R to be processed in the sum and difference mode, which has been found to be the

“

... it seemed quite logical for Delta to opt for manufacturing its own processor.

” most appropriate way to process for C-QUAM AM stereo. From here, the L+R and L-R signals are applied to their own processors.

These processors consist of a 3-band filter/VCA combination. The filters have gentle 6 dB/octave slopes to maintain the transient response required for the signal fidelity goal, and the VCAs exhibit distortion too small to be measured, with little control voltage feedthrough.

Gain control is accomplished by a digital decision-making circuit in each band that can do one of three things: increase the gain, decrease it, or leave it where

it is, with the L+R signal the controlling factor.

If it decides to increase or decrease the gain, this is done at a constant number of decibels per second to provide a smooth, inaudible change. The rate at which it changes is user-adjustable by the attack and release controls in each band, as well as the amount of change allowed by the range control.

Additionally, the fixed gain of the L+R VCAs may be increased by 6 dB to provide stereo enhancement.

Limiting and clipping circuits

Upon exiting the tri-band filter/VCAs, the L+R and L-R audio is summed back into wideband signals and applied to their own integrated peak limiter/clipper circuits.

The limiter senses the onset of clipping and sends a signal back to the VCAs to reduce the gain just enough to prevent the clipping from becoming audible.

This is one of the ways that the competitive loudness goal is met, and the way that absolute control of the audio peaks is maintained.

The circuit also allows adjustment of the L+R positive peaks from 100% to 150%. If a single-channel-only condition

is sensed, the L+R negative peaks are limited to 70%.

Recently, Delta has incorporated the new NRSC pre-emphasis and low pass filtering. If everybody uses it, maybe someday we'll have high quality AM radios.

Designed for ease of adjustment

Audio output control in the processor is done before de-matrixing to meet the goal of ease of adjustment.

We found that adjusting the left and right signals for the required modulation and separation parameters is difficult.

However, adjusting L+R for modulation and L-R for separation (or stereo content) is quite easy. All user adjustments are placed behind a front security panel.

LED bar graph metering is provided for Left/Right Input/Output levels, L+R/L-R Input/Output levels, L+R/L-R tri-band gain and L+R/L-R tri-band levels.

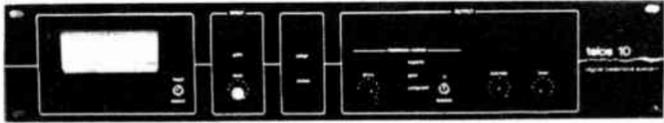
Two additional LEDs show whether the input AGC is operating in its proper range, and another shows when the single channel limiter is active.

Delta also has added a headphone driver with its own volume control.

Editor's note: For more information, contact Joe Novak at Delta: 703-354-3350. The author may be reached at 214-924-3929.

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Buyers Guide

HF Station Opts for Dorrrough

by Roy Shontz, Chf Trans Eng
KVOH

Woodland Hills CA ... Shortwave station KVOH is operated by High Adventure Ministries in Northridge, CA. It is the first West Coast HF station since 1939.

KVOH uses an RCA 100B HF Ampliphase transmitter with a Dorrrough DAP 610 Audio Processor.

I have always been intrigued by a transmitter system utilizing the concept of outphasing.

Outphasing, as the name implies, provides amplitude modulation into a common load by using the vector sum of two separate high efficiency Class C power output amplifiers, whose phase relation-

User Report

ship is varied at an audio rate by phase modulation techniques. The concept was marketed by RCA under the name of Ampliphase in 1955.

We located an RCA 100B HF Ampliphase for KVOH and, after acceptance tests were completed, it was shipped to Simi Valley and reassembled. It was placed in service 17 November 1986.

We had a desire to provide a natural sound which would be loud and clean, but devoid of the artifacts that accompany high levels of audio processing present in most AM broadcast signals

and the frequency selection techniques prevalent in shortwave broadcasts.

This system has no reactance networks or transformers to limit the frequency response or transients. Also, it is inherently balanced where the modulation is developed at the output of the transmitter with both channels contributing equally throughout the entire modulation cycle, making it a wide band system.

Ampliphase modulation is effectively a DC coupled modulation system. Therefore it has a transparency somewhat similar to FM sound.

In order to satisfy our original goals of sound quality, we looked for an audio processing system that would reproduce the most natural sound.

While some shortwave broadcasters utilize audio techniques which shape the spectrum and include broadband clipping, we chose to present an open sound which is essentially wideband with moderate amounts of compression and limiting. The Dorrrough DAP 610 Audio Processor was our choice.

The Model 610 is a musically engineered system that has a very pleasant and natural sound to the ear. It is a three band compressor configured to place equal power in each band. The result is preservation of the integrity of the music. This is the only audio processor we know of that does not add artifacts.

The DAP has an attack time fast enough to be within the first half cycle of a 15 kHz signal. Overmodulation is

tightly controlled.

The DAP has a program equalizer that can be adjusted to satisfy program taste and sound requirements. It may be used at will to help improve program balance within the limits of international broadcast stations.

International stations are required to limit the audio response to 5 kHz because of congestion in the shortwave bands with 5 kHz channel spacing.

Too many international stations use

heavy clipping along with overlimiting under these requirements. This approach reduces dynamic range to the point where not only program integrity is lost, but the station ceases to be pleasant to listen to.

The transmitter and the Dorrrough DAP 610 are a perfect combination which allow us to maintain high engineering standards and bring higher audio practices to shortwave broadcasting.

Editor's note: For more information about DAP, contact Mike Dorrrough at Dorrrough Electronics: 818-999-1132. The author may be reached at 818-701-5133.

BBE 802 Works 'Magic'

(continued from page 32)

With this in mind, switching the 802 unit in and out of your on-air audio processing chain (properly adjusted) will do the job.

The vast majority of audio processors require elaborate set-up procedures to produce the intended results. This is not the case with the 802.

From the moment you engage it on line, regardless of where it has been positioned in the audio chain, you will hear a significant increase in clarity, especially with music towards the high end.

The difference in processed audio and non-processed audio is like the difference between high-fidelity speakers with and without pillows placed in front of them.

I can only say that "the proof is in the

pudding." Once I had switched my demo unit on-line on the air I immediately phoned the Barcus-Berry people and informed them that they couldn't have the unit back!

The effect is so dramatic that GMs, PDs and all non-technical station personnel will quickly perceive an added crispness, cleanness and sparkle not previously heard, on all types of receivers.

If you are in the market for that magic black box that will give you an edge over your competition without busting your equipment budget, arrange a trial of the 802 processor—it could make you a very popular person!

Editor's note: For more information, contact John McLaren at BBE: 714-897-6766. The author may be reached at 213-466-9283.

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Circle Reader Service 13 on Page 28

Dolby SR Compared to Digital

by William Mead, Bdcst Tech Mgr
Dolby Laboratories

San Francisco CA . . . Since its introduction, Dolby spectral recording, or Dolby SR, has attracted worldwide attention as a practical method of raising the performance of analog recording up to the level preferred by today's critical listeners.

Dolby SR is finding applications in all segments of the audio recording, motion picture and broadcast industries.

For the radio station, SR offers a practical means of improving the quality of existing recording equipment—often to the extent that replacement with new equipment, digital or otherwise, is unwarranted.

Any well maintained tape recorder, including reel-to-reel and even cart players, can be equipped with the process. Furthermore, SR can be used to effectively eliminate a noisy studio-transmitter link as the overall quality restriction in the broadcast system.

Dolby SR, like the more familiar Dolby A-type noise reduction, relies upon the concept of complementary signal processing.

A complementary process is one where the audio signal is treated, or altered, in a controlled way to make it more suitable for storage or transmission; then on playback, an exact opposite, or mirror image process, is used to restore the signal back to match the original.

In short, it is an encode-decode process.

Depending upon the effectiveness of the process, the problems caused by the natural limitations of the storage or transmission channel are audibly reduced.

A complementary fixed frequency response change, called pre- and de-emphasis, is often used in transmission and recording to reduce noise on play-

back. Often, however, this carries the penalty of inefficient channel loading by reducing the available headroom at high frequencies.

Similarly, a wideband compander which is continuously changing the gain of the signal, can be used to increase the apparent dynamic range of a channel, but the side effects—audible modulation of the noise floor—can be equally disconcerting.

Dolby A-type noise reduction, introduced in 1965, was the first professional system to effectively deal with noise in such a way that critical needs could be satisfied.

Dolby A-type divides the frequency spectrum into four fixed bands with each treated separately.

Individual treatment of different frequency regions allows a full noise reduction effect at frequencies away from the main signal where noise can be heard—that is, not concealed by the presence of program material.

With A-type, the processing in each frequency band is limited to only that absolutely necessary for effective noise reduction, thereby minimizing the potential of any side effects.

Controlling the action to only that which is absolutely necessary is called the "least treatment principle." Both complementary processing and the "least treatment principle" are cornerstones of the new Dolby SR process.

Dolby SR goes beyond previous systems in its ability to efficiently and fully "load" the storage or transmission channel.

It entails a sophisticated analysis of the audio signal during the recording process to determine its predominant spectral characteristics.

This analysis, in turn, directs a number of movable filters into position. This results in a controlled frequency-sensitive increase of low level pro-

gram material.

For high level program material, the SR process also incorporates what are called spectral skewing and anti-saturation circuits.

These circuits control the maximum signal level, thereby allowing significantly higher record levels at extremely high and low frequencies. The result is more efficient use of the storage or transmission channel at all levels and at all frequencies.

When the SR encoded audio signal is decoded on playback, there is a matched mirror-image process, restoring the level of the previously increased signal back to that found at the input.

Noise introduced between encode and decode is reduced by about 24 dB. Because the SR process "packs" the audio gently within the limits of the recording channel, there is less chance of overload; therefore, less distortion and no audible side effects are produced.

Dolby SR makes extensive use of modern theories on human hearing. In keeping with the "least treatment principle," SR is optimized to process the signal only in areas where the ear is able to detect problems, leaving the rest alone.

This explains why listeners feel that SR recordings retain the natural clarity of the original material. Dolby SR recordings sound accurate and unprocessed—like the authentic "line in" signal.

Dolby SR can be used on all types of tape recorders at any speed with good results. A typical use at the radio station would be on a two-channel 1/4" tape recorder.

Two channels of Dolby SR can be incorporated using Dolby 280 modules mounted in two Model 361 Series interface frames.

Adding these will improve the performance of the recorder to where it can be compared—sonically—with the best digital machine, but at a fraction of the cost.

And, the tapes can be edited easily using conventional razor blade techniques without expensive editing systems.

Cart machines, both new and existing, may also be equipped with Dolby SR. At the 1987 NAB show, Pacific Recorders & Engineering demonstrated Dolby SR as an outboard unit with its line of Tomcat cart machines.

Those who heard the demonstration were impressed that the cart format, often considered to be a low-grade tape format, could sound so clean.

Pacific Recorders now offers a Dolby SR package for use with its Tomcat and Micromax cart machines.

Clean source material is especially im-

(continued on page 38)



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Buyers Guide

StereoMaxx Creates Unique, 'Big' Sound

by Eric Small, VP Eng
Modulation Sciences, Inc.

Brooklyn NY ... Broadcasters process audio to maximize coverage, make the station as loud or louder than the competition and provide a unique sound that is easily identifiable.

All of these goals are achieved by the use of compressors (single and multi-band), limiters, and static or dynamic equalizers. These processing devices all alter the peak or average amplitude at various frequencies.

Modulation Sciences' StereoMaxx, however, works differently. StereoMaxx enhances the overall spatial effect of stereo. The stereo image becomes bigger and deeper.

The effect is dramatic even on "box" type portables with their closely spaced speakers, and is especially striking on auto radios and Walkman™-type headphone portables.

So what's new, you ask?

Stereo processing problems

Creative engineers have been hyping stereo for years, but always with problems—often intolerable ones. By boosting L-R gain, for example, the stereo field will expand, but the monaural signal will drop considerably in loudness.

And with a hefty chunk of most stations' audiences still listening in mono on cheap portable and table radios, loss of loudness in mono cannot be tolerated.

Many stations that tinker with their L-R report exaggerated multipath effects. Increasing the peak level of L-R seems to make the signal much more susceptible to multipath problems, especially in cars.

Several consumer type "hi-fi" devices have been marketed as "ambience" enhancers. Some of them sound nothing short of spectacular in stereo. But trying to use them at the radio station is a different story.

Most of these consumer "ambience" enhancers suffer from even greater mono compatibility problems than are caused by simply cranking up the L-R gain.

Mono compatibility has never been a design goal for the hi-fi type stereo enhancers. After all, what self respecting audiophile would ever sum stereo channels to get mono?

Another nasty problem with the hi-fi enhancers is image stability. On music which was recorded using "legitimate" coincident miking techniques (M-S for instance) many enhancers tend to "destabilize" the sound image.

The effect is best described as a "swimming" or "rocking" of the image, which

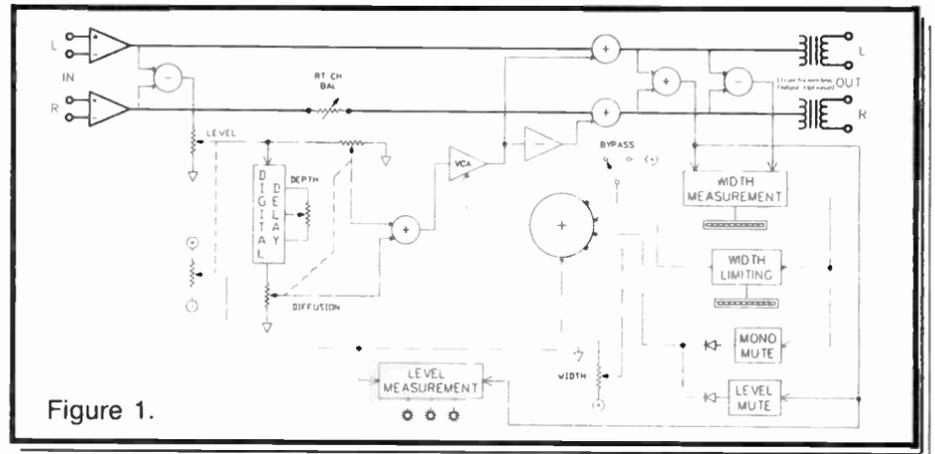


Figure 1.

is obviously disconcerting to the listener.

Modulation Sciences became interested in stereo enhancement because many of our customers were asking us for some way to make their stereo "bigger." Several techniques were explored and discarded for the reasons mentioned earlier.

Finally we discovered a technique that delivered the benefits without the problems. Conceptually simple, it nevertheless addressed all the drawbacks previously encountered.

Figure 1 shows the basic topology. The incoming audio channels are subtracted

to form a difference signal, L-R. The difference signal is delayed 3 to 15 ms. It is then split into two signals, out of phase with one another.

One signal is mixed into the Left output channel and the other is mixed into the Right output channel. Note that the stereo is *never* converted into sum and difference format, processed, then converted back to Left and Right.

Let's examine what is happening in detail:

1. By first extracting a difference signal to use in the enhancement process, **(continued on page 38)**

KSO Converts to NRSC With CRL

by Jerry Bowers, DE
KSO

Des Moines IA ... KSO was the first AM stereo radio station in the state of Iowa. We use a modified Harris AM stereo exciter with Motorola C-QUAM™ signal generating. The quality in noise response, distortion and separation exceed that of over 60% of the FM stations in the nation.

With noise at -70 dB, response at ±0.25 dB (L, R; L-R 50 Hz to 10 kHz), distortion at 1.7% maximum and separation at -31 dB to 41 dB, why would we

want to make a change in our audio?

While AM stereo receivers typically allow for an adequate bandpass, monophonic receivers do not. The majority of our listening audience still listen in on 3 kHz bandpass receivers.

That, and the occasional complaint from the program director and general manager about splatter from neighboring stations in the antenna nulls made me decide to give the new NRSC standard a try.

I was quite pleased to find the CRL 75 μsec pre-emphasis and 10 kHz lowpass filter easy to install in my SMP 900 matrix limiter. A filter card was attached to the mother board with ease, and a pre-emphasis modification (a few resistor changes) was available from the factory.

After installing this new standard, I stood back to see what would happen. I noticed three immediate results.

First, with all the audio maintained in a 10 kHz bandpass we were now sounding just as good as a 5 kW non-directional daytimer (and 5 kW directional night) on 1460 kHz as our competition at 1040 kHz, 50 kW non-directional.

Second, the adjacent channel interference that we had become so accustomed to had literally disappeared.

And third, there is a distinct improvement in monophonic reception (especially on the typical 3 kHz receiver) with the 75 μsec pre-emphasis.

Our initial intention of relieving the station of some of the adjacent channel splatter has been more than met, and we're even legal!

User Report

But it is even more obvious to me that the adoption of the NRSC standard is, by far, one of the truly great improvements for the whole AM band. Our hats go off to the NRSC team (and CRL) for a much needed standard that will more than save AM radio.

Manufacturer's note: NRSC conversion is available from CRL for nearly all audio processors on the market. Modulation monitor conversions, stereo or monaural, are also available.

Editor's note: For more information on CRL's NRSC conversion, call Ray Updike at 602-438-0888. For information on the NRSC standard, call 800-NAB-NRSC. The author may be reached at 515-265-6181.



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Buyers Guide

MLW-1 Audits Audio

by Larry Titus, Pres
Titus Technological Labs

Glastonbury CT ... For years broadcasters and production facilities have had the problem of what to do if a stereo channel or the entire program audio is lost from a broadcast, satellite feed or stereo production mistake. Another problem has been matching and switching sources of two different levels.

The Titus Technological Laboratories' MLW-1 detects and corrects these problems. Its microprocessor-based controls make decisions instantly, before inaudibly "cross fading" the appropriate MLW-1 functions in or out of the audio chain.

The MLW-1 watches for channel drop-out on the active input of one of its three stereo inputs. When a channel is lost, it automatically takes the channel with audio, puts it into both outputs and alarms the operator that a channel is missing.

And it can automatically bring up another stereo source. If the audio is missing for a period of time, it will automatically do this.

If the audio on the inputs is polarity reversed it will automatically correct the problem. All sequencing and time delays before action are user programmed.

In the "Manual Mode" the MLW-1 allows the user several operating conditions and controls over the audio.

With the push of a button, the user can also reproduce the source (stereo pass through), produce an out-of-phase stereo source, produce the sum or difference of the inputs on both output channels, or direct the left or right channel input to both outputs.

The heart of the MLW-1 is a microprocessor which monitors the selected audio input and controls all of the processes.

The microprocessor analyzes the error condition and, based on the immediate past history of error conditions and the

user selected time delays and sequencing, will automatically (or manually) direct the correction of the error.

There are three stereo inputs on the MLW-1. Each channel of the first two inputs are DIP switch-selectable for operating levels of +8 dBm, +4 dBm, or -10 dBm (the third input is preset to +8 dBm).

The audio is then passed to either the internal 32 input, 4 output audio router or a 4 by 2 audio router for processing in the matrix circuits and passed along to the metering or the buffered monitor

audio outputs.

The 32 by 4 audio router is then fed into four VCAs which will "cross fade" the appropriate operating condition into the stereo outputs.

The inputs are all active, balanced and high impedance. The outputs will operate at a user-selected level of +4 dBm or +8 dBm. The outputs are active, X-balanced, and DC isolated.

The maximum output level is +29 dBV (+27 dBm) which will provide more than adequate headroom for any installation.

One common application for the MLW-1 is installing it at the end of a discrete STL path. If one of the STLs is lost, the active STL will feed both channels. Or an alternate input, such as phone

lines, can automatically be put on the air.

Another application is installing it in a satellite audio feed. If the feed is lost, another can be put on line. The MLW-1 also can be remotely controlled and monitored.

Other applications include switching between studios, main and standby audio processing chains, satellite feeds and channels on four track tape machines. Because there are so many applications for the MLW-1, an applications pamphlet is available by writing or calling Titus Technological Laboratories.

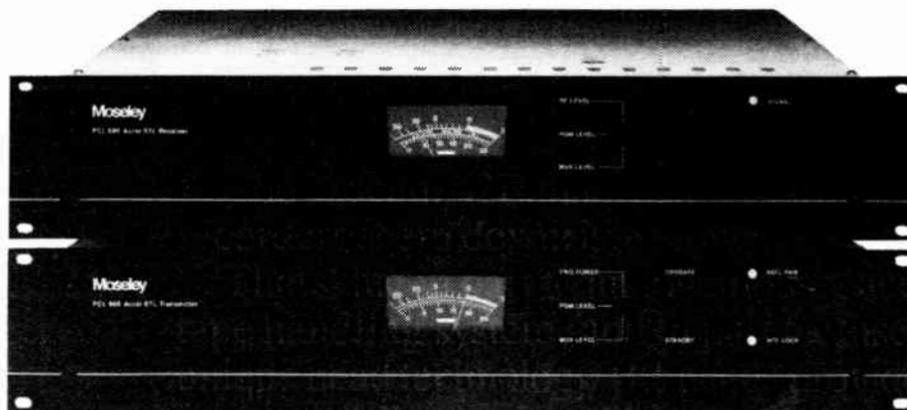
Editor's note: For more information contact Larry Titus at Titus Technological Laboratories: 203-633-5472.

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Circle Reader Service 35 on Page 28

Circle Reader Service 29 on Page 28

Buyers Guide

StereoMaxx Creates 'Big' Sound

(continued from page 36)

we guarantee that only stereo information will be acted upon.

When a mono signal is fed into the StereoMaxx, no difference signal exists and thus no enhancement will take place. This ensures that a DJ's voice will stay put rather than wander or be diffused between the speakers.

2. Next, the difference signal is delayed. This delay is the most critical step in StereoMaxx. Psychoacoustically, it creates the effect of "bigness."

Electrically, it offsets the enhanced signal in time so that it no longer adds and subtracts from the stereo signal in a predictable way.

This prevents the StereoMaxx from increasing the peak modulation of the L-R subchannel much greater than it would be without enhancement.

More technically, the delay decorrelates the enhancement signal from the stereo program.

Another way to look at the process is that by using delay, the enhancement "fills up" the brief periods of silence between the notes in the music. The average energy in the L-R channel increases, but not the peak energy.

3. By re-inserting the delayed signal into the Left and Right stereo channels out of phase, the effect is made completely inaudible to monaural listeners. This is important, because otherwise the delayed signal would sound strange in mono.

Basic design enhanced

A number of additions to the basic design were needed to create a professional

broadcast product. (See Figure 1)

The tendency to destabilize the image of some stereo material was cured by bleeding some signal—about -30 dB below program level—around the delay line. This small un-delayed component in the output seems to hold the image "locked" in place, without any significant effect on monaural compatibility.

Another concern was how StereoMaxx would effect material that was already highly separated. Too much of a good thing can sound bad. To prevent this, "Automatic Width Control" was added.

This circuit senses how much "stereo" the program material has. If it is "big enough," the gain of the L-R "enhancement channel" is reduced. The reduction is non-linear, with a threshold.

To indicate the status of these circuits, two LED bar indicators are on the front panel. The lower one, Width, displays the ratio of L+R to L-R as an expanding line. Above it is a display of the Automatic Width Control. This indicator moves inward to indicate reduced gain in the L-R "enhancement channel."

If either the Left or Right channel goes silent, the enhancement must squelch off, preventing the enhancement from being heard on a channel without program. It also prevents enhancing impulse noise that might appear on the silent channel.

Preventing mishandled mono

Another special circuit takes care of signals that are "almost" monaural.

For example, a console can add enough level unbalance and phase shift between left and right channels to make

the DJ mic seem a bit stereo. A stereo threshold detector prevents these marginal signals from being enhanced as though they were stereo.

An additional circuit provides for input level setting. Yellow, green and red LEDs indicate "barely enough," "just right" and "too much" signal level.

Three adjustments are provided: Depth, which controls the length of delay applied to the L-R signal; Width, which is the total amount of enhancing signal returned to the Left and Right channels; and Diffusion, which is the percentage of enhancing signal that is not delayed.

A push-button acts as a bypass switch to disable the entire enhancing chain. It flashes red when in the bypass mode.

Installation

Because StereoMaxx operates in the time delay domain rather than the amplitude domain, it is fully compatible with all processing used in broadcasting.

Setup is simple. The level control is adjusted so the green LED is lit most of the time and the red flashes hardly at all. Balance is set with StereoMaxx in bypass and being fed monaural program material. Adjust the balance control for minimum indication on the width bar. That's it for setup.

Problems with multipath discourage many stations from trying to increase their stereo width.

In addition to loss of monaural loudness, using simple linear matrices to increase L-R also increases L-R peak levels. As the peak level of the L-R channel increases, the impact of any multipath increases too.

This devastates the effective coverage of a station. It doesn't matter how many millivolts of signal you have if the station sounds so distorted by multipath that no one will listen to it.

StereoMaxx avoids these problems by not increasing the peak level of the L-R subchannel over what it would be without enhancement. The result increases stereo image size without degrading the sound quality or coverage of the station.

Applications

Uses for StereoMaxx are as varied as the uses of stereophonic music reproduction.

For FM broadcasters with formats ranging from Beautiful Music to Rock to

Heavy Metal, StereoMaxx will create a unique, attention-getting sound in any stereo listening situation.

Because the effect does not add anything to the music as reverberation would, even sensitive formats such as Beautiful Music can greatly benefit from it.

The protective circuits discussed earlier assure that StereoMaxx will make the right decision regardless of the program material.

And, rather than "homogenize" the sound, StereoMaxx brings out the differences between musical selections.

Lastly, like a good DJ, StereoMaxx knows when to keep quiet.

Editor's note: For more information call Dan Rau at Modulation Sciences: 718-625-7333.

Dolby SR

(continued from page 35)

portant for the station that uses a compression-type processor on its output signal. These devices increase the gain during quiet moments—frequently allowing tape hiss from noisy recordings to be broadcast.

Using Dolby SR on pre-recorded material will provide ample operating latitude where tape noise will not be raised to an audible level.

Another application for Dolby SR is on the studio-transmitter link. Here, a stereo station would typically use two channels at both the sending and receiving end.

The two-channel Model 365 is ideal. In cases where a noisy but otherwise sound STL has proven to be a quality restriction, Dolby SR can be used.

Initial users have found that, in addition to decreasing system noise by more than 20 dB, the overall modulation level can be increased up to 6 dB. Dolby SR has proven to be a simple and relatively inexpensive way to add new life to an older but reliable STL.

Improving off-air audio requires a top-down understanding of the quality limitations as heard by the listener. Often, the signal can be noticeably improved by using Dolby SR only where there are weak links in the system.

Editor's note: For more information on Dolby SR, contact the author at Dolby Labs: 415-558-0200. For information on Pacific Recorders' Dolby SR package, contact the company at 619-438-3911.

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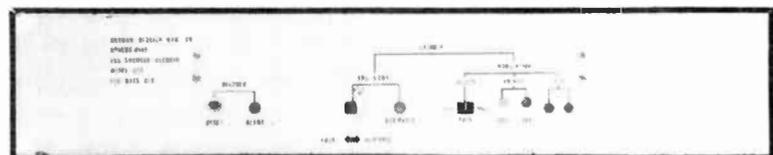
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WQXR's Dominator Adds Audio Sparkle

(continued from page 29)

The results for WQXR-FM were outstanding. The "brick wall" low pass filter combined with an "absolute maximum" peak output ceiling allowed us to bring up the average modulation several decibels. We did not have to worry about overshoot and/or peaks sneaking through.

The entire unit was so transparent we could not tell if it was really working until we made an A-B comparison with other stations and realized we were much louder than ever before.

The set-up and installation of the Stu-

Audio Prism

(continued from page 31)

Texar also has an excellent sounding phase rotator and a very effective AM peak limiter card. The newest version is the AMC-2, which is NRSC compatible.

Texar has also introduced a new style Prism called the Phoenix, which is optimized for AM.

In the twenty-five Texar installations (both AM and FM) that I have performed in various parts of the world, no units have ever come back because of lack of impressive sound.

Editor's note: For more information, contact Glen Clark at Texar: 412-856-4276. The author may be reached at 504-292-0840.

dio Dominator is quick and painless. It is the easiest limiter to put into operation that I have seen in many years.

The lack of control interaction cut down adjustment time to mere minutes instead of hours. The only feature not present on the front panel was the output level trimpot to slice that last decibel before the stereo generator.

Actual adjustments were fairly down the middle. For our application we did not use any of the equalizer controls for boost or cut. The same is true of the release time.

For our wide dynamic range in source material, we found that the release control set near 12 o'clock gave us the least noticeable limiter action.

The LF crossover was set at 80 Hz and the HF crossover was set at 4500 Hz. The transient enhancement circuit (TEC) was put on and the unit operated in the tracking mode.

With the Dominator teamed up with Aphex's Compellor at the studio, WQXR-FM's loudness was dramatically improved with no noticeable sacrifice in sonic integrity.

The complaints from listeners stopped. We got a few letters and calls congratulating the station on its "power" increase. In addition, we gained a happy sales department at the station.

The Studio Dominator met WQXR-FM's specific needs very well. I cannot speak of its effectiveness when put up against other processors when loudness and density are the only require-

Buyers Briefs

JSA Inc.'s new stereo audio processor, the Eliminator, may be used as a production room processor/equalizer/stereo enhancer for putting music and commercials on cart, a pre-processor for AM and FM, or as a recording studio mastering processor. It features up to 20 dB of wideband compression, a bass and treble equalizer with up to 20 dB of boost or cut and an integrated peak limiter/clipper circuit for control of output peaks.

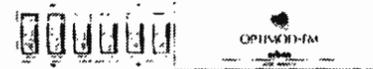
A "smart" stereo enhancement circuit expands the stereo image only when stereo is present, eliminating any center channel loss. Relay bypassing of the unit is provided for if the power supply fails.

The processor's balanced, transformerless input accepts levels between -10 dBm and +10 dBm with 40K ohm differential input impedance, and the output delivers levels of up to +28 dBm at the onset.

The Eliminator has a stereo headphone driver with volume control and LED indicators for input peaks, compressor gain, peak limiter action, output peaks, bypass/operate and power supply voltages.

For more information, contact Joey

Sainton at 214-924-3929, or circle Reader Service 55.



Orban Associates, Inc.'s XT2 Six-Band Limiter Accessory Chassis for the Optimod-FM Model 8100A provides a means to fine-tune the sound on-air through control of bass and treble sound texture, program density and program dynamics.

The XT2 is primarily applicable to high-energy contemporary music formats, although its ability to achieve improved consistency through "automatic equalization" makes it applicable to "gold" and even "beautiful" formats.

When the XT2 is in use, the 8100A's dual-band compressor is converted into a slow, "hand-on-the-pot" AGC amplifier to ride gain ahead of the XT2 so the amount of six-band limiting can be consistently maintained.

For more information, contact Howard Mullinack at Orban: 415-957-1067, or circle Reader Service 59.

ments.

However, I feel that it will sound very clean, loud and give a station that extra sparkle that it may have been looking for.

My next project will be setting up the Model 705 Studio Dominators to implement the NRSC pre-emphasis standard with our Kahn STR-84 AM stereo gener-

ators for WQXR-AM. This should be a tremendous help for our faithful nighttime skywave audience throughout the East Coast.

Editor's note: For more information, contact Marvin Caesar at Aphex Systems: 213-765-2212. The author may be reached at 212-556-1144.

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