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PO Box 1214, Falls Church VA 22041

November 15, 1987

Volume 11, Number 22

Changes Seen For Dial-Up

by David Hughes

Washington DC ... In an effort to clarify its rules regarding telephone dial-up remote control of transmitters, the FCC has unveiled some preliminary clarifications.

At a 15 October meeting of the Association of Federal Communications Consulting Engineers (AFCCE) in Washington DC, FCC Assistant Mass Media Bureau Chief William Hassinger distributed copies of an effort, which he stressed is still only in the preliminary stages, to sweep away some confusion about the dial-up rules.

Dial-up remote control equipment allows authorized personnel to take transmitter readings and make changes in operation from any telephone.

In August, Hassinger indicated that the FCC was planning a public notice that will more clearly specify its remote control rules. No date has been announced when the formal notice would

be released.

The remote control rules continue to be a source of confusion and criticism in the broadcast engineering community.

While the FCC still requires that a specified operator have final control of the transmitter and EBS monitoring, the existing rules, many engineers say, are vague about the use of phone line remotes that, effectively, can bypass the control operator.

Hassinger stressed that the preliminary clarifications that were unveiled at the October AFCCE meeting are "unofficial." However, copies of the document were given to the approximately 75 engineers who attended the meeting.

He said that the document, containing

11 paragraph guidelines, was being distributed to "see if it's worthwhile to (eventually) put out a public notice."

The rule clarifications, if approved, would follow revisions made in connection with Docket 84-10 several years ago, as part of the so-called deregulation campaign.

That effort resulted in remote control changes to allow the use of microwave control circuits, as well as to establish uniform remote control procedures for AM, FM and TV, said John Reiser, of the FCC's Engineering Policy Branch, who has been heavily involved in the remote control rules.

Hassinger asked the AFCCE members attending the October meeting to exam-

ine the wording of the 11 paragraphs dealing with the dial up rules, and invited them to call either himself or Reiser with their suggestions about the wording of the paragraphs.

11 points

The 11 paragraphs cover a wide range of dial up remote rules. Statement 10 says that "it is permissible for authorized personnel, including the chief operator, to obtain data and adjust the transmission system by telephone from any location."

Paragraph one maintains that "dial up circuits, dedicated circuits, RPU channels and the like are acceptable for metering, adjustments and control."

Statement two goes on to say that "there must be a second, positive means for the duty operator to use to turn the transmitter off," with the possibilities including "interruptions to the program line, STL microwave link or a continuous radio frequency cueing and control unit."

Yet, the rules also call for the ultimate, final control of a duty operator.

"Alarms and warnings of out-of-tolerance conditions which may result in interference must go to the duty operator first," according to the third point.

If a response is not received "by the remote control master equipment from the duty operator" within a specific period of time, the remote control must turn the transmitter off.

Statement seven says that "the duty operator can be located at any fixed location and employed in other duties that do not detract from continuous attendance and ability to respond to operational requirements."

Hassinger said that the rules, for example, would allow an operator to work as an emergency services dispatcher, but would not allow that person to go out on calls, thereby being away from the remote monitoring point.

Point number nine maintains that "a duty operator may be employed by or for more than one station concurrently provided it does not hamper his responsibility to respond to emergencies and EBS alerts."

That statement would seem to be at least an acknowledgement of the increasing use of contract engineers by many stations.

Paragraph four states that alarms, warnings and indications must be "unambiguous," while five says the FCC "will not specify the parameters which must be monitored because these can vary from station to station."

Yet it stresses that "a licensee bears full responsibility both to operate within its terms of authorization and the Commission's rules, and to provide all essential control and monitoring capability appropriate to its circumstances."

(continued on page 9)

Daytimers Get Night Authority

by Alex Zavistovich

Washington DC ... The FCC has authorized 21 of 41 daytime-only AM stations operating on Bahamian clear channel 1540 kHz for nighttime operation and has adopted rules to allow some daytime-only stations on the 14 foreign Class I-A clear channels at night.

The Commission's decision followed the receipt of comments by the FCC regarding the issue, in which nontechnical standards for deciding use of the clear channels were opposed by engineering and commercial broadcast concerns.

Non-commercial associations, however, urged the use of such nontechnical standards, citing benefits to be derived from having minority and public radio preferences in the channel allotments.

New international agreements

Adoption of the nighttime operations for daytime-only stations was attributed by the FCC to new international agreements, which are "based on interference protection rather than priority use of the channel."

In previous agreements, priority for nighttime operations on the 14 foreign clear channels was granted to the Bahamas, Mexico and Canada.

(continued on page 3)



The 83rd AES convention drew attendees from the broadcast and music industries. Coverage begins on page 12.

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REGULATORY NEWS

FCC Keeps K-W Call Distinctions

by David Hughes

Washington DC . . . The FCC has decided not to change its traditional policy of having "W" call signs east of the Mississippi River and "K" calls signs in the west.

However, the commissioners voted 20 October to allow stations that are not commonly owned to share call letters—but only with the approval from the station that originally was using the calls.

They also approved a plan that would "streamline" the rules to allow more efficient transfer of calls during an ownership transfer.

W/K changes rejected

In rejecting a plan it had proposed earlier this year to allow "W" calls in the west and "K" calls in the east, the FCC said it "recognizes the value of maintaining the traditional radio station identifications embodied in the K and W rule."

The FCC concluded that "the benefits of maintaining the geographic restriction on (the) assignment of K and W as the first letter of call signs outweighed any minor inconvenience it may pose for some broadcasters."

It also said that "on further reflection such a change would not increase the pool of available call signs, but only the areas in which existing call sign possibilities could be used."

With a few exceptions, such as Philadelphia's KYW or Ft. Worth's WBAP, W calls are confined to east of the Mississippi and K's to west of the river.

Call sign sharing

Also in its October ruling, the FCC said that it would allow stations that are not commonly owned to share call signs, but only if the station that originally had the call sign approves the sharing.

Earlier this year the Commission said it wanted to explore the possibility of al-

lowing stations on different bands and in different markets to share calls. For example, the proposal said that the WNBC calls, now used by an AM and a TV in New York, could be used by a non-commonly owned FM elsewhere since there is no WNBC-FM.

The FCC does allow stations to share call letters if they are commonly owned,

“ *The FCC recognizes the value of maintaining . . . station identifications.* **”**

such as KCBS-TV in Los Angeles and KCBS-AM in San Francisco, which are both owned by CBS.

Those that commented on the plan criticized it saying that allowing unrelated parties to share calls would lead to confusion within the industry and among listeners.

Taking those comments into consideration, the FCC said it would "permit assignment of the same basic call sign for stations in different services that are not commonly owned, but only if an applicant for a conforming call sign obtains, and submits with its application, written permission from any other station already using the call letters."

"In view of the fact that broadcast stations sell time and participate in program supply in other markets nationally and locally," the FCC said that "the harmful effects from mistaken identity would not be limited to any particular geographic area."

Ownership transfer

The FCC also said it will eliminate the risk broadcasters had of losing their call

letters when they changed frequencies within the same market.

The previous "first come, first served" policy required stations to relinquish and then to re-request their calls when changing frequencies. In its October ruling, the Commission said it will waive the first come, first served rules in such cases.

The NAB immediately praised the FCC's latest ruling. Radio Board Chairman Jerry Lyman, of RKO Radio, said that dropping the W and K geographical distinction would have created "unnecessary confusion."

While he added that the NAB "continue(s) to believe that the Commission's decision to permit stations in the same or different markets to use the same call letters could create confusion to the public and to the rating services," Lyman maintained that "at least the Commission has decided to require consent of the station holding the original call sign."

The issue is contained in FCC docket MM 87-11. Contact Scott Roberts at 202-632-6302.

FCC Clips

Holmes appointment

There has been no action yet on an appointment to the FCC commissioner's slot left vacant when Dennis Patrick took over as chairman earlier this year.

With the imminent departure of Commissioner Mimi Dawson to the Department of Transportation, the FCC will soon find itself with only three members.

The potential for problems in decision making has some in the FCC concerned. In the case of a split decision, abstention by the third member could stall any Commission action on controversial agenda items.

There is also concern that Congress may choose not to address the Commission issue until next year, in part due to Congressional dissatisfaction with the FCC over the Fairness Doctrine.

If no one is selected to the Commission before Congress recesses, rumors in Washington suggest that President Reagan may opt to grant a "recess appointment" to Bradley Holmes, one-time aide to Chairman Dennis Patrick.

Although only a temporary solution to the shorthandedness on the Commission, a recess appointment would allow Holmes to serve without Senate confirmation through next year.

For additional information, contact the FCC news media information office at 202-632-5050.

Monitoring FCC indecency actions

The director of noncommercial WRFG-FM in Atlanta is launching a grassroots campaign to inform the public of the FCC's actions in the matter of broadcast indecency.

Calling her project Open Ears/Open Minds, WRFG's Melanie Collins said the event will "expose and oppose . . . attempts to censor, suppress or ban progressive or controversial artists, ideas and activists."

Collins has chosen the first week in January 1988 for her project which she expects will be endorsed by radio stations nationally.

For additional information, contact Melanie Collins at 404-523-3471.

New MMB appointment

Douglas W. Webbink has been named the Mass Media Bureau's new assistant chief for economics of the Policy and Rules Division.

Before the appointment, Webbink had served as an economist at the Federal Trade Commission's Bureau of Economics, where he was involved in matters such as the FTC's franchise rule.

Webbink had worked at the FCC from 1978 to 1982 as an economist and later as Deputy Chief of the Office of Plans and Policy.

He received a B.A. in physics from Brown University and a Ph.D. in economics from Duke University.

Contact the FCC's news media information office at 202-632-5050.

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Some Daytimers OK'd For Night

(continued from page 1)

The agreements, particularly those with Canada and the Bahamas, which did not allow nighttime operations in the US within 650 miles of their countries, had levels of protection which "far exceeded the requirements necessary to avoid interference," the FCC maintained.

The FCC announcement on use of the clear channels, issued 15 October, maintained that the Commission was "not precluded from partially implementing nighttime operation on 1540 kHz, so long as full international protection is provided."

Restrictions in some agreements which are still binding will require power limitations from some stations beyond 650 miles of the Bahamas, the FCC said.

When the older agreements are no longer binding, the Commission said it will issue a "show cause order" granting possible increases in power.

No list of daytimers allowed evening operations on 1540 kHz was available at press time. Sources at the FCC have said such a list would be unavailable for 90 days after the 15 October announcement date.

Opposing nontechnical standards

Prior to issuing its statement regarding the clear channels, the FCC had requested comments from interested parties on whether nontechnical criteria should be used when reviewing applications, to give preferential consideration to minority and public radio applicants.

The FCC, which has called such criteria unnecessary and "redundant," was supported in some comments from

commercial broadcasters and engineers. However, comments from noncommercial groups stressed that nontechnical considerations afford greater broadcasting diversity.

The NAB filed comments with the FCC which underscored its desire for "FCC elimination of artificial barriers to expansion of AM radio service." The group also showed support for a proposal "not to utilize nontechnical acceptance criteria for processing fulltime station applications on the 14 foreign clear channels."

The non technical rules "severely limit the availability of these foreign clear channels," the NAB maintained. The association added that opportunities for use of the clear channels were available in "underserved or unserved areas," and that the rules might restrict new service.

The Association for Broadcast Engineering Standards (ABES) said that the FCC has provided evidence that "there are so few opportunities throughout the nation for meaningful new services on the Canadian and Mexican clear channels that the application of the (nontechnical) acceptance standards would have been an irrational act."

FCC data, ABES maintained, "provide a clear and rational basis for the Commission's fundamental conclusion that considerations of daytime co-channel and adjacent channel interference rule out the extensive use of the Canadian and Mexican clear channels for new full-time AM stations."

"There is no rational alternative to permitting daytime-only stations, which already operate on these frequencies dur-

ing daytime hours, to expand their service into the nighttime period," ABES wrote.

ABES held there was "no public interest in preventing licensees of daytime only-stations from applying for fulltime facilities" on the clear channels. The group urged the FCC to speed adoption of the rules.

Not uniformly supported

Despite some comments favoring purely technical considerations as eligibility criteria for the 14 clear channels, the proposal was not uniformly supported within the industry.

The Corporation for Public Broadcasting (CPB) maintained that the FCC proposal "fails to take into account the reasons, independent of the service-related criteria, for limiting applicants for these channels to minorities and noncommercial entities."

CPB also took exception to the FCC's reasoning that benefits from using nontechnical criteria would be outweighed by having "whatever spectrum remains available in the mature AM service from being used where it is most needed."

"This appears to mean," CPB said, "that service by commercial and minority broadcasters is equivalent to no service at all, and is in any case not a service to be nurtured and encouraged."

National Public Radio (NPR) con-

tended that "nontechnical acceptance criteria for minorities and public radio do not prevent available spectrum in the AM service from being used."

Rather, NPR contended, the criteria "focus the use of the spectrum for achieving important national policy purposes."

"Congress has established that the public interest is served by extension of telecommunications to audiences unserved or underserved by public radio," NPR stated.

The group recommended the FCC should "view development of this spectrum from a long-range perspective and defer immediate use of these channels for development by public radio and minority applicants."

Still, filings supporting engineering criteria outnumbered those in favor of nontechnical standards.

A number of private citizens and smaller broadcasting concerns also filed comments with the Commission on the foreign clear channel issue. Typical of those comments was a filing by Canyon Broadcasters, Inc., of Canyon Country, CA.

Canyon Broadcasters stressed their belief of the importance of having new AM stations in areas unserved or underserved by existing AM stations.

"Careful engineering review of these applications should be the only criteria for acceptance," the company wrote.

FCC docket number is MM84-281. Contact Louis Stephens at the FCC: 202-254-3394.



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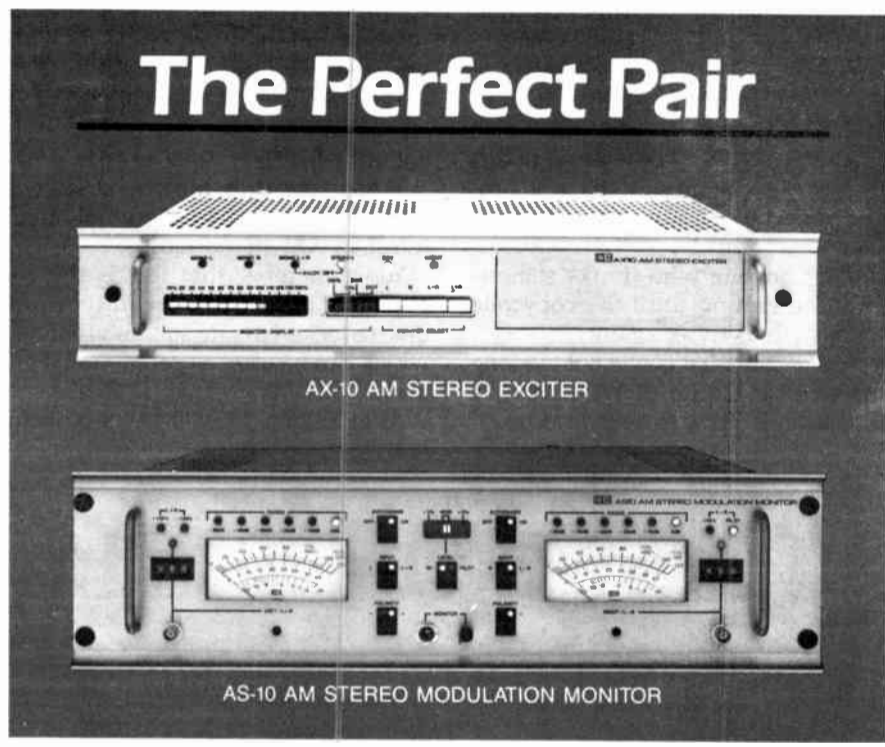
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Circle Reader Service 48 on Page 28

Digital Steals the (AES) Show

by Judith Gross

Falls Church VA ... Yes, it's digital ... Once again that dirty word to some, magic word to others, was the hit of the AES show in New York last month.

Sony had both the R-DAT field recorder and studio unit on display. They've changed the model numbers, however, to capitalize on the PCM designation. The field unit is now the PCM-2000, the studio model PCM-2500.

The time for availability seemed to differ by many accounts. Folks at the booth told me February, so let's say the NAB show is a good bet.

Audiotechniques is handling the Sony pro machines as well, and surprise, surprise ... two other companies showed their own R-DATs.

Fostex had a unit and cassettes in a demo suite, but nobody seemed to be demo-ing it at the time.



Down on the floor, Technics had an R-DAT machine, but was saying next to nothing about it. It was a consumer model, and looked to be a likely candidate for radio station air play, but we all know that R-DAT can't be sold yet in this country while Congress steps in to protect us from copy-code violators. So we'll see.

And for anyone who thinks stations are waiting around until the copycode thing is settled, think again.

Typical of calls I get is one not too long ago from Rick Cruise of WQIO-FM, a CHR station in Mount Vernon, OH.

Since June 29 the station has had five R-DAT machines (Rick wouldn't say where they got them), consumer models, on the air 24 hours a day, seven days a week.

He said at the time that there hadn't been a problem with them yet. The station plays music and commercials from R-DAT, and keeps a back-up cassette in case something goes wrong.

There were also hard disk audio editing systems and evidence of a new processing war.

More about that next time, when Earwaves becomes a per-issue staple.

☆☆☆

I had hoped to be able to report by now that the AM stereo war is virtually over, but thanks to the FCC's delay on addressing the issue we're going to have to wait a little (I hope it's just a little) bit longer.

Right now the FCC is the last remaining obstacle to giving stations a clear path down the road to conversion. They bungled the job five years ago, and now they're wavering once more.

There are some undercurrents over at the Commission that maybe they don't need to address the issue at all because maybe the market demand for AM stereo just isn't there.

Every AM station in this country should disabuse them of such a convenient alibi ASAP. It's too bad there is no unified voice speaking out for AM stations on this. (Where is the NAB when you really need them?)

No demand for stereo? Let's take a look at a company I wrote about a few columns back.

Target Tuning, in Moonachie (love that name!) NJ reports an overwhelming interest in AM stereo radios.

You remember that this is the company that makes a walkman-type radio, quartz-locked to one station's frequency which can be used as promotional giveaways.

After selling 100,000 FM TTs in four



On each other's wavelength?

months, company president Dan Flohr tells me he is interested in making AM stereo radios because there's been a tremendous amount of interest from AM stereo stations.

One station wants 35,000 in time for the spring book. Another group owner with six AM stations wants to order 10,000 for each market. And Target Tuning has taken a deposit on 50,000 units from yet another AMer.

Dan is pleased with the response, and when you think about it, Target Tuning is a natural for AM stereo. As Dan put it "It equalizes AM and FM. The distinction means nothing, because it's the only station you listen to."

There's just a slight snag in all of this, however. Target Tuning is trying to hurry Motorola along with the walkman-type C-QUAM chips they promised at this year's NAB show in late March.

The ICs are almost ready, but even though they're a high priority from the engineering department's standpoint, that's apparently not the case with Motorola marketing.

You know the old refrain, 'Nobody wants AM stereo, etc. etc.'

I think it's time for stations to tell Motorola to get on the ball and get those chips out there. We do want AM stereo!

As for Kahn AM stereo radios, Target Tuning is also very interested in marketing those. But it's a fact of design that the Kahn ISB system is a bit trickier to accomplish than the C-QUAM (you need more chips, for one thing). So Dan says that the Kahn radios will probably be about 40% more expensive than C-QUAM.

Hmmm ... for the extra expense, it almost seems it would be more cost effective for the Kahn station to convert to C-QUAM and then order the Target Tuners ...

☆☆☆

Rumors are still flying about Harris. The latest one, which appears to be pure hogwash, is that they've been bought by Allied.

Meanwhile the Harris-Allied marketing deal seems to be intact and rolling right along.

And Allied is starting a unique 24-hour emergency service for after hours, weekends and holidays.

Right now it's for stations that need Andrews and Cablewave coaxial products or Wegener and Fairchild satellite products in a pinch. The number is 317-935-0455, from 5 PM to 8 AM (EST) and all days weekend and holidays.

Finally, from our Eclectic Engineer Barry Mishkind comes the heartwarming tale (and photo) of a fairy-tale radio romance.

Two DJs from co-owned KKPW/KFXX in Tucson AZ, where Barry is VP and DE, have really tuned in to each other's frequency.

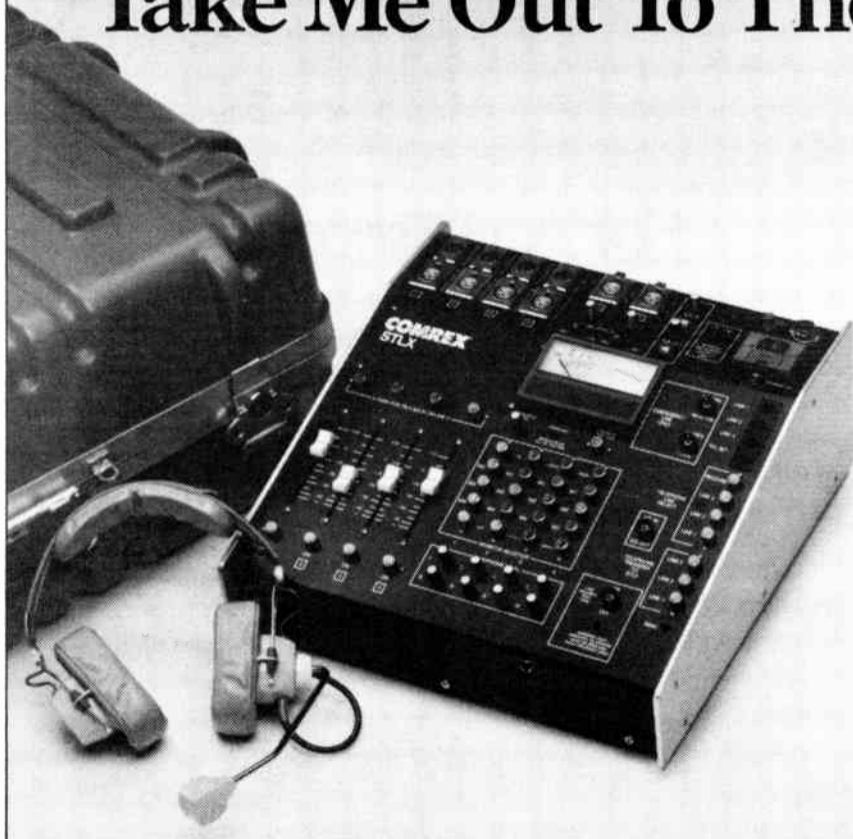
Melissa Mason and Jim Sharpe got married, on the air, during morning drive, in front of an inflatable giant boom box in outside of the station, at the end of October.

It was covered by the local TV news as well, which is one heck of an unusual way to get publicity for your stations.

But there's no truth to the rumor that the sign on their honeymoon suite door read "No Interference."

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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OPINION

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).

No mandatory NRSC

Dear RW:

Your 1 October editorial was right: "making a voluntary standard mandatory may cause opposition to surface that had been previously held in check." Here's mine.

I don't oppose progress. As engineer for two AM stations, I followed the NRSC deliberations with hope and trepidation—hope for solutions to some problems of AM radio; and trepidation that this might be the camel's nose in the tent, a first step toward more burdensome regulations than those the FCC has removed.

Strangely, both prospects seem to be coming true.

The NRSC preemphasis can sound good even on mediocre radios, and is worth considering on that basis alone.

Since the FCC lifted frequency response specs we've used a curve almost identical to NRSC's up to 10 kHz.

Recognizing the need to avoid splatter we also roll off above that point, but at 24 dB/octave, instead of the more brittle-sounding brick wall filter.

We meet the current FCC emission limits (even with aging transmitters), our sound is clean and the expense was negligible.

We could do this for two reasons: the standard is voluntary, and we (like most other small market stations) have no second adjacency problems.

But here is the other side of the coin. Mandating full compliance with the NRSC standard, and especially the emis-

sion limits (page 10, same issue of *RW*) would be horrendously expensive and still not benefit anyone in our coverage area!

Owners and managers in small markets should consider not only the new transmitter that might be required, but also the cost of proving compliance each year: the USASI test signal, a spectrum analyzer or splatter monitor, or at least the cost of a consultant who can afford such things.

True, there are areas of second adjacency interference . . . often populous areas, where the demand for improved receivers would be highest.

In those areas, a few stations not adopting the full standard would spoil things for the rest.

(What about local splatter reduction committees, patterned after frequency coordinating committees to exert persuasion for mutual corrective measures?)

But most of us in the small markets—who are not in the NRSC or EIA, nor even well represented in NAB—are not in such situations. We are the ones who would pay unnecessarily.

That's my principal objection, but I foresee others being raised.

The cry all along was "voluntary," and now, less than a year into the "voluntary" standard, an NRSC subgroup chairman says "the time has come . . . to make it mandatory."

Some will wonder if that wasn't the idea all along. Others may feel the equipment manufacturers are after a windfall.

After all, it could happen—twice!

If the "interim" standard is made mandatory, thousands of stations will have to invest in new equipment, which may have to be replaced after five years.

Others might speculate the big guys are trying to drive the little guys off the band entirely.

Realistically speaking, though, an FCC rule should only be created to address a clearly established need.

It shouldn't be a case of overkill, imposing an undue burden on those who are not part of a problem.

No matter how good the basic idea, nor the respectability of the organizations proposing it, the undoing of hard-fought deregulation is not a matter to be taken lightly.

John H. Davis
Warm Springs, CA

FM antennas timely

Dear RW:

Thank you for the fine article by W.C. Alexander on directional FM antennas (15 August). We found it to be a timely, concise report on a very complex and involved subject.

However, we must take exception to one of Mr. Alexander's statements. In his discussion on installing the DA, he says parenthetically "directionals always require a pole mount."

This is simply not true, providing the manufacturer has an accurate, field

verifiable pattern range and proven engineering capability.

For the past 15 years Shively has been providing directional antennas for not only pole installations, but leg and face mount situations as well, with over 30 non-pole installations in the past three years alone.

Never has a Shively directional antenna been rejected, for pattern violations, or any other reason. This is true of the installations both in the US and abroad.

Again, Mr. Alexander should be commended for a fine article and, apart from this detail, excellent presentation of the subject matter.

We hope to see more of his writing and this kind of editorial space commitment to FM transmission concerns.

D.S. Collins, VP Engineering
Shively Labs
Bridgton, ME

One Last Obstacle

Once again the AM stereo situation has fallen squarely into the lap of the FCC, and once again AM stations are faced with an inexplicable agonizing delay on the Commission's part.

The Commission was to have made what many hoped would be a definitive statement on AM stereo.

But the FCC's last minute tabling of the AM stereo item from its October agenda was just one more disappointment in a long, messy turn of events that the Commission is partly to blame for in the first place.

Perhaps some pressure from industry factions or other interests has held up action on AM stereo, or perhaps the Commission just wants to be cautious about a volatile issue.

But it's been several months since the NTIA released its final study of the AM stereo question, and the industry is waiting for the FCC to act—on two pending petitions; the NTIA's suggestion of pilot tone protection for C-QUAM and on the stereo question in general.

At the very least, the Commission should acknowledge the way the AM stereo picture has shifted in the five years since its "marketplace" non-decision.

At best, the Commission should concede that its marketplace approach has yielded a de facto standard in C-QUAM so the bickering over standards can cease and AM can give listeners the high fidelity they seek.

To say that the market demand for stereo is weak, and therefore any action on the Commission's part is unnecessary is circular reasoning, if indeed it is even true.

If demand is in fact weak, it is all the more important for the FCC to make some guiding statement and give AM stereo a boost.

The receiver companies are also looking to the Commission for action. With the NRSC standard such a success, manufacturers need to get the stereo question settled before they build new high fidelity AM radios.

Further delay threatens to hold up the entire effort on AM improvement. There has been too much delay already. It's time for the FCC to take a stand. The industry is waiting.

—RW

power tube we do suggest making a continuity check between the tube elements using a VOM on ohms scale.

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John Sullivan
Econco Broadcast Service
Woodland, CA

AM stereo sense

Dear RW:
Bravo! Plaudits to Judith Gross who expresses the current plight of AM stereo as accurately as anyone I've seen to date.

She really hit the nail on the head with her statements: "time is running out" and "if the standards war continues much longer nobody wins and AM loses."

I hope Leonard Kahn and the "die hard" Kahn system supporters really care about AM's future and "will swallow hard, grit their teeth and do the only thing left that will save AM radio," and soon.

Rich Robertson
KOMO
Seattle, WA

Radio World

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& OTARI Preview Your Next Tape Recorder

We recently had the pleasure of playing with one of the first MX-55's to hit the U.S. The machine feels good . . . as if it should cost several hundred or thousand dollars more. There is heavy-duty aluminum diecasting on the deck plate and the side frames. The mechanical stability is not unlike that of a much more-expensive Studer.®

If you have used the 5050B you know that different size reels for the take-up and supply have always been a problem and one with which you had to exert a certain amount of care. Well, we are happy to report that the MX-55 has a selector for large or small reels for each of the reel tables, and, it works! The tape handling on this machine is like that of an MTR-10. The MTR-10 is a machine we will use as a basis-of-comparison several times.

There is a front panel pitch control which permits plus or minus 20% variable speed range in 100th of 1% increments. External control of the speed may also be accomplished by a source of 9600hz nominal square waves for each interface with synchronizing or similar controlling. The speed change under external control is variable up to plus or minus 50% of the nominal speed.

Otari has slipped something new into the broadcast arena with this machine. Front-panel pitch facilities include a "VEM" position. We can't think of a cornucopia of ideas where this feature might come in handy, however, if you are editing a long-winded speech or news conference, this thing could be a lifesaver. You have heard of the learning methods which permit you to listen to a tape at twice the speed at the same voice pitch?? Well, that's what this is! Consider that a longwinded speech or news conference could be listened to in half the time when you are editing. We think you begin to see immediate benefits. The VEM is an optional plug-in card and can retrofit into the machine at any time.

The built-in tape/timer is similar to Otari's MTR-10 and, like the MTR-10's, displays current tape position in hours, minutes and second, or, the tape speed in inches-per-second, or, the tape speed as a percentage of change from the nominally selected speed.

The tape/timer also incorporates a 4-point search to cue locator with three cue-point memories and a zero



OTARI. MX55N

COMING SOON!

location memory. Again, like the MTR-10, the unit includes a repeat function which allows continuous repeat/play between any two selected cue points. When a production pro gets his hands on this machine, he's not going to want to let go. Consider the number of times in production that a particular piece of tape must be listened to again and again and again. With this repeat function, it's all automatic. And the accuracy? It's uncanny. When you ask it to search out a cue-point, including zero, or set the repeat points, the point to be located is so accurate it's unbelievable with a machine in this price range.

The machine is capable of 3.75, 7.5, and 15 IPS. Internal selection permits front-panel choices of either 15/7.5 IPS or 7.5/3.75 IPS.

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Felker Settles In as MMB Chief

The following is an interview with FCC Mass Media Bureau (MMB) Chief Alex Felker conducted 21 October by RW Editor Judith Gross and News Manager David Hughes. Felker, a 15-year veteran of the Commission, assumed the MMB's top spot 18 September. In an hour long talk, he shed some light on his plans for the bureau as well as a wide range of radio issues including AM stereo.

RW: Are you settling into your position?

Felker: Yes. It's pretty hectic down here with a lot of meetings and a lot of decisions. It's interesting how many decisions are made in the first instance at the bureau level.

It's a great job. I recently talked with (former MMB Chief) Jim McKinney and he told me that this was the best job at the FCC, bar none. It's certainly the best job I've ever had.

RW: Under former FCC Chairman Mark Fowler, a lot of technical rule deregulation took place. Will this continue under your leadership and Chairman Dennis Patrick?

Felker: A lot of it has already been accomplished. However, there may be some additional areas from a clean-up perspective that still need to be examined.

Now that we've accomplished a lot of things Chairman Fowler set out to do, we have the opportunity to look at how we define and enforce interference rights and responsibilities. We want to see whether something a bit different from our uniform approach to interference rules and responsibilities is worth pursuing.

RW: How would that apply to AM?

Felker: We're looking at redefining AM service and interference (rules)—creating something less rigid than we have had in the past—such as allowing for the negotiation or creation of interference rights. That's a concept that's pretty novel for the spectrum resource. Obviously, there are some legal and policy questions that are not fully explored.

One of the reasons that we're looking at AM right now is that the world is a much different place than it was 40 or 50 years ago. Maybe the role of AM is different than it was before. We may want to provide a framework in which AM's role can change. Maybe we should give AM stations greater freedom to exploit the technical advantages they have, such as long distance propagation.

RW: But isn't the FCC moving in the opposite direction by allowing greater daytimer operations and more stations on clear channel frequencies?

Felker: AM's propagation is an advantage. Whether, on balance, exploiting that advantage is worth the cost, such as having fewer stations, is a question we don't have the answer to yet. We have to determine what would be optimal for listeners' perspectives. To provide a framework that allows licensees to achieve optimal operations without involving the government in any extent might be a good idea.

RW: When you evaluate these changes, such as negotiated levels of interference, how do you balance the business interests of the sta-



FCC Mass Media Bureau Chief Alex Felker.

tions with the needs and demands of listeners?

Felker: Ultimately, listeners drive our actions. Someone once said that there are no solutions, only tradeoffs. We have to worry about people losing service, but on the other hand, others will gain it.

Even if the FCC gets involved in these issues, there is no guarantee that we'll have the perfect answer. We may not make decisions that are in the best interest of listeners either. You have to look at what's better on a relative basis. It's still an open question as to whether we should try a new approach.

RW: Now that you are in charge, will you be making any major changes in direction for the MMB?

Felker: I don't know. I'm not sure I'd be able to answer that question even after 10 years in the job. I don't know how things were with McKinney, but I do know is that I have a very good relationship with the chairman and with the other commissioners.

I'm quite happy with my front office staff. I don't foresee any (personnel) changes. I'm very comfortable with the arrangement that we have now. On the processing level, things are going extremely well. We are moving FM applications at lightning speed, and it will improve.

RW: On the AM stereo question, we've heard that the FCC was scheduled to examine it in a 20 October meeting of the commissioners, but the item was deferred.

As you know, your predecessor was very vocal about AM stereo, and many AM stations are still looking to the Commission to set a standard. What is happening?

Felker: The Commission does need to respond to the petitions before it (Texar and Press Broadcasting), and I think that it will—soon. Obviously there are those who would like us to select a standard and they argue that then the world would be wonderful for AM. We're analyzing that question closely.

But then there is another school of thought that says anything the FCC does now, in an active sense, would only make matters worse. We're also concerned about that. Then there's a third school of thought that says that maybe the market is working and the demand for stereo on AM is so weak that even if the Commission acted there would be no meaningful change to the (existing) situation.

RW: The recent NTIA study found that a number of stations were not going stereo because there was no standard.

Felker: Yes, but there's another good study out that nobody refers to. That study was done by Leland Johnson and Stan Besen, a couple of noted economists, for the Rand Corporation. It's about a year old.

They make the observation that the cost of going from mono to stereo is "X" dollars, which includes adding a complete new audio chain. Irrespective of the standard you pick, if a station is going to go to stereo, it will have to make an expenditure of "X" dollars, the exciter of which is a fraction of "X." So, the cost of making the wrong choice is only a portion of cost that you are going to absorb in any event.

That tends to undercut the argument in which stations say 'we're ready to go, but we're waiting for the selection of the

exciter.' Stations will have to weigh the potential benefits of stereo and weigh them against the cost, and risk enters into the cost equation. That alone should not hold things up. There is an indication of a demand question here. It is not entirely clear that any particular Commission action necessarily would change anything.

RW: Should the overall demand for AM stereo enter into the FCC's mind about the selection of a standard?

Felker: It is a factor, especially when you try to make the argument that the market isn't working and that the Commission should get in the middle of it. If the market is saying there's no demand, then that undercuts the argument that the market is not functioning properly.

There are risks to picking a standard. Say we selected System A, then System B would face significant losses. And, in selecting System A we would have to go through a rulemaking and subsequent litigation. As a result, nobody would do anything and that would be the end of it.

RW: Give us your comments on the NRSC's push to make the predeemphasis standard mandatory.

Felker: I'll take a look at the petition when it comes in. Standards, generally, are good. They reduce consumer uncertainty. My only problem with government standards is that they have the force of law and they lock things in.

RW: On a related topic, there is a sense that there is a lot of splatter and interference going on in the AM band, with FCC rules not being enforced.

Felker: Give me a specific and I'll look at it. If you can give me some instances in which stations are not doing what's right, we'll investigate, and we'll take appropriate action.

RW: On the FM side, what is the future of the FM2 plan, in light of the rejection by the FCC's Office of Engineering and Technology (OET)? Is there a need for a second FM band?

Felker: We have to look at all opportu-

(continued on page 9)

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Kahn Opposes Pilot Protection

by Alex Zavistovich

Washington DC . . . Kahn Communications' President Leonard Kahn, in a letter to the FCC, has maintained that protection of AM stereo pilot tones, suggested by the NTIA in its report on AM stereo, is "unnecessary."

The letter from the developer of the Kahn/Hazeltine Independent Side Band (ISB) AM stereo system noted that "such protection clearly contradicts the administration's and the FCC's avowed support of the free marketplace."

The letter was apparently prompted by a recent experiment by two stations using the Kahn AM stereo exciter. The stations added the competing Motorola C-QUAM stereo pilot tone of 25 Hz, prompting protests from Motorola.

Kahn, in the letter, also predicted the imminent demise of the C-QUAM system, and acceptance by the marketplace of multisystem AM stereo radios, although the NTIA report found such radios economically unfeasible and no receiver manufacturers are currently interested in making them.

"If our expectations prove accurate," Kahn wrote, "and the Motorola system is forced out of the marketplace by the widespread use of multisystem radios, such protection will limit the freedom of engineers to make other use of the Motorola 25 Hz pilot frequency as soon as it

becomes dormant."

The Kahn letter preceded a decision by the FCC to remove the AM stereo issue from the Commission's 20 October meeting agenda. Commission spokespersons, however, deny the letter prompted the agenda change.

Agenda changed

The FCC was expected to issue a single, all-inclusive statement on AM stereo during its late October meeting. On 14 October, one day after the FCC's receipt of the Kahn letter, it was learned that the AM stereo issue had been removed from the meeting agenda.

However, Bill Hassinger, engineering assistant to the chief of the FCC's Mass Media Bureau, commented that the Kahn letter probably did not affect the Commission's decision to postpone comment on the matter.

Kahn's letter was received at the FCC on 13 October, Hassinger said. He added that he learned of the removal of the AM stereo item from the FCC agenda either on 9 or 12 October. Official media notification followed soon after, he added.

Hassinger had been told at the time that the issue was removed from the 20 October calendar because FCC Chairman Dennis Patrick felt insufficiently prepared to discuss the matter. The explanation was credible, Hassinger explained, because of Patrick's recent oc-

cupation with the fairness doctrine and indecency matters.

In general, the Kahn letter "has not had much of a reaction" at the FCC, Hassinger maintained.

However, he continued, sentiment at the Commission seems to side with Kahn's statement that FCC protection of AM stereo pilot tones is unnecessary. He said there was "some reluctance" at the FCC to authorize such protection.

“

Such protection clearly contradicts . . . the FCC's support of the free marketplace.

”

Protection of the pilot tones "seems to call for a rulemaking," according to Hassinger, which would reinvolve the Commission in the issue.

Monopolizing receivers?

In his letter, Kahn held that Motorola has attempted to "monopolize" AM stereo receivers. This monopoly, he wrote, has led some stations to experiment with "whether there is a compromise system that would not degrade mono transmission and not cause additional interference to their neighboring stations but which could be heard on C-QUAM receivers."

Kahn used the example of WSYR, Syracuse, NY, which in September used the 25 Hz C-QUAM pilot tone to transmit in Kahn ISB stereo (see 1 November RW).

Although WSYR CE Dave Solinske has said that the station had employed the C-QUAM pilot tone to "increase fidelity," Kahn in his letter appeared to contradict that statement.

The letter maintained that at WSYR, "Certain staff members, who were fur-

nished with cars equipped with C-QUAM receivers, decided that WSYR was at a disadvantage vis-a-vis a station operating with C-QUAM."

Kahn continued that, "In other words, they wanted to 'light the stereo lamp.'"

The experiment was discontinued, he said, because "the received signal in C-QUAM radios so degraded reception, in terms of loss of coverage due to noise and image motion, that such operation was clearly unacceptable."

Motorola spokespersons declined to comment on Kahn's letter to the Commission.

Protecting himself

John Marino, VP/engineering for New-City Communications, which owns WSYR, the station cited in Kahn's letter, speculated the message to the FCC may have been a move by Kahn to "protect" himself, in the wake of the National Telecommunications and Information Administration (NTIA) report, released this August.

He was doubtful whether Kahn's letter in any way precipitated the removal of the AM stereo issue from the Commission's 20 October meeting agenda.

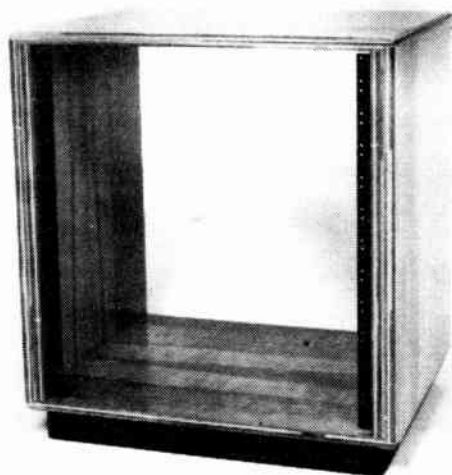
Marino said he had heard nothing other than that the issue had been deferred, which he pointed out is not uncommon at the Commission. The topic was rumored to be on the agenda for the November FCC meeting, Marino added.

The FCC's Hassinger declined to speculate on when the AM stereo issue may actually be addressed by the Commission. FCC Mass Media Bureau Chief Alex Felker indicated that the FCC would examine the pending Texar and Press Broadcasting petitions "soon."

It had been rumored that the FCC, in addressing the stereo issue at its meeting, was to have acknowledged in some way the industry support for the C-QUAM system. Whether this will be the case at a future Commission meeting is now unclear.

Leonard Kahn refused comment.

For additional information, contact Bill Hassinger at 202-632-6460. Contact John Marino at 203-333-4800, or Leonard Kahn at 516-222-2221.



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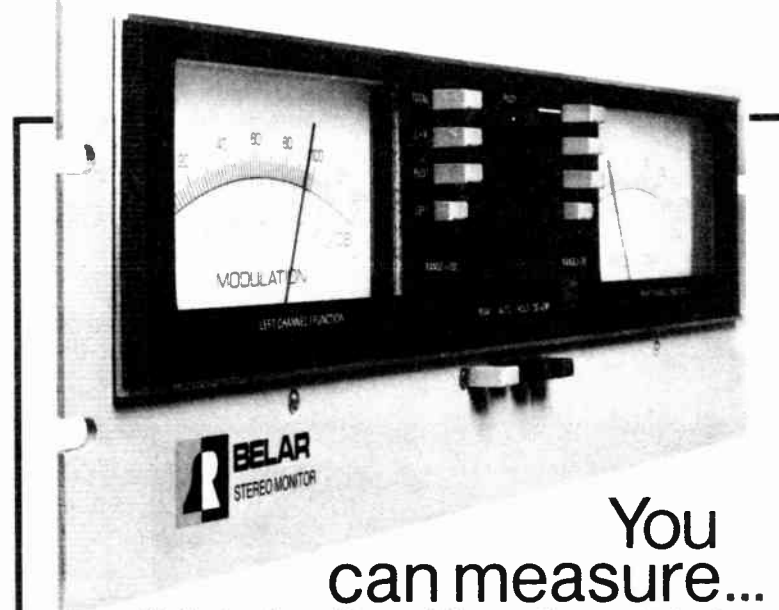
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Changes Due For Dial-Up Rules

(continued from page 1)

Other points indicate that a licensee is responsible for testing and calibrating the remote control system on "an appropriate schedule."

And that "systems which rely, either wholly or in part, on portable pagers to reach the duty operator are not acceptable."

Paragraph 11 says that regardless of the remote system used, stations must comply with all EBS requirements.

Many of the AFCCE members at the October meeting had questions about the wording of the 11 paragraphs.

While fielding some of the questions, Hassinger maintained that theoretically it would be possible for stations to violate the rules no matter how they are written.

Yet he stressed that while the FCC may increase the ways stations can implement the rules, he said stations will still

be required to stay within their legal tolerances.

Peter Burk, of Advanced MicroDynamics, praised the 11 points. "I am delighted to see (the FCC) clarifying a policy that was confused in many people's minds."

He said he was particularly pleased to have the FCC underscore in statement 11 that stations must monitor the EBS and be able to "activate (the) EBS encoder."

Burk also said that statement two was a well worded failsafe requirement, a point that is often misunderstood, he added.

"It would be nice to see an official stamp on (the eleven points)," Burk said.

John Leonard, of Gentner RF Products, who gave a presentation at the meeting, also praised the 11 paragraphs.

He said he was glad to see statement 10 which indicated that an engineer making transmitter changes from any telephone did not have to directly inform the duty operator. It is assumed, Leonard added, that the duty operator is constantly monitoring the situation, though.

The FCC's presentation essentially "endorsed the dial-up concept," he said. "I think that if the FCC officially endorses (the 11 points), it would be a good thing."

Yet, not all were satisfied. Consulting engineer Ogden Prestholdt said that the

FCC's hand-out largely covered "pica-yune details."

He recommended that the Commission undertake "a whole, fresh approach" to rewrite the remote control rules, rather than "another interpretation of the (existing) rules."

There was also some criticism about the way the FCC distributed the "unofficial" document. Some engineers and consultants who did not attend the AFCCE meeting said they had no chance to see or to comment on the document.

"I want to know what's happening," said one industry representative who did not want to be identified. "It would be fair game for the FCC to (officially) publish the proposed (rule) clarifications."

For more information about the FCC's dial-up remote transmitter regulations, contact John Reiser at 202-632-9660.

Talk With MMB Chief

(continued from page 7)

nities that can be derived from spectrum allocations. There are obvious benefits to creating more broadcast spectrum, but there are also benefits from other spectrum uses. It's an important issue to consider. Unlike some other uses, much broadcast use can be relegated to other non-spectrum media (cable, VCRs, etc). Is it good spectrum policy to encourage further spectrum use by broadcasters?

RW: What is your reaction to the recent petition calling for an across the board increase for Class A FMers?

Felker: We're looking at it carefully. We want to take a close look at their numbers. However, we are also a bit worried on the Docket 80-90 process, particularly the vacant allotments. We want to see what effects will be created.



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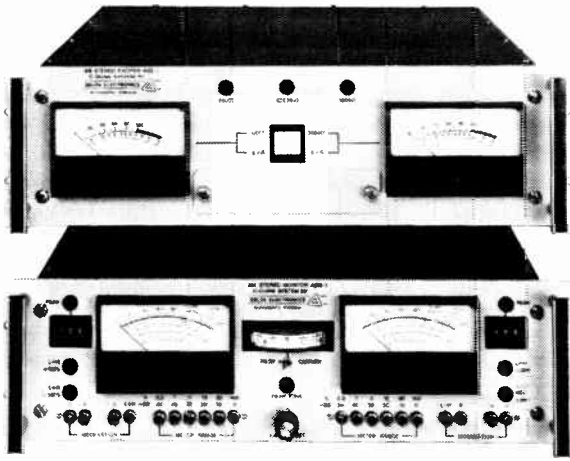
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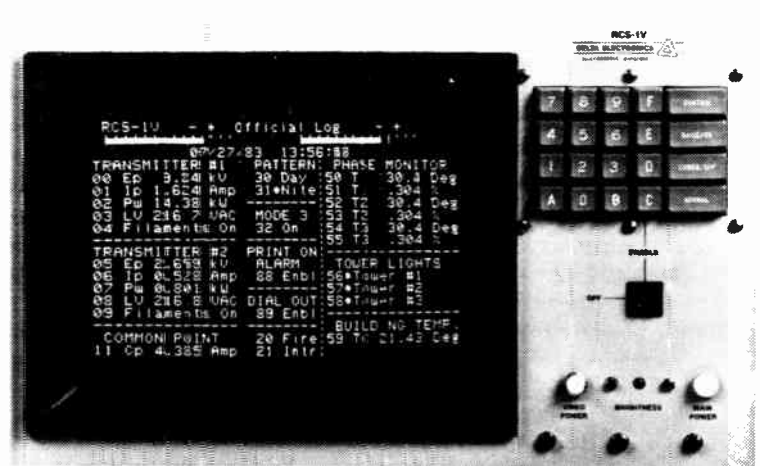
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ASE-1/ASM-1

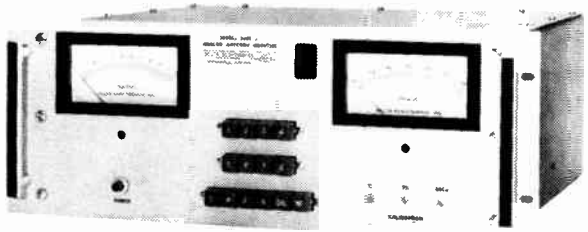
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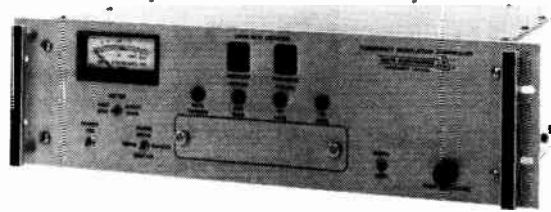
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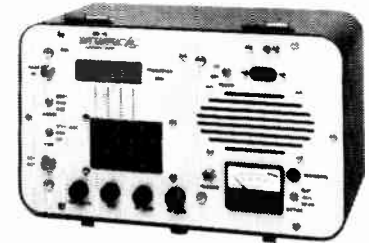
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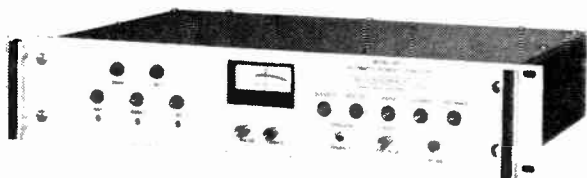
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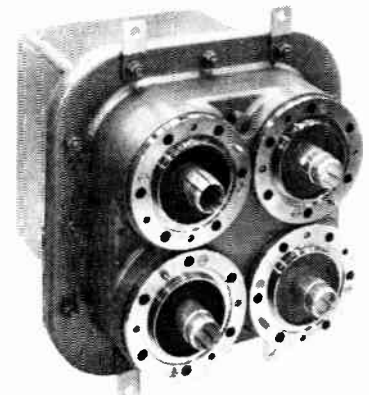
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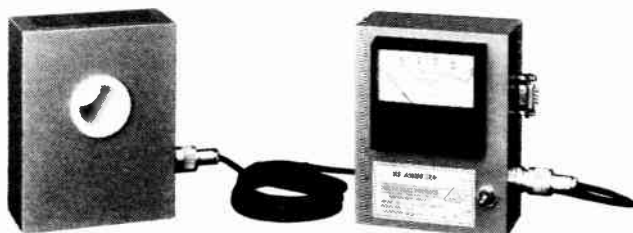
OIB-1/OIB-3/CPB-1

Full power impedance measuring. The Operating Impedance Bridges measure the impedance of radiators, networks and the like while operating under normal power. The OIB-1 measures VSWR and impedance up to $400 \pm j300$ ohms. The OIB-3 extends the range to $1000 \pm j900$ ohms, and has an RF amplifier for improved nulling. The Common Point Impedance Bridge is permanently installed for continuous monitoring of the common point during network adjustment. An optional TCA ammeter can be installed in its front panel.



6730E/6740B

Fast, efficient coaxial transfer switches. The coaxial transfer switches are designed to switch transmitters, transmission lines, antennas, dummy loads and auxiliary equipment quickly and easily. Either manually or remotely controlled, the switches are fully interlocked to prevent switching with RF power applied. The 6730E switch uses 1-5/8 inch connectors, the 6740B switch uses 3-1/8 inch connectors.



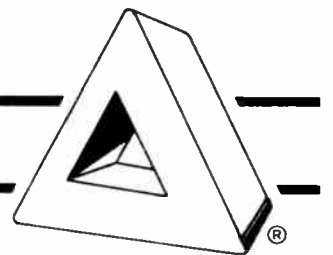
TCA/TCT

Simplifies antenna current and phase sampling. TCA Ammeter Systems provide accurate, modulation-free current readings on a variety of meter types. Toroidal Current Transformers provide current and phase samples, and are available with three output voltage ranges, as well as high voltage models.

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Circle Reader Service 40 on Page 28



Second VOA Project To Be Re-Bid

by David Hughes

Washington DC ... Following a complaint from an audio console manufacturer, the bids submitted for four audio consoles at the Voice of America (VOA) have been rejected.

However, bids will again be accepted by late November for consoles to be used in the four studio construction project at the VOA's Washington DC headquarters.

The project is the latest round of renovations at the VOA—work is already underway to renovate 19 studios at the facility.

Complaint dismissed

According to Bill Gallagher, a contracting officer with the US Information Agency (USIA), the VOA's parent organization, even though the complaint, lodged by Wheatstone, was dismissed by the General Accounting Office (GAO), the USIA still decided to put the four console contract up for rebid.

"We received a lack of response to the project, and we decided to cancel it," Gallagher said. "We do intend to have it rebid."

He indicated that only two console manufacturers, Harrison Systems and ADM Technology, placed bids for the four studio project.

In August, Wheatstone, the console manufacturer that lost out to Harrison on the VOA's 19 studio renovation project, filed a complaint with the USIA, which forwarded it to the GAO.

Wheatstone alleged that the console specs for the four new studio consoles, as well as the original 19, closely resembled the Harrison design and were therefore exclusive.

Sources indicated that Wheatstone had originally been the lowest priced bidder on the console portion of the contract until Harrison came in with an even lower bid.

Following the complaint from Wheatstone President Gary Snow, the matter was handed over to the GAO, which reviewed the process. While USIA officials confirm that the bidding process on the four new studios has been delayed indirectly as a result of the complaint, work on the 19 studio project continues.

While he stressed that the GAO had decided to dismiss the Wheatstone complaint, Gallagher said the USIA had determined that the console specs should be changed. "We plan to do a rework on the specs, to open them up and make (them) broader," he said.

The original specs were part of a total list of specifications drawn up by National Teleconsultants at a

cost of \$500,000 for the VOA's modernization program.

As of press time in mid-October, Gallagher indicated that the reworked specs would be completed by mid-November, with the console contract bidding process reopened by late November.

"Technical point"

Snow told RW in late October that the GAO had dismissed his complaint on a

"technical point." In the original complaint he did not actually mention Harrison.

"Since my letter didn't mention the manufacturer, the USIA did not want to find it out," he said.

Snow added that he will examine the console specs in the new bidding process and if he finds similar alleged similarities to Harrison consoles he will file another "more specific" complaint

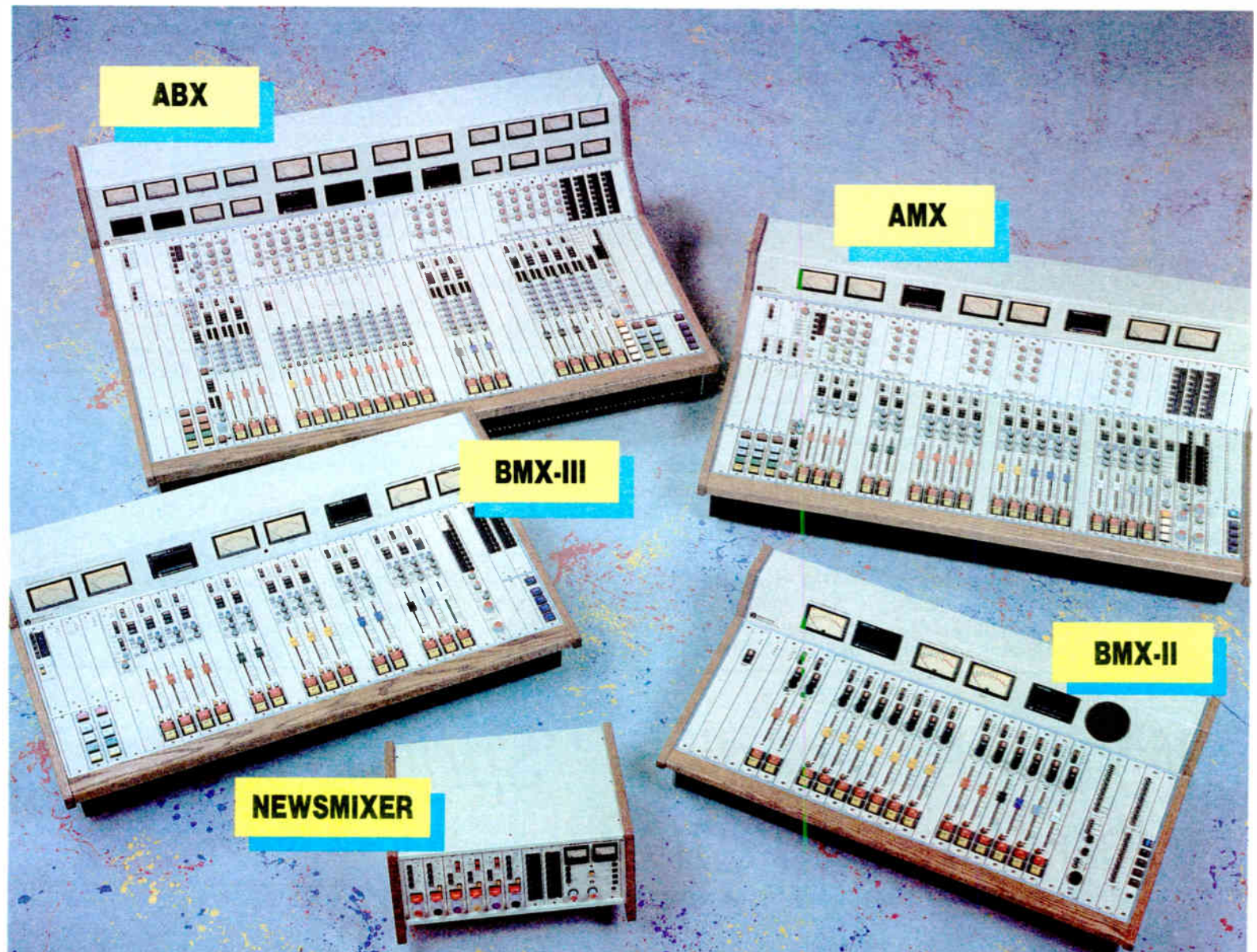
with the GAO.

"But, if it is a fairly written bid, I will bid on it," he said.

Harrison spokesperson Brad Harrison has maintained that he was confident that the Wheatstone complaint would not affect his firm's bid to provide the consoles for the 19 studios.

In late October, Harrison confirmed that his firm will submit a new console bid for the four additional studios when the contract process is reopened.

For more information on the bidding process, contact Bill Gallagher at the USIA: 202-485-6421.



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AES Aims at Music, Broadcast

by Douglas W. Fearn

New York NY . . . The Audio Engineering Society convention is primarily aimed at the recording industry but there has been a significant amount of crossover with broadcasting over the years.

In the past papers have been presented on every major technological innovation in broadcasting, sometimes years before the practical implementation of such advances.

For example, in an anthology of articles from the *Journal of the AES*, I found a paper on AM stereo with a variety of proposals on how multichannel AM could be accomplished, including the fundamentals for what became both the C-QUAM and Kahn ISB systems.

The year this was presented? 1953!

In keeping with this tradition, the 83rd AES convention held 16-19 October included a presentation by Emil Torick on the current state of FMX, and was one of many updates on the state of audio technology.

International flavor

Broadcasters do attend the AES; I ran into three Philadelphia radio station chief engineers this year. But it differs significantly from the strictly broadcasting conventions such as the spring NAB show.

For one thing, the AES is a truly international show. The location rotates between New York, Los Angeles and a varying European city, with regional conventions held throughout the world.

You can get on an elevator and hear

conversations in three different languages. Thirty percent of the 225 exhibitors were from foreign countries, mostly European.

Plus, unlike the NAB show, this is a purely engineering show. Virtually all of the estimated 12,000 attendees to the New York convention are involved in the technical side of the audio industry.

But the most obvious difference is that the AES is aimed primarily at the recording industry.

Unlike most broadcast stations, recording studios have their equipment visible to their customers.

Indeed, the visual impact of a recording studio is a vital consideration for the owner. Recording facilities are frequently chosen by clients on the basis of their appearance, and the possession of the latest "goodies."

Consequently, this show is a dazzling display of high-tech equipment. You can look at (and listen to) recording consoles that cost more than some entire radio stations!

Broadcast equipment is represented, however. Among the exhibiting manufacturers whose products are often found in radio stations were: ADC, AKG, Alpha Audio, Ampex, Aphex, Audio-Technica, Crown, dbx, Dorrrough, Eventide, Harrison, JBL, Lexicon, Orban, Otari, Sennheiser, Shure, Stanton, Studer, Symetrix, Tascam, Technics, Telex, 3M and UREI.

R-DAT recorders

The theme of this convention was "Analog Present, Digital Future." And digital was definitely in evidence. Every

major reel-to-reel tape machine manufacturer displayed a digital recorder, some up to 32 tracks.

Of greater interest to the broadcaster was the new R-DAT cassette machines.

Fostex, Sony and Tascam each had R-DAT machines on display. Sony had its field recorder and studio unit, both professional products. Tascam's R-DAT machine is not yet a product and it's not certain when it will become one.

Most of the people I talked with about this new format agreed that in its present configuration it is primarily a high-end consumer product and not well-suited to broadcast use.

For one thing, all the machines take a significant amount of time to start from a cued position: a second or more. This makes them impractical for on-air use.

The cueing system is reminiscent of the first generation of CD players. Audio is repeated but there is no real sense of where you are in relation to the point where you want to start.

Editing appears to be virtually impossible. Even such a common practice as "punching in" is not feasible. And the machines are expensive, costing \$5000 and up.

Of course this is the first generation of machines and undoubtedly many of these drawbacks will be corrected in the future.

The manufacturers seem to be targeting the consumer market and hoping that retail sales will finance the development of truly professional machines.

One use I could see for the current R-DAT technology is live performance recording by radio stations.

The two-hour recording time is a definite advantage, and of course the machines boast typical "digital perfection" specifications.

If you don't need to stop and start recording, or edit, or cue tightly for air play, these devices may make sense if you can justify the cost.

With the demise of the Sony audio PCM encoders/decoders for use with VCRs, there aren't many practical alternatives for broadcasters who want to record digitally at a reasonable cost.

The new Studer A-727 CD player is also of interest to broadcasters. It was first introduced at the spring NAB show.

This unit superficially resembles its predecessor, the A-725 found in many radio stations, but it is significantly different.

For one thing, the disc drawer is now merely a disc holder. There are no active components involved. All the optics and electronics remain in place inside the chassis.

This eliminates the stress on the drawer cabling and the subsequent early failures.

Another useful feature is a beginning and end preview function. Pressing one button plays the first few seconds of the selected track, and pressing another will play the last few seconds of the song.

That could be a very useful feature for DJs who want to hear how the song begins and ends.

Cueing

But the best feature is the cue to music function. To cue a track, it is merely necessary to insert the disc, select the cut number, press "Locate," and the machine will automatically cue to the first note of music.

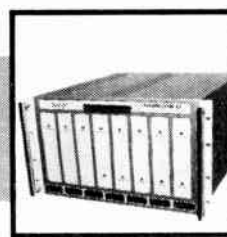
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If Your RF Feedline "Springs A Leak" At 3AM, Who Can You Call?

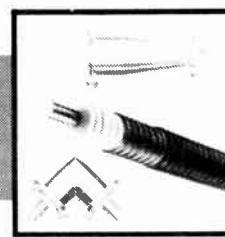
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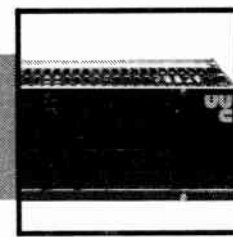
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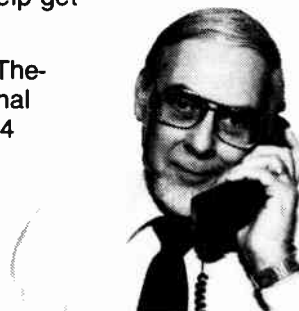


ANDREW

Some kinds of problems just can't wait until morning — or even worse, 'til Monday morning. If there's a break or serious leak in your antenna feedline or connectors, you're off-the-air. Period. And for many stations, losing the satellite receiver is almost as catastrophic. We all know the horror stories, but here's the good news . . .

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You won't get a recording when you call Allied All-Through-The-Night. You'll be talking to a real, live broadcast professional with many years of RF and satellite experience. He's got 24 hour access to Allied's full stock (the industry's largest) of feedline components from both Andrew and Cablewave, plus the satellite lines of Fairchild and Wegener — including replacement boards. And our all-night man knows how to get what you need to your location, FAST!



Suggestion: Right now, before you turn the page, why not jot down our special 24 hour number, 317-935-0455 and file it with your other emergency phone numbers. It's the one Allied phone number we hope you won't ever need to call. But isn't it good to know that we're always there when you need us, 24 hours a day?

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The Word is Digital

by Tom Osenkowsky

New York NY ... The 83rd Audio Engineering Society Technical Meeting and Exhibits held 16 through 19 October in New York City was a display of the latest in audio gadgets.

What else could dominate such an event but digital audio?

One of the most informative sessions was held on the status of digital audio in the industry, beginning with a bit of history.

Did you know that PCM (pulse code modulation) was first suggested as a medium way back in 1937?

Although we are nearly into the 1990's and digital audio is very much a part of our lives, there still is a long road ahead.

Standards needed

Briefly, we see that the most difficult problem right now is the lack of a standard ... a digital standard both for recording and more important I/O.

I/O as in computers refers to Input/Output so that the various digital devices can communicate with one another.

For example, imagine digital input/output jacks so that you could dub from source to source (i.e. CD to DAT) in the digital domain, never having to go analog. It would be like eliminating the modem when interfacing computers.

Another problem right now is the lack of high speed, low power chips for the portable digital devices.

Also in the session, it was revealed that right now in 1987, a totally digital studio is a reality.

Radio Cologne in West Germany airs 100% digital programming from studio to home via direct satellite.

That is, a digital source, mixing console and processor mod/demod—all digital. Transmission to the home is via Intelsat.

Image devices wars

Away from the sessions, on the exhibit floor, there was a "war" of sorts waging in the analog domain of "image"—stereo image that is.

A number of devices which enhance our perception of the stereo image are now on the market, or soon will be.

There were several such devices at the show. The first unit for broadcast applications is the Modulation Sciences Stereomaxx which was introduced at previous shows.

It utilizes both digital and analog processes in altering the perception the listener has about the source of the sound to which he/she is listening.

Two new devices on the AES exhibit floor are scheduled for marketing in January 1988. They come from the fam-

(continued on page 17)



Products at AES show:

(clockwise from upper left) Full Compass Systems' Graphic Digital Audio Processor; Orban's Stereo Spatial Enhancer; Otari's new MX-55 tape deck; KW Electronics Journalist Pro-Cassette recorder for news; Technics R-DAT machines; Sony PCM-2500 Studio R-DAT recorder.

Tape Deck Workshop Tackles Maintenance

by Douglas W. Fearn

New York NY ... Of the ten workshops offered at the 83rd Audio Engineering Society convention the one of greatest interest to broadcast engineers was the Tape Recorder Maintenance session.

Four recorder manufacturers and a New York service company were present to demonstrate, explain and answer questions on just about any tape machine.

Mitsubishi, Sony and Studer concentrated primarily on their digital audio machines, while Otari attracted over 60 people to their very practical and informative sessions on the 5050 and MTR series recorders.

Many of the attendees were shopping for a machine and felt that a thorough look inside the units, as well as hearing the questions from users, would help them make a decision.

Others in the audience were ex-

perienced users of the various machines and had interesting, and sometimes complex, questions and problems.

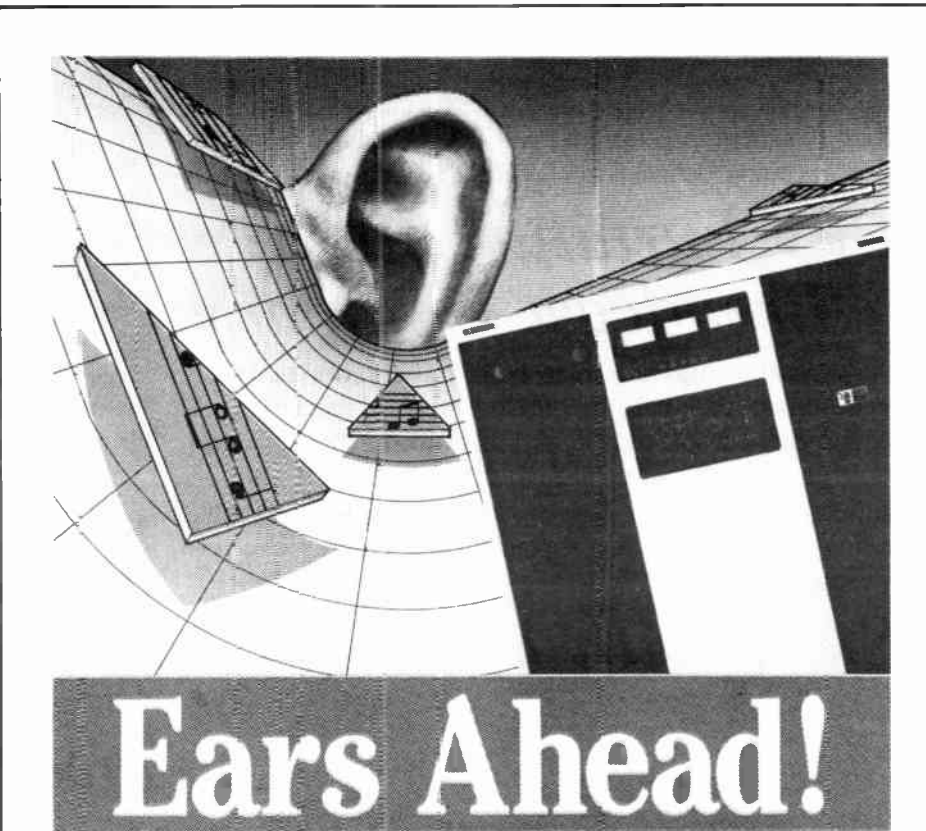
Otari basics

The information from the Otari technical people ranged from basic (how to properly thread the machine, and what happens when the threading is incorrect) to sophisticated (modifications for full-track operation, adding a record meter calibration control to the 5050, etc).

They went over the routine alignment procedures, including some of the undocumented internal adjustments, as well as common maintenance problems such as installing new meter lamps, head replacement, and brake pad and drum replacement.

I learned a few new things about the 5050B series machines, such as the fact that the VU meters do not have true VU ballistics, but rather show how the sig-

(continued on page 18)



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an operator's dream, with Harris' ColorStat™ signal flow diagnostic diagram and other exclusive extras to keep you on the air.

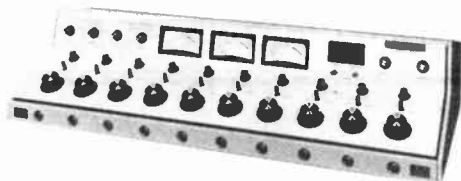
Install the DX-10. Be "ears ahead" immediately and be years ahead because you've gone digital. Call now for the DX-10 brochure. We'll also send you the popular Harris Conversion Chart and On The Air poster. 1-800-4-HARRIS, Ext. 3005. Or write: Harris Radio Sales, P.O. Box 4290, Quincy, IL 62305-4290.



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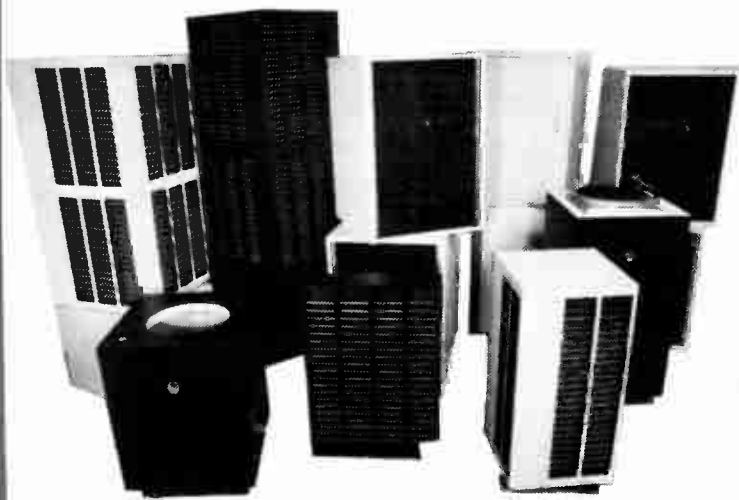


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NABET Strike Settled on Revote

by Alex Zavistovich

New York, NY . . . After 118 days on the picket lines against NBC, employee members of the National Association of Broadcast Employees and Technicians (NABET) ratified a new master agreement 24 October.

Earlier in the month, a contract proposal was submitted to a vote of NABET members. The union employees had been without a contract since 31 March.

A tally of the 14 units affected by the strike showed all but two in favor of adoption. However, the two units opposing the proposal—couriers in Chicago and air conditioning plant maintenance workers in Los Angeles—made adoption of the contract impossible at that time.

Revote held

At the request of NABET International President James P. Nolan, a revote of the NABET members in those units was held. Prior to the call for revote, Nolan had held private discussions with both NBC and General Electric representatives.

By some reports, Nolan had entered the discussions to gain further modifications of NBC's offer. However, the attempt proved unsuccessful, and some

sources suggest Nolan had no other choice but to call for a revote.

With the revote, the two units ratified the contract proposal.

At press time, NABET maintained that no date had been set for a return to work by NABET members. The union notified NBC that its members were prepared to return to work upon ratification of the contract.



We're now dealing at the network level with people . . . are interested more in profit than the welfare . . . of their employees.

NBC, however, was reportedly having difficulty with scheduling, and, at press time, had proposed 2 November for return to work by the employees.

NABET International Representative John Krieger added, however, that because the settlement was effective on ratification, the union expects to be paid for the interim period.

Contract terms

The pay increases established by the new contract—which expires 31 March

1990—were 3.68% for the first year and 4.64% for the second. A 3% lump-sum payment will be effective 1 April 1989.

NBC has agreed to a benefits program to be in effect for the term of the contract, Krieger said. The network also eliminated its proposal for a two-tiered wage scale in Cleveland and Washington, DC.

A number of points in the agreement addressed the issue of “daily hires” and

misconduct during the strike will be dealt with according to the grievance and arbitration procedures set out in the master agreement.

Some 25 to 30 cases of misconduct across the US were cited during the strike, Krieger commented.

The terms of the agreement are comparable to, but slightly lower than, terms reached by the union in its new master contract with ABC. The terms also provide somewhat less than the union was expecting.

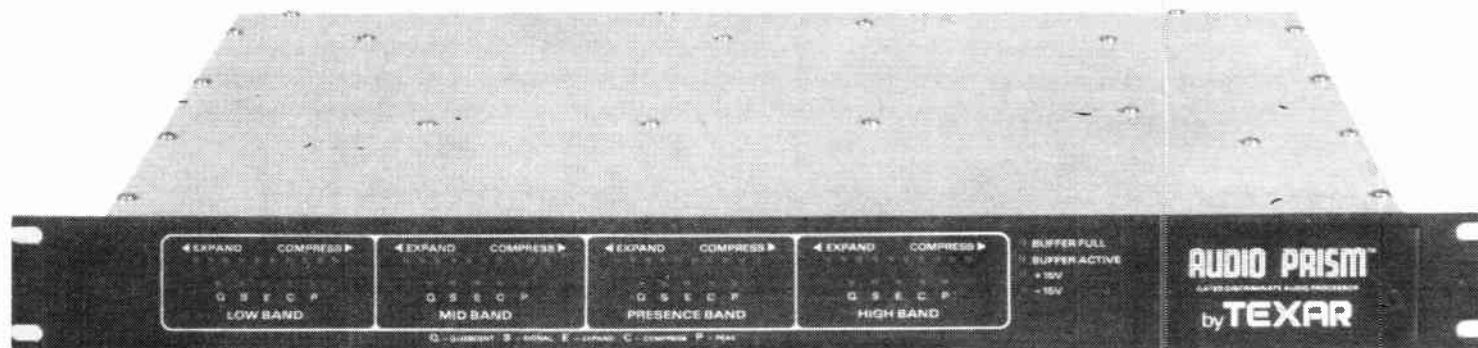
Krieger noted he was “glad to see the strike over.” However, he commented that there were some “hard lessons learned” during the strike.

“We're now dealing at the network level with people who, at the bottom line, are interested more in profit than the welfare and well-being of their employees,” he said.

NBC VP/Labor Relations Day Krolik was less caustic about relations between the network and NBC. Krolik, head of NBC's negotiating committee, said he was hopeful the agreement would “mark the beginning of an era of greater understanding and cooperation” between the two sides.

For additional information, contact John Krieger at 301-657-8420. Contact Day Krolik at 212-664-4444.

ALL NRSC PROCESSORS ARE NOT CREATED EQUAL



On January 10, 1987, The National Radio Systems Committee (NRSC) approved a standard for high-fidelity AM transmission. When implemented by both broadcasters and receiver manufacturers, the standard will bring near-FM quality to the AM band. Many people are not aware however, that all NRSC processors do not sound alike.

The standard established a maximum audio response for frequencies at or above 10 kHz. In the common language of filter design, this is called the “stopband specification” but the NRSC elected not to establish a minimum “passband specification,” electing instead to let the passband performance be dictated by competitive market pressures. The passband specification is the performance of the filter below 10 kHz.

Simply stated, while the NRSC standard requires response to be at least 15 dB down at 10 kHz, there is no minimum response requirement for frequencies below 10 kHz. One other NRSC processor begins its rolloff early so that its response is already down several dB at 9 kHz. The Texar Phoenix™ maintains flat frequency response to

9.5 kHz to give you all the fidelity practical within the standard.

The Phoenix also implements a unique intermodulation-reducing pre-emphasis/clipper circuit to assure crisp, clear high-end response. The circuit is patent-applied for, so only the Texar Phoenix has it. The Phoenix is also the only digitally-controlled NRSC processor you can buy!

But high performance shouldn't come without convenience, so we added an internal 80 Hz square-wave generator to assist in setting the low-frequency tilt corrector. There is no need to disconnect the program line and connect an external oscillator. Just press the oscillator button and adjust the corrector. Release the button and program is back on air.

We could talk for hours about why we think our NRSC processor is better, but then so can any other manufacturer. The true test is to listen with your own ears. For a no obligation, 10-day trial of the digitally-controlled Texar Phoenix, call your favorite broadcast distributor or call Barry Honel at (412) 856-4276.

Considering an “add-on” NRSC filter for your present AM processor instead of a fully integrated package? There are reasons you may not be pleased with the performance of an “add-on” box. Call the factory for our pamphlet “Technical Limitations of a Non-Integrated Approach to Processor Design.”

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NBC To Cut 200 NABET Jobs

by Alex Zavistovich

New York NY ... Although the National Association of Broadcast Employees and Technicians (NABET) has settled its strike against NBC, its worries are still not over.

The network has announced its intention to lay off some 200 union members.

According to NBC spokesperson Dom Giofre, approximately 100 NABET members' technical and engineering jobs will be terminated by the end of the year, owing in part to the August sale of the NBC radio networks to Westwood One.

The reorganization of NBC's A-News and Skycom satellite news services, announced during a network affiliates meeting at the Radio-Television News Directors Association convention in early September, will also reportedly require the elimination of some jobs.

Approximately half of the total jobs affected will come from the network's news division, Giofre added.

Sources within NBC speculated that the four-month strike against NBC by NABET—which began on 29 June—may have contributed to the network's decision to terminate the technical positions.

"We've been operating with 2,800 less people with no real problems since this summer," one source pointed out shortly before the strike was settled in late October, adding, "I think it showed us we don't really need all those hands."

The status of NABET's employees fol-

lowing the sale of the NBC radio networks had been of great concern to the union, and had dominated at least one session of the union's contract discussions with NBC this fall.

There apparently had been some hope within the union that Westwood One might pick up the contracts of the NABET employees working for NBC Radio. However, Westwood One President Bill Battison has stated that no contract was in effect when Westwood purchased the NBC radio properties.

According to Battison, NABET's members in NBC Radio were "still employees of NBC." He added that "anyone who wants to join (Westwood) has to resign from NBC."

NABET International Representative John Krieger commented the union was "not completely surprised" about the expected layoffs. He said the network told union negotiators that some practices had been instituted at NBC during the strike, so that some jobs might be lost. Krieger added, however, that he

"questioned the judgment" of NBC to announce the anticipated loss of jobs while the two sides were still in dispute and while NABET was involved in a critical vote of its members.

At press time the union had reached a contract settlement with its members in the strike against NBC.

As for the status of NBC's approximately 4,700 non-NABET employees, network CEO Robert Wright reportedly maintained that layoffs in those ranks would come about only through "attrition."

For additional information, contact Dom Giofre at NBC: 212-664-4444. Contact John Krieger at 202-657-8420.

Bill Prohibits Minority Studies

Washington DC ... The FCC may be undermined in its attempt to eliminate minority licensing preferences, if a measure passed in a Senate subcommittee receives House endorsement as well.

Senators Frank Lautenberg (D-NJ) and Lowell Weicker (R-Conn) proposed the legislation in a Senate appropriations subcommittee the first week of October.

The measure, as an amendment to the Senate appropriations bill, would prohibit the FCC from using any government money to conduct a study on minority preference licensing.

The motive behind the Senate proposal is opposition from Lautenberg and Weicker to FCC actions which would eliminate preferences that in the past have been granted to minorities and fe-

males in the licensing of broadcast stations.

Another part of the Senate proposal would prohibit the FCC from eliminating policies which encourage sale of broadcast stations to companies controlled by minorities, at reduced cost. These minority practices have of late come under the scrutiny of the FCC as possibly being unconstitutional.

The FCC has been involved more closely with the issue of minority preference this past year. In particular is the controversial "Minority Ownership Report," which the Commission had required broadcasters to complete this summer.

The NAB was among those who maintained that responding to the question-

naire should be voluntary. On 6 April the Office of Management and Budget apparently sided with the NAB's recommendation but was "overridden" by the FCC on 17 April.

Some Congressional sources maintained results from that report would fuel the Commission's argument for reconsideration of its minority practices.

Although the Senate measure has yet to be signed into law or even approved by the other half of Congress, sources within Lautenberg's organization speculate that the legislation will have the support of the House.

For additional information, contact the press office of Senator Frank Lautenberg at 202-224-4744. Contact the FCC new media information office at 202-632-5050.

On time. On budget. On air.



The Tascam 42B makes other 2-track recorders seem downright slow.

That's due in part to an ingeniously accurate tape handling system, and in part to Tascam's unique head technology. (Its heads provide sync response fully equal to repro, so you don't waste time rewinding to make audio decisions.)

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.)

For more information, call or write about the Tascam 42B today. It's a new and vastly improved way to keep meeting your deadlines.

And your budgets. **TASCAM**

AES Draws Variety of Interests

(continued from page 12)

Press "Play" and the song starts perfectly. Press "Locate" again and it recues.

One compact disc that Studer had available for demonstration was of a live concert with applause between the cuts. There was no silence at all. Yet the A-727 cued perfectly to the first note of every cut on the disc.

The automatic cueing feature can be disabled from the front panel controls, but it requires pressing three buttons simultaneously so it will not be done accidentally. There is also a selectable auto-stop function.

One other thing I liked about this machine was that when a disc was started by remote control (from the console "On" button, for example), all the A-727 front panel controls are disabled.

You can't accidentally stop the disc that is on the air. Even the power switch is locked out.

The remote control does have one characteristic that might require the addition of some interface components for broadcast use: the machine requires a holding contact throughout the playing time.

Reel-to-reel

Also on display at the Studer booth was the relatively new A-807 reel-to-reel tape machine which is very reasonably priced for a recorder of this quality.

I learned from the Studer people that

my biggest complaint about the A-807, the slow starting time, was soon to be corrected. A new PROM will be sent to all current owners.

Evidently many new functions will be available after installation of this chip, but the best news was that the user will be able to select whether the capstan motor runs continuously or not.

At \$28,500 the new Studer D820X DASH format digital reel to reel audio tape machine is priced beyond what most radio stations can afford to spend for a two-track recorder.

A feature on the D820X that I thought

would be useful on other digital audio equipment was a small LCD display that indicated the signal quality coming from the tape.

Wouldn't that be great to have on a CD player so you could get some idea of where the problem is when the player doesn't work properly?

Otari also introduced a new reel-to-reel tape machine, the MX-55. This machine is evidently intended to replace the 5050 series machines. Among the new features is a 4-memory locator. It is also available with a center track for time code.

Otari reports that the new machine is currently available for shipping.

In addition to the exhibits there were 96 papers presented, ranging from digital audio, forensic audio analysis, FMX and stereo TV.

There also were 10 workshops on topics that included digital editing, film sound, sound reinforcement and tape recorder maintenance (see related story, this issue).

The AES convention is a four-day show that offers a tremendous amount of information for audio professionals, including radio broadcasters.

Doug Fearn is CE of WKSZ-FM in Media, PA, and a frequent contributor to RW. He can be reached at 215-565-8400.

Digital Is Still Industry Buzzword

(continued from page 13)

Orban name and a company called Seven Seas Audio, respectively.

Different approaches

The Orban 222 is totally analog and is very multipath conscious.

According to Bob Orban, tests conducted carefully and extensively in the number one rated multipath market of San Francisco demonstrated no increase in multipath distortion while enhancing the stereo sound and increasing perceived loudness.

Seven Seas Audio has developed three models of its Image Control. One model is designed for production purposes, allowing the user a wide range of

enhancement.

A broadcast model has three selectable settings so that enhancement may not be over-used (i.e. multipath effects) and a third model is specifically designed for sound stage work.

I tend to refer to these processors as those of the horizontal domain, looking at it from an oscilloscope standpoint.

That is to say compressors and limiters deal with the vertical domain, setting limits on peak excursions while in the horizontal domain we try to squeeze more punch into a given time period.

Look Ma, no mics!

And last but not least I was impressed by Holophonics, a process by which liq-

uid transducers replace microphones for picking up sound.

The Dimension Sound library of sound effects was very impressive. All CD, all Holophonically recorded.

As each year progresses more and more digital will find its way into our everyday lives.

Who knows, with the advent of HDTV we may even see some direct digital radio channels allocated, but for now I'd be happy with an R-DAT in my living room.

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

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.

And in the split-second, high-speed, high-pressure world of the broadcast professional, it's the only machine you can depend on, 100% of the time.

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.

Call or write for more information on the CD-501. Find out about a new, higher level of digital quality. And digital toughness.

TASCAM

Digital defined.

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Workshop Deals With Reel-To-Reel Answers

(continued from page 13)

nal is actually going on to the tape. (This explains why the meters appear to indicate differently on program material than they do when set with tone.)

I also learned that both the brake pads and the brake drums should be replaced at the same time when indicated. Otari says that should be after 3000 hours.

Replacing only the pads may cause rapid wear of the new pads. Heads should also last about 3000 hours, so if you replace heads, check the brakes and vice versa.

Otari also had available schematic diagrams of the 5050 capstan servo circuit, which does not appear in the instruction book.

Simultaneous workshops

Since several of the five individual workshops were going on simultaneously at any given time during the three-hour session, it was impossible to hear everything.

I spent some time with the Otari people and then moved on to the New York Technical Support Company session across the room.

This was a good basic overview of analog tape recorder principles and maintenance. Test equipment and tape machines were used to illustrate the principles.

It was interesting that instead of specific information on particular machines, the theory of bias, equalization, head alignment, etc. was discussed, with particular machines noted for their idiosyncrasies.

About 100 people were in attendance at this session and an interesting question and answer period followed.

Pro-Radio Campaign

by Alex Zavistovich

New York NY ... The Radio Futures Committee—a joint committee of the NAB and Radio Advertising Bureau (RAB) has come closer to its goal of launching a national promotional campaign to enhance the awareness of radio by considering strategies proposed by three advertising and public relations agencies.

At its second meeting, held 7-8 October at RAB headquarters in New York, the Radio Futures Committee heard proposals from the agencies of Earl Palmer Brown, in Washington, and New York's Warwick Advertising, and Manning, Selvage and Lee.

The committee's first meeting, which took place at NAB headquarters in



Tape recorder maintenance workshop attendees got to see an Otari deck from the inside

boards of the NAB and RAB in early 1988, according to Sue Kraus, spokesperson for the NAB.

Brown noted that, under arrangements made with the various agencies, ideas submitted to the committee are owned by the committee.

The committee has also decided not to limit itself to the three proposals it heard in early October. Brown said further study was being conducted into the matter of promoting the image of radio.

"We (the committee) were not unhappy with the proposals," Brown said. However, he stressed the committee wanted to be certain that the campaign, which is to be industry-wide, will make the best use of the funds set aside for it.

The next meeting of the Radio Futures Committee is scheduled for 9 December in Washington DC.

For additional information, contact Bev Brown at 214-693-6668, or Sue Kraus at the NAB: 202-429-5350.

Washington on 15 June, succeeded in establishing the goals for its mission of enhancing the image of radio.

The goals are "to increase the public's consciousness of radio, to increase radio's revenue share, to increase understanding by public officials and opinion leaders of the radio industry and its service to its communities, and to increase the pride and professionalism of those in the industry."

Although specific details were not provided, Brown said the campaigns proposed during the committee meeting were "multi-media," and included print and video advertisements, as well as radio spots.

A recommendation on what type strategy to take in the campaign is expected to be made to the respective

Raise your standards.



To understand the superiority of the Tascam ATR-60/2N, begin with the heads: no other 2-track production recorder has heads that can provide sync response fully equal to repro response—an advantage that allows you to save time by making critical audio decisions without rewinding.

Next, look at its direct-drive reel motors, its PLL servo capstan, and its 3-motor servo controlled tape handling system—all factors that lead to the ultimate in fast, accurate, and stress-free tape handling.

Finally, consider that the ATR-60/2N gives you all this and more, hour after hour, year after year.

Then call or write today about the Tascam ATR-60/2N. And take your broadcasting to a higher level.

TASCAM

Cases of Array Pattern Moding

by Tom Osenkowsky

Brookfield CT . . . Space considerations precluded examination of the Case A parameter options last month.

Presented here are three parameter options (out of the total of eight possible) for Case A as well as Case B, a four-

RF Reader

tower in-line array consisting of tall equal height elements.

A detailed analysis I did with the MATRIX computer program demonstrates that parameter sensitivity varies considerably from option to option.

For a given variation of each tower's ratio and/or phase, the effect on each radial field intensity is considerably different.

Power distribution vs. stability

One opinion in terms of bandwidth stipulates that it is best to have the majority of power distributed among the least towers, such as one or two towers carrying the bulk of the power.

In this way fewer elements need to be properly matched or broadbanded. While this perspective may seem valid, pattern stability must also be considered.

A given variation in phase and/or ratio in this situation would result in a far

Combination number 1 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	70.75	1.96	231.93	0.00	0.504	1.000
2	29.27	3.45	343.14	117.18	0.808	1.762
3	39.65	3.21	433.78	84.59	0.850	1.687
4	50.36	1.04	54.84	86.61	0.268	0.532

Combination number 2 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	61.21	1.86	432.73	0.00	0.504	1.000
2	69.47	3.70	752.22	178.56	1.001	1.986
3	20.61	3.07	174.50	47.64	0.829	1.646
4	55.11	1.10	66.50	86.61	0.297	0.569

Combination number 3 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	116.64	1.04	203.27	0.00	0.504	1.000
2	41.98	3.31	459.21	171.20	1.597	3.169
3	49.62	3.45	591.89	-10.54	1.667	3.310
4	39.59	1.96	156.16	86.61	0.947	1.879

Combination number 4 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	19.48	5.32	352.78	0.00	0.828	1.000
2	16.86	0.22	1761.48	-146.72	1.59	1.723
3	-15.80	5.92	-553.98	63.45	0.924	1.561
4	-92.92	2.46	-564.30	-88.00	0.582	0.462

Combination number 5 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	7.87	4.47	157.27	0.00	0.828	1.000
2	14.75	9.99	1471.65	-153.91	1.850	2.135
3	21.11	6.78	97.04	58.72	1.256	2.133
4	-75.20	3.09	-725.36	-88.00	0.513	0.693

Combination number 6 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	9.14	4.46	165.53	0.00	0.828	1.000
2	14.43	9.83	1393.75	-152.00	1.912	2.309
3	4.10	6.99	200.24	60.00	1.360	2.104
4	-70.91	3.27	-759.52	-88.00	0.637	0.769

Combination number 7 has the following pairs						
TOWER	LOOP R	LOOP I	POWER	PHASE	LOOP RATIO	FIELD RATIO
1	0.5960	phase -150.2761				
2	1.4236	phase 169.7884				
3	0.9483	phase -107.5122				

greater field variation than if the power were more evenly distributed.

It is generally advisable to select the "mode" which produces the highest drive point resistances and most even power distribution while avoiding negative and parasitic elements.

Examples from Case A and B using the MODING computer program bear these possibilities out.

Once again in the Case A array, the conical radiation will be different for each "mode."

Another consideration in moding of an array is the "real RMS."

When calculating the actual RMS of an array, and thus by hemispherical integra-

tion determining the "K" factor using a 1 ohm or other specified loss resistance at the current loop of each element, a change in the drive point resistance will certainly affect the determination.

RMS calculated

For example, if we have a 5 ohm drive point resistance with 1 ohm loss, a greater dissipation (and lower RMS) will occur than if the drive point resistance were 10 ohms.

In general we utilize a constant "K" factor when moding or matrixing an array.

It is easily possible to model an array on the computer where, as we vary a pa-

parameter, the drive resistance varies such that the dissipation (loss) is in proportion to the field variation due alone to integration.

In other words, if we used a constant "K" we'd see a change, but for the real RMS study we'd see no change because our gain was eaten up by a greater power dissipation.

In our next article we'll examine an actual error-vector and talkdown application.

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.

10 years from now, it'll still be the standard.

The undisputed standard for broadcast cassette decks has always been the Tascam 122B.

But that standard has just been surpassed.

Presenting the 3-head Tascam 122MKII. Its leadership is founded upon features such as Tascam's Cobalt Amorphous tape head technology. Plus a choice of built-in Dolby systems: not just B and C, but also HX-Pro, for virtually perfect high-end frequency response.

More than any comparable deck, it maintains constant tape speed and tension, thanks to a tape handling system that includes Tascam's Hysteresis Tension Servo Control.

And when it comes to handling, the 122MKII is the complete professional tool, with cue and review functions (manual cue), balanced XLR +4dBm inputs and outputs, and rack-mountability.

Call or write for more information about the 122MKII. Get it now, and use it for decades.

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TASCAM



GDO Meets Many Station Needs

by Tom Vernon

Harrisburg PA ... Picture this scenario. Your communications receiver is badly out of alignment, and you need to tweak it up for the hamfest this weekend.

You procrastinate until Friday night, when there is a power outage lasting several hours.

In spite of the handicap of no power for the receiver or signal generator, come Saturday morning your rig is tweaked to perfection.

Impossible? Not with the topic of this

month's column, the grid-dip meter. Although not used as often as other RF test equipment, the grid-dip meter,

Station Sketches

or grid-dip oscillator (GDO) has many interesting applications around the radio station or shop.

As you can see from Figure 1, this is a relatively simple device. It's no more than a simple oscillator with a meter for

measuring oscillator grid (or base) current.

Typically these are small battery powered devices with numerous plug-in coils for overlapping frequency bands.

The dial of the variable capacitor is calibrated in frequency, with bands that match the range of the plug-in coils.

The principle of operation is also simple. Oscillator current dips when the coil is in the presence of an external circuit which is resonant at the oscillator's frequency.

Figure 1. Simplified schematic of a grid-dip meter.

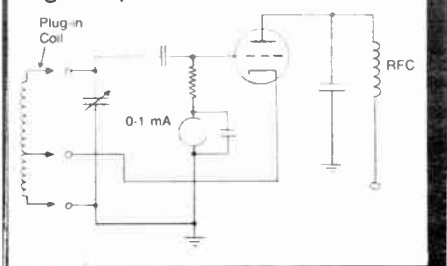
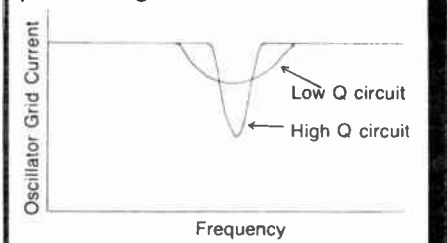


Figure 2. Oscillator grid current as a function of frequency, when coupled to high and low Q circuits.



This is because a certain amount of the oscillator's energy is absorbed by an external resonant circuit.

The sharpness of the meter's dip depends on the tightness of coupling to the external resonant circuit as well as the Q of that circuit. This relationship is illustrated in Figure 2.

The most popular use of grid-dip meters is to determine the resonant frequency of tuned circuits in transmitters and other RF devices.

The coil of the GDO is placed close to the circuit in question, and the tuning cap is adjusted for a dip in the meter. The frequency is then read off the calibrated dial.

Care must be exercised when using this technique to get just enough coupling between the GDO and the circuit under test to see the dip on the meter.

Too much coupling will cause the oscillator to be pulled off frequency, resulting in measurement errors.

The electrical length of transmission lines may be determined by opening the far end, and putting a loop of wire on the other end.

Now tune the grid-dip meter to the lowest frequency where a dip is located. This dip is the point where the transmission line is a quarter length long.

In a similar manner the resonant frequency of antennas may be determined. Simply connect a loop from antenna to ground, couple in the grid-dip meter and tune for a dip on the meter.

A GDO may also be used to check the resonant frequency of RF components. To check coils, simply place the coil close to the grid-dip meter and tune for the dip.

It's that simple. Capacitors are a little more involved. Connect the unknown capacitor across a coil of known inductance.

Measure the resonant frequency of both, and solve for Cx in the formula:

$$C_x = 25,400 / (f^2 L)$$

where C is in picofarads, L is in microhenries, and f is in megahertz.

You can find the inductance of a coil using the same procedure, only with a known capacitor value. In this case, solve the above formula for L instead of C.

And, as I mentioned in the introduction, a GDO can be used to align a receiver with no power connected.

Begin by coupling the GDO to the last transformer, and adjusting the slugs for a dip at the IF frequency. Gradually work
(continued on next page)

"We wanted the best sound in town—I think we were successful."
Martin Brandl, Chief Engineer
GJMF-FM, Quebec City, Canada
(Soft Rock)

"The automatic equalization and gently gain riding were just what we were looking for. And thank you for making your updates retrofitable."
Don Hobson, Engineering Manager
KJQY, San Diego, CA
(Light and Easy Music)

"I would highly recommend it to anyone—except my competitors!"
Ray Fisher, Program Director
WZLX, Columbus, MS
(Contemporary Hit Radio)

"Increased our punch and gave us a fuller sound. It's ultimately clean. In a competitive market, regardless of format, the cleaner sound gets (and keeps) the long-term listener. The added controls give us the advantage of tailoring our sound to the listener."
John Bortowski, Chief Engineer
WBMX, Chicago, IL
(Urban Contemporary)

"It's scary! Loud and dense, but not fatiguing. And it's consistent whether we're playing old LPs or a new Huey Lewis CD."
Duffy Egan, Chief Engineer
WPRO-FM, Providence, RI
(Contemporary Hit Radio)

"Clean and loud."
Barry Mishkind, Chief Engineer
KFXX, Tucson, AZ
(Contemporary Hit Radio)

"Clean and natural without being strident. It gives you lots of adjustment capabilities, and will fit almost any format. The manuals are very good as usual."
David Ficker, Chief Engineer
KHOO, Waco, TX
(Adult Contemporary)

"Voices sound clean and open, and the music sounds great."
John Buckham, Chief Engineer
KITS, San Francisco, CA
(Modern Rock)

"Super! The most cost-effective change we've ever made."
Randy Wells, Chief Engineer
KREO, Santa Rosa, CA
(Adult Contemporary)

"It's the biggest bang for the buck—lets us customize our sound for our listeners."
Matt Conner, Chief Engineer
WASH, Washington, D.C.
(Adult Contemporary)

"Lethal."
Terry Carpenter, Chief Engineer
KJYY, Houston, TX
(Vocal Soft Rock)

"Gave us more punch and clarity without any increase in distortion."
Michael Fast, Chief Engineer
WPOC, Baltimore, MD
(Modern Country)

The OPTIMOD-FM XT2 Processor: Everything they say is true.

Orban's XT2 Six-Band Limiter is an accessory chassis that works with any 8100-series OPTIMOD-FM. It gives you bass and high frequency equalizers, plus CLIPPING and DENSITY controls that let you customize the sound for your format and target audience. At \$2075*, it's probably the most cost-effective upgrade you can make to your audio.

For the details, see your Orban dealer, or contact us direct.

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*suggested list



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PAB Hosts Engineer Sessions

by Douglas W. Fearn

Philadelphia PA ... The Pennsylvania Association of Broadcasters (PAB) held its annual convention here on October 19.

For the past four years a feature of the convention has been an engineering conference.

This year, there were seven presentations, six of which were of interest to radio station engineers.

Tower maintenance

John Windle, VP of Engineering for Stainless, Inc., a tower manufacturer, emphasized the responsibilities we have for proper inspection and maintenance of towers.

He stressed that annual tower inspections should include checks for damaged or deformed members, corrosion, paint condition, damaged hardware and connectors, base insulator cracks, guy wire corrosion, tower base and guy anchor condition, guy tensioning, and tower alignment.

Towers should be checked with a transit to be certain they are plumb and straight.

Some of these checks can be done from the ground, but much of the inspection must be performed by someone qualified to climb the tower who knows what to look for.

Windle passed out a four-page summary of maintenance requirements, which includes methods and formulas for determining whether a tower is within tolerance for straightness and plumbness, and two methods of calculating guy wire tension.

Most tower failures are the result of ice buildup and there is not much that can be done to prevent ice.

Windle discussed experimentation with new anti-icing coatings which seem to be effective but require frequent renewal (every couple of years), are subject to degradation from any handling, and are quite costly to apply.

The coatings do seem to work however and may be a solution for towers with severe ice problems.

There are new EIA standards which took effect earlier this year and which require that most new towers have a higher wind survival rating.

Michael Rau of the NAB's Department

of Science and Technology brought us up to date on the latest improvement projects.

These include the two AM antenna experiments, the NRSC AM Standard and FM matters.

NRSC conversions

Rau observed that some 359 stations have reported converting to the NRSC standard, and that prototype receivers have already been designed.

Meanwhile, FM's FMX, with its improved design, is ready to be tested.

Of the two AM antennas the NAB is getting ready to build, one, the Biby antenna, has undergone a few changes and is set for construction.

The Prestholdt antenna, however, still needs to be assigned a site. The NAB is currently working that detail out with Howard University, which will lease the land for the project.

For TV engineers, Rau also spoke about the current state of High Definition Television (HDTV) experiments, which the NAB is getting more involved in through its subsidiary, NAB Technologies.

AM stereo and other concerns

Larry Will related his experience with both stereo TV and AM stereo.

Will, of New Jersey Public Television and an owner of AM stereo WCZN in Chester, PA, explained the problems and results of converting an older AM transmitter to C-QUAM stereo.

His talk was illustrated with slides taken at the radio and television stations, as well as data on the performance of the systems.

After lunch, Ennis Coleman, Engineer in Charge for the Philadelphia office of the FCC spoke on broadcast station inspections and possible fines for violations.

He explained the procedure by which stations are chosen for inspection by the Philadelphia office.

The most likely stations to be inspected are those that appear to have a violation. Next are those with a history of violations. And then a few stations with good records of compliance are randomly chosen for checking.

The typical inspection lasts two to three hours and concentrates on the transmitter site.

Grid Dip Oscillator Uses

(continued from previous page)

your way back to the antenna in this manner.

To set up the local oscillator, tune the receiver to 1500 kHz. The grid-dip meter is tuned to this frequency minus the IF frequency, in this case 1045 kHz. With the meter coupled to the oscillator coil, adjust for a null at 1045.

Since the GDO radiates RF, it can also be used as a signal generator, and BFO or Q multiplier for your communications receiver.

By noting dips at places other than the resonant frequency the grid-dip meter is useful for tracking down spurious radiation. Checks of crystals and filters are also possible with this device.

Grid-dip meters are also inexpensive. These units frequently show up in government surplus catalogs for very reasonable prices. Hamfests are yet another source.

Just make sure the batteries for older units are still available and that all plug-in coils come with the meter.

If you don't mind a few evenings of work with a drill and soldering iron, *The Radio Amateur's Handbook* contains plans for some nifty GDOs. These plans don't include coil winding data for the broadcast band, but there's enough information to figure this out.

While the GDO gives an accurate indication of resonant frequency, it is not as razor sharp as a frequency counter, and probably should not be used for FCC required measurements.

Its real advantage is that it can give you information that cannot be easily obtained in any other way.

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

Tower painting and lighting, and fencing are included. Indicating instruments (plate voltmeter and ammeter, RF ammeters and phase monitors) are observed and, if the station is operated by remote control, the calibration is checked with the control point.

The signal is monitored for frequency, modulation percentage and spurious radiation. At the studio the EBS equipment comes under close scrutiny as well as the operator's knowledge of EBS procedures.

If all goes well, that's the end of the inspection. If violations are noted, additional measurements may be made, such as checking an AM directional station's monitor points for each pattern.

Dealing with violations

If a minor violation is found, an "advisory" would be issued. If a serious violation is detected, the FCC issues an official notice that requires a reply indicating what action has been taken to rectify the problem.

A "willful violation" is one that station personnel either have failed to prevent or failed to correct.

This type of violation subjects the station to a Notice of Apparent Liability (NAL) which carry fines up to \$2000. Also in this category are repeated violations, those that occur twice in a 12-month period.

At the end of the presentation, Coleman fielded questions from the audience on a variety of topics, some outside the broadcast realm. He acknowledged that the FCC field offices have at least as

much trouble keeping up with the changing rules as broadcasters do.

Harris Corporation has been a pioneer in the current experimentation with synchronous AM transmission, and Art Silver from Harris advised us on the latest findings.

He explained how synchronous AM worked and who could benefit, using examples such as a station in the Southwest whose nighttime null falls over a major city.

By using a second synchronous transmitter, service was restored to the city. Currently there are four experimental systems in use around the country. The final results are not yet in.

Equipment Exhibits

In addition to the technical sessions, a small radio exhibit hall displayed equipment and services available from about a dozen exhibitors.

ATI showed its line of consoles, distribution amps and various other handy devices.

LPB had a low power AM transmitter on display which could be used for Pre-Sunrise or Post-Sunset operation.

And featured at the Radio Systems' booth was the company's ESA-10 console.

Although small compared to shows such as the NAB spring convention, the Pennsylvania Association of Broadcasters convention offered area engineers a lot of information in one day.

Stainless, Inc. will provide copies of its tower maintenance reference data to interested RW readers. Contact Ken Wetzel at 215-699-4871.

Doug Fearn, CE of WKSZ, Media, PA can be reached at 215-565-8400.

STERLING PERFORMANCE



RADIX

Turntable Preamp

Model TP-500

The all new Radix is everything you would expect in a high performance turntable preamp. Superb specifications with quality components and construction throughout permit Radix to claim "Uncompromising Sterling Performance."

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- Output: +20 dBm single ended .600 OHMS
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- Designed for stereo or dual mono operation



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The Rites of Spot Copywriting

by Tyree Ford

Baltimore MD ... Effective copywriting for commercials, recorded station promos and even liners is an art/science that frequently gets overlooked due to the need to get the piece on the air as quickly as possible.

Due to lack of attention to detail, compromises occur which reduce the credibility of the client and your station.

Your first job is to determine what effect you want to achieve. Begin by getting the facts from the client. Asking some very basic questions will help determine the best approach.

Basic identity

If the client is new, or relatively unknown to the market, it is important to reinforce the name, unique position and location as well as any special information which will help the listener contact the client.

While repeating the client's name is important, it is also important not to overdo it. With most 60 second copy seven impressions is plenty.

Even then you need to make sure the client's name is used in sentences with strong, simple positioning statements. Attempts to insert the name at every possible interval are unwieldy and sound hyped. (Of course there are always exceptions.)

In a spot I recently worked on for an upscale auto dealer we achieved nearly

ten impressions. The first five came in the first ten seconds of the spot.

Because the client was having a special year end clearance celebration event we opened the spot with a champagne cork pop, party ambiance and five different foreign folks toasting the dealership in their native languages.

Because the voices and pronunciations were all markedly different we were able to achieve a very high impression rate.

Living up to image

Our international voices also connoted a very upscale image. This wasn't just a con job to get people to the showroom. The company really does have a class act.

Producer's File

Remember this when you write for a client or your own station; if you make statements or promises that can't be fulfilled your station and your client will both lose credibility.

Stay away from copy that makes more of a product or service than can reasonably be expected by the consumer.

Another thing to remember is that advertising creates traffic, not sales. If a client runs a schedule and complains of poor results, the reason could be that he was unable to close the customer be-

cause the copy was mostly smoke.

There are many other reasons for non-performance of a spot schedule, including running spots when the market is not ready to buy, running too small a schedule to make enough impressions, etc., but for now let's stick to copy.

Copy overload

Even though a spot *sounds* great, it may not be doing the job you want it to. It's very important to realize that the message should not be the medium.

Too many advertising pros fall into the trap of accepting that more is better. As a result, their copy includes too much information. They excuse this poor approach by claiming it gives excitement to the spot.

While we have learned that humans hear faster than they speak, there is a point at which excitement becomes clutter and confusion.

You hear more of this misguided approach in local retail price and product copy where examples of "great bargains" fill a spot to overflowing. The very style of this buzz saw approach is a tipoff to most people that the buyer should beware.

If you find yourself with too many copy points to comfortably fit in one spot, make two or more spots. By using the same open and close you will establish continuity and transform a one-spot monster into something approaching a

marketing campaign.

If you've spent some money recently for a commercial music package make sure you take full advantage of it by customizing your copy to the particular bed you're using.

One of the best ways to maximize your impact is to pick a music track which conveys the feel you intend to take with the copy.

After you find the right track, listen to it for "musical posts" or obvious changes in the music patterns. Write your copy so that your sentences and phrases coincide with the musical timings.

It's okay if one thought runs across several posts, but try to avoid ending or beginning thoughts between posts. If you finish a line of copy too soon, try slowing the line down to fill the hole or adding a few more appropriate words. Don't add meaningless filler.

Listen to make sure you're not speeding up to get those extra words into one section, and dragging your delivery too much in a later section to fill up the space. It may help you to think of your voice as an instrument providing a melody for the bed.

Choosing the right words

Be aware the effect your choice of words has on the spot. Some words just don't work well when said next to each other.

As you write your copy, be aware of "power words" and how they also increase the impact of your piece. Power words come in varying strengths.

The stronger ones usually contain plo-

(continued on page 27)

Until now, setting up a sports remote was a sport in itself.



Feel like you've gone five rounds with Sugar Ray, run a marathon and been tackled by the entire Bears' line by the time you've set up your sports remote?

A Gentner Remote System can have you on the air in less than five minutes with no set-up hassles. Everything is pre-wired in a single ATA-approved Star case. There's even room for your accessories. Just plug in power, mics, headsets and the phone line and you're on the air.

The real beauty, though, is in the remote itself. Your listeners hear high-quality audio, not tinny telephone sound. Your talent receives return cues

missed cues or mistimed spots. And with the optional cellular phone and battery interfaces, you can broadcast from virtually anywhere.

Nine Remote Systems packages have been designed to meet your needs and budget. Call your distributor or Gentner today and score points with easy set-up and clear broadcasts.

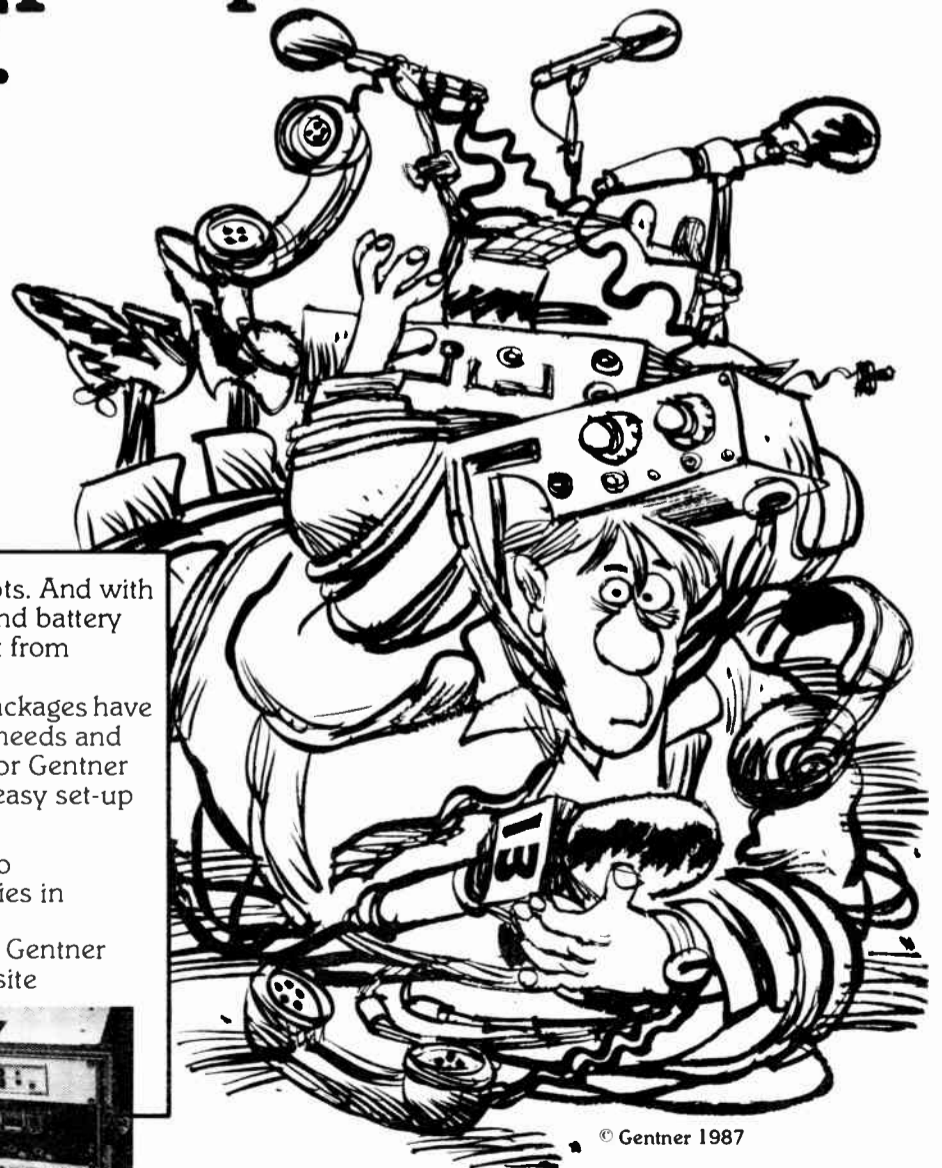
- High quality telephone audio
- All equipment and accessories in one case
- Pre-wired and pre-tested by Gentner
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Circle Reader Service 33 on Page 28



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The Basics of POTS Business

In Part I, the author shared his "telephone insight" on choke networks, FXs and digital exchanges. In the following he examines business phone lines, loading coils and echo suppression.

by Steve Church

Part II

Cleveland OH ... Now we're getting into some real mysterious, esoteric stuff.

Standard POTS (plain old telephone service) business phone lines come in two basic flavors, loop start and ground start. Loop start is the kind that is most common.

In this kind of circuit, the CO (central office) provides "talk battery" to the line at all times and knows that an off-hook condition is occurring when your equipment connects and causes current to flow between the two tip and ring wires.

With ground start circuits, the CO waits for a connection from the ring wire to ground before connecting talk battery, at which time your gear removes the ground connection so that a balanced talk path is established.

When the calling party hangs up, a ground start circuit removes the talk battery. A loop start circuit may or may not provide a momentary interruption or reversal of the talk battery when the calling party terminates.

Talk battery

Talk battery is originated at the exchange at 48 VDC. Since there may be as much as 5,000 ohms resistance between the CO and you resulting from a series current-limiting resistor and the wire pair resistance, the voltage at your end will be some lower value, depending on the resistance of your terminal equipment.

The interruption of the battery is known as "CPC," or Calling Party Control, since the "calling party" can control your equipment when he hangs up.

The CPC can be used to turn off an answering machine, for example, or to extinguish the winking light on a held line on a 1A2 Key System phone.

The CPC interruption on loop start circuits was probably never intentional, having most likely been a by-product of early mechanical switching relay systems.

While most exchanges do provide CPC, there are some that don't reliably provide it, or provide it after a variable time delay, and many PBXs don't look for it at all.

Ground start lines

Thus, ground start lines are highly desirable for connection to PBXs and answering machines.

Incidentally, you can connect ground start lines to 1A2 Key Systems. This approach will ensure that a line will go off of hold if a caller gets tired of waiting and hangs up.

Of course, your jocks won't be able to call out on these lines, and you can't busy-out unused lines, since the Key System doesn't provide the ground start signal.

Occasionally, you may see a reference in phone terminology to something called "E&M" signaling. While this sounds very impressive, like it might be an unusual

and advanced digital coding scheme or somesuch, the truth about E&M is much less exciting.

E&M merely abbreviates the words for Ear and Mouth, and the signaling is accomplished by simply asserting and removing -48 VDC. This technique is sometimes used for special circuits in order to communicate line status.

Loading coils

We all at one time or another have been told by the phone people that an EQ'd broadcast loop was not possible from a certain location because no "unloaded pairs" were available.

In some cases, the phone guys have probably offered to remove the load

coils—with a couple of months lead time and a special service charge involved. What are these things? Why are they on some lines and not others? Why do they need them at all?

A typical phone pair of #24 wire has an attenuation of approximately 2.5 dB per mile at 3 kHz due to capacitive effects. On an eight mile long line, high frequency attenuation would thus be 20 dB, a significant amplitude distortion.

Load coils are toroidal inductors which are used to counter the effects of the phone pair's natural capacitance. While the coils are effective at flattening out the response within the voice band, the roll off above 3.5 kHz is devastating (see Figure 1)

Physically, load coil banks are long cylinders, with the individual donut-like coils stacked on top of each other inside. They are typically placed at 3000', 4500' or 6000' intervals along the phone cables. Generally, load coils are only used on cables of greater than three miles length.

Load coils also usually have a deleterious effect on the performance of the simpler radio station hybrid interfaces since the coils can create resonant peaks and phase anomalies in the phone line impedance curve which are difficult to null out.

This is a reason why simpler hybrids are more likely to operate satisfactorily when a station is near the serving CO.

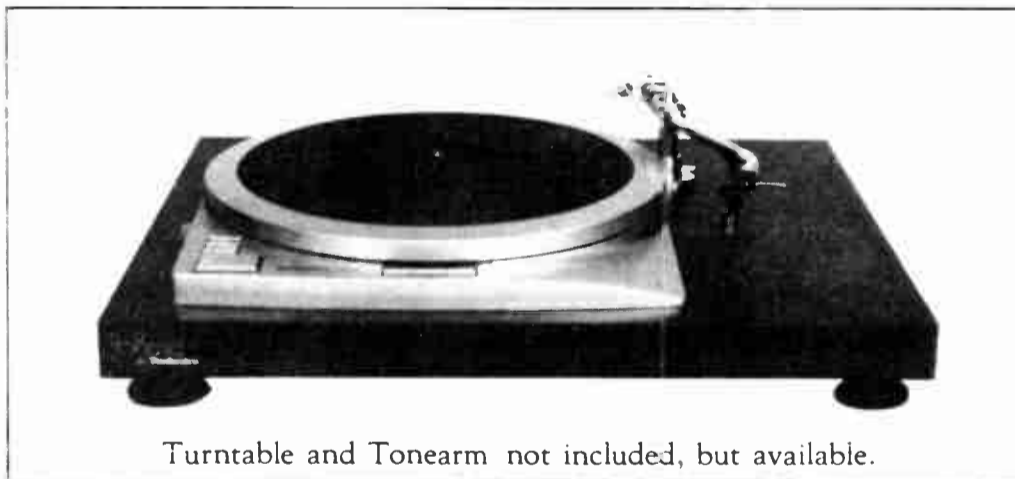
If you've ever had the experience of having a long distance conversation on a phone circuit with an overactive echo

(continued on page 27)

BSW

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for Technics



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CONTRACT ENGINEERING

Small Market Station Survey

by Jeffrey Baker

Fairport NY . . . There are conflicting beliefs about the state of broadcast engineering as a profession.

One view holds that de-regulation has killed broadcast engineering as a career because most of the technical rules have been eliminated and stations no longer need or want the services of an engineer.

Therefore engineers cannot find work. An alternative position is that broadcasting is losing its technical talent to other fields such as computing, therefore it is a seller's market for broadcast technical talent.

The recent layoffs of technical personnel at major networks and major market stations tend to support the "engineering is dead" theory.

So does the often heard wisdom of some broadcast managers who believe that broadcast equipment is so reliable, major market AM-FM combos need but one engineer on staff and all other stations can get by with a contract engineer.

That would seem to open opportunities in contract engineering.

At the same time, at least in the state of New York, long time contract engineering operations have been shutting

down. This contradictory state of affairs leaves one to wonder whether there is any future for the contract broadcast engineer.

Even with major staff reductions, large broadcast operations will have a few engineers on payroll and opportunities will be limited.

But what is the situation in smaller communities? Are small market stations meeting their needs? Is there an opportunity for the contract engineer in small markets?

In an attempt to find out, we surveyed stations in smaller markets within New York State.

The scope of the survey was limited because of limited resources and our particular interest in this area as a possible location for a consulting business.

But the results may be useful to engineers seeking this kind of work in other areas, and the methods used could be adapted for larger markets as well.

Methodology

Questionnaires were sent to GMs of 50 stations selected from the *Broadcasting Yearbook* listings. An attempt was made to make this sample representative based on station type and community size.

The survey form was kept concise—one page in which six questions were asked.

Two questions need a bit of explanation.

Good survey technique requires that questions be free of bias. That is, they should not suggest to the person being surveyed that any given answer is more appropriate than any other.

Nevertheless, in questions 4 and 5, a deliberate attempt was made to *position* the price data asked for in terms that the respondent could relate to.

This positioning was the result of previous experience with station managers who relate the hourly cost of contract engineering to the cost of an employee.

They may not consider that contract personnel don't receive the benefits provided other employees and that contract engineers also have fixed overhead costs to meet.

Therefore, the questions suggest the similarity to other services with which the GM would be familiar and which would have the same sort of expenses.

Although the response forms could be sent anonymously, respondents were given the option of enclosing a business card or affixing their name and address for contact in case a consulting service were started in the near future.

A cover letter explained that we were considering starting a broadcast technical service, listed some areas of expertise and explained we were trying to as-

sess the need for those services.

The survey produced an unusually high response rate of 48%. Responses were highly variable but some clear trends were discernible.

They are tabulated in Figure 2 and discussed below.

One third of the stations had a full-time technically trained CE. Just under a third had part time chiefs on staff, and the same number (29%) employed a contract engineer.

One station had no engineer but there was a good reason (or perhaps result)—they weren't yet on the air.

Some of the engineers on staff doubled in other jobs and two stations had both a contract chief and part-time staff person.

As for meeting technical needs, 42% reported that their current arrangement met all requirements, 38% said it met most needs, and for one eighth, it met some. Several stations failed to respond to this question.

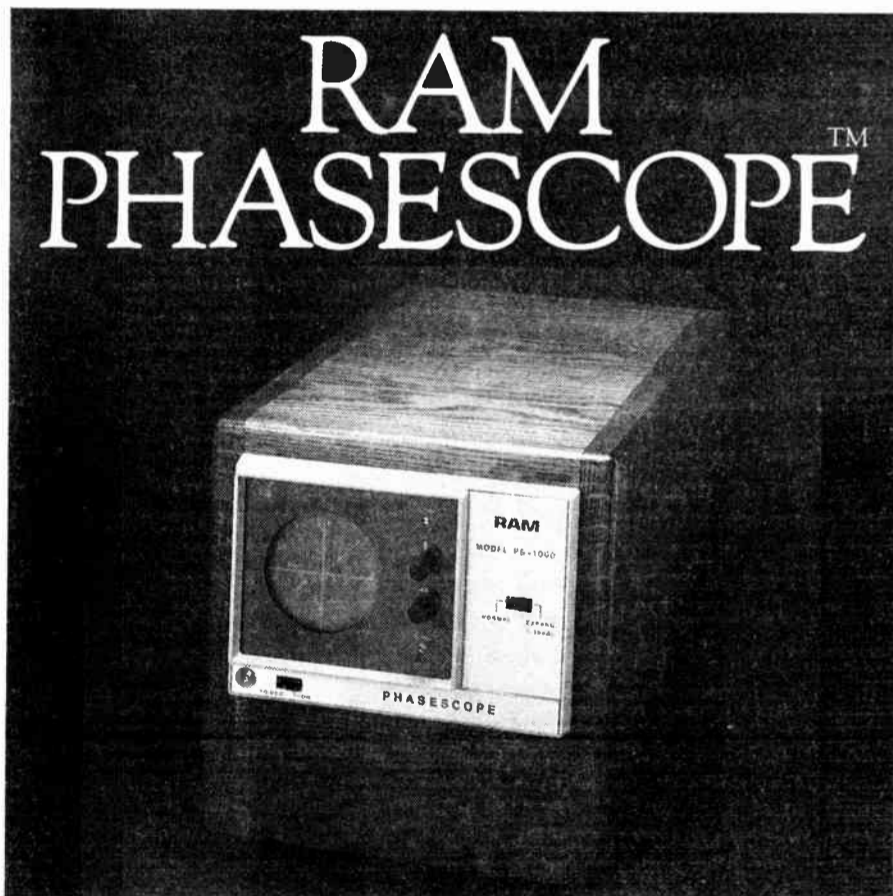
Many stations expressed an interest in using a new technical service for various purposes.

The major categories for this interest included antenna adjustments and measurements (54%), emergency transmitter repairs (50%), antenna construction (33%), emergency studio repairs (29%), and studio and transmitter construction, (29% each).

Only a few selected minor FCC applications and routine maintenance/inspections.

What are stations willing to pay for these services?

(continued on next page)



Phasescope is the new word in economical-visual stereo monitoring. The Phasescope is priced to be affordable for every control room and studio. It displays the classical stereo starburst when monitoring stereo audio or a straight line when a mono signal is present. Designed with the operator in mind, the Phasescope contains a minimum of

adjustments and unnecessary extras — a back to the basics monitor.

Once calibrated to your house standard, the Phasescope can be used for quick operating level checks. Using the special graticule, you can measure phase and amplitude of test signals. Flip a switch and you can easily view voice and music peaks.

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Circle Reader Service 37 on Page 28

Pacing the continued growth of RADIO WORLD . . .

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CONTRACT ENGINEERING

Is The Need There?

(continued from previous page)

For routine maintenance, responses clustered in the lowest two groups presented, "less than \$15 per hour" (46%) and "\$15-\$20 per hour" (33%).

Emergency services were valued more widely and, in general, more highly at "\$20-\$25 per hour" (33%).

For major work, such as studio and transmitter plant design, antenna adjustments and proofs, the mode was "between \$200 and \$300 per day" (33%), with 13% favoring \$300-\$400 per day, and 17% choosing less. There were a large number (33%) of non-responses to this question.

The majority of the respondents indicated an interest in being notified if a new service were to be started. Nearly all of those included a business card or contact address.

No technical shortage

It appears that the majority of stations responding have some relatively permanent form of technical help.

Over 90% had either part-time or full time staff who were said to be technically trained, or had engineers on contract.

The others had non-technically trained chief operators or did not respond to the question. From this response it appears that there is no shortage of technical personnel.

However less than half the replies indicated that the arrangement met all the station's needs.

Thus it seems that the technical personnel employed may have limited experience in some areas and that outside help would be required for certain jobs.

The large response to the question on using an outside technical service would seem to reinforce this perception.

Judging from the responses to question 3, it would seem that the greatest areas of weakness are in antenna adjustments and measurements, emergency transmitter repairs and construction.

Apparently, according to the responses, routine maintenance and studio repairs are being handled adequately.

Experience wanted

It appears that the most help is needed in areas which require the most experience in the broadcast engineering field.

Thus, it may be surmised that the "technical" people working at small market stations are relative newcomers to the field or at least haven't been able to gain the breadth of experience required to handle the more complex technical tasks.

This is of course consistent with com-

mon belief that the inexperienced start working in small markets and move up as they gain experience.

But pay in smaller markets tends to be low, and so apparently do the service cost expectations of small market GMs.

The \$15 or so amount selected by most for cost of routine services would not cover the overhead of an average contract engineer, let alone provide a decent living (a future article is planned to cover this subject).

This is especially true for a highly experienced person who has the necessary equipment and supplies.

The cost expectation for emergency services is in a slightly more reasonable range (around \$20-\$25 per hour), but it is not consistent with the cost of services mentioned for comparison.

Auto repair services around the state appear to run in the \$25-\$35 per hour range (higher in cities) and plumbing and electrical hourly costs are higher.

Undervaluation

Thus on a comparative basis, broadcast engineering, a job which requires a high level of skill, appears greatly undervalued.

And it is rare to find a plumber, electrician or auto mechanic who will come to you in the middle of the night for the regular rate.

The \$200-\$300 consensus for major consulting services is also quite low.

Professional engineering consultants in the Washington, DC area generally charge above the top scale mentioned in the question.

Obviously, a small market station would prefer not to hire a \$600 a day consultant for a minor antenna adjustment or common point impedance measurement. It would be desirable to find someone locally who will work for less.

But the amounts proposed are less than half what the Washington group would get. The low response rate to this question, however, indicates some uncertainty or indifference on the part of the participants.

It should be pointed out that the limited geographical area and small sample size as well as the particular sampling technique cautions against drawing broad generalizations from this survey.

Nevertheless some trends can be discerned which point the way for further research on engineering needs and broadcast employment.

Conclusions

Within the limited scope of this study, it can be concluded that small market

stations seem to meet their routine technical needs to some extent.

However their managers perceive needs for additional services in the areas of emergency repairs, antenna work and construction. Many are willing to hire outside services but at inadequate or barely adequate fees.

Based on the result of this survey, we abandoned the idea of a local consulting service. The fees would not have generated enough income to cover decent salaries, pay normal benefits such as vacation, health and liability insurance and retirement, or cover overhead for equipment, telephone and non-billable time.

The need is there but the money is not.

Some engineers may feel they could do a good job on the fees that stations are willing to pay. They should know that three contract engineers previously working in the survey area have shut down or greatly limited their operations.

While that would seem to provide an opportunity, the reasons cited for discontinuing operations are worrisome.

They include station unwillingness to pay reasonable fees (as documented in this survey), station failure to pay on time or at all, and lack of trained personnel to assist on large projects or in multiple emergencies.

Perhaps the survey results could be summarized by the remarks of one respondent (apparently an engineer given the survey by his manager) who wrote a note. Although the letter is somewhat contradictory, his conclusion was:

"The only need in the radio business right now is the minimum wage chief with 30 years experience. If you are thinking of changing business thrust then become electricians or plumbers. It takes half the ability and pays four times as much."

The survey result doesn't quite justify that view. But there is certainly a need to train station managers in how to value the engineering services they need.

Jeffrey Baker is Director of Engineering for the radio group at Heritage Media Corporation. He holds several degrees and is currently a doctoral student at Nova University. He is also a certified Senior Broadcast Engineer, AM-FM, and can be reached at 716-232-7550.

Editor's note: RW would be interested in similar research conducted by contract engineers or potential contract engineers in other markets. Write: Editor, PO Box 1214, Falls Church VA 22041, or call 703-998-7600.



"Keeps Playing"

"I've finally had all I can stand..."

"I can't let another day go by without telling you about my Harris SX-5A AM Transmitter," writes R. Dale Gehman, partner and chief engineer of WAGS AM Stereo 55 in Atmore, Alabama.

"We got prompt action on our order. Your shipping people followed it through. I was very pleased with the manual, the construction (Built Tough!), the hook-up procedures and the initial turn-on performance. The final numbers were beyond my wildest dreams! Imagine 0.3% distortion, 0.2% intermod, 3% IPM... I never dreamed I'd see any AM transmitter turn out numbers like these!

"But let me tell you what surprised me most: WAGS is located in a lightning belt—more strikes than anywhere in America. Our 511-foot tower has been

popping with static many times, but your solid-state SX-5A just sits there and keeps on playing! We haven't been off the air once. THANKS!"

Harris' SX-5A is your best bet for a rugged, reliable and efficient 5 kilowatt AM transmitter, and it's available for single or triple phase hook-up. There also are 1 and 2.5 kW SX models. SunWatch™ automatic PSA/PSSA and C-QUAM® AM Stereo are options. Standard-setting Harris training and service top off the features.

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StereoMaxx

StereoMaxx™ is a hit with scores of Chief Engineers and Program Directors from coast to coast. Our spatial image enlarger is their new "SECRET WEAPON". And it's a secret they'd prefer to keep to themselves as long as possible.

A Southwest top 10 market CE explained to us:

"After you asked me for a quote about StereoMaxx, I talked it over with management. We agreed on two things: First, StereoMaxx is making a difference at our station. It gives our sound a fullness and richness we didn't have before, and nobody else has now. And second, we don't want our competition to know what we're doing. So no names, OK?"

We understand. StereoMaxx users love the box, but most don't want publicity. After all, it's no secret that audio processing can be a potent weapon in the "ratings wars." A West Coast Chief Engineer tells us how StereoMaxx is working out at his station:

"It's terrific. The extra separation and depth we get from StereoMaxx makes us not only sound bigger, but better. It's amazing... The PD has been bugging me for months to give our station a sound that stands out from the other CHR's. With StereoMaxx, we're finally able to do it. I followed your instructions for connecting StereoMaxx with our Texar Audio Prisms. There were no problems putting StereoMaxx in, and it gives us no problems on the air."

We're glad he said that. Enlarging the stereo image is one thing, but doing it without creating big hassles is quite another. A top 5 market CE put it this way:

"I was a little skeptical because I'd played with several ambience gadgets in the past. But they were more trouble than they were worth. StereoMaxx is different. It really does make us 'more stereo'. And it really doesn't cause us any undue multipath hassles. Also, I don't like unknown 'black boxes', so I was impressed that you sent me complete specs, and a block diagram. The unit comes with full schematics... no mystery modules! Eric Small, you've done it again."

To sum up, we like these comments from a West Coast Program Director:

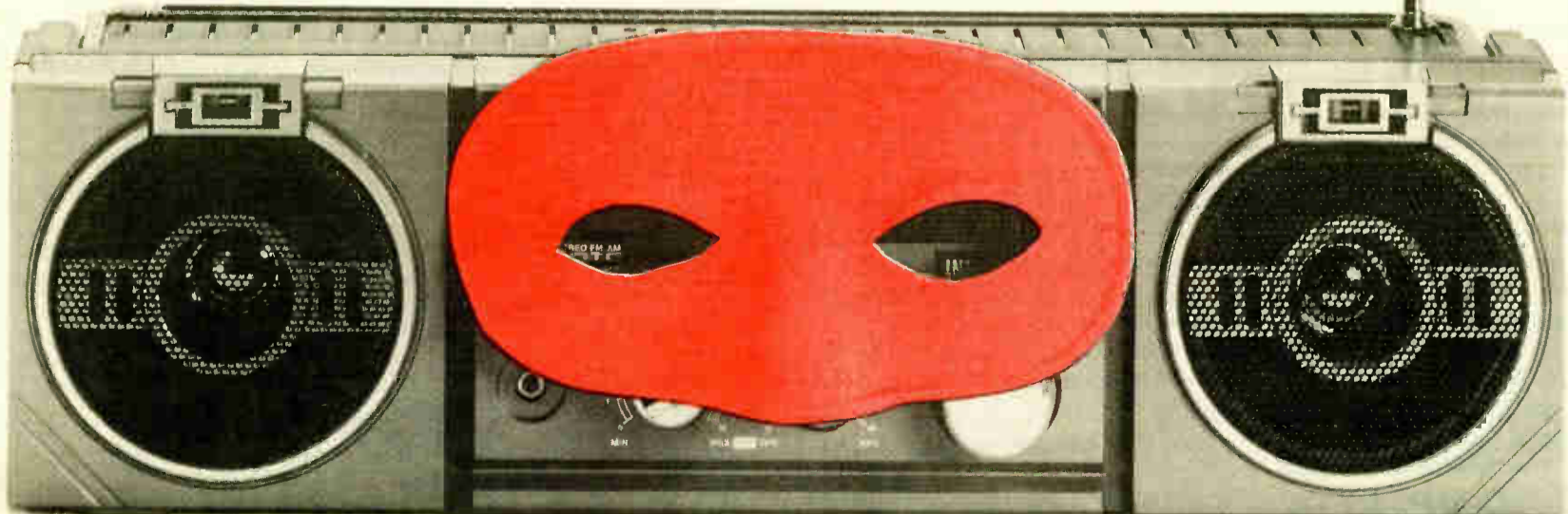
"When I first heard about StereoMaxx, I thought it was a little expensive. But now you couldn't buy it back from us. Every song we play now has as much separation as the best produced stereo record or CD. Turning off StereoMaxx is like going back to mono."

StereoMaxx sounds intriguing, right? Our FREE DEMO CASSETTE is an ear-opener. To get yours *pronto*, just call the StereoMaxx hotline at (800) 826-2603 toll-free. Our first production run sold out in weeks. So act fast, and there's a good chance you can beat the other guys to "radio's new secret weapon".



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Telco Service Basics

(continued from page 23)
 suppressor, you know how annoying it can be.

Echo suppression

Long distance calls begin and end as standard "two-wire" circuits, but are transmitted over the long haul "four-wire," that is, with the send and receive paths separated.

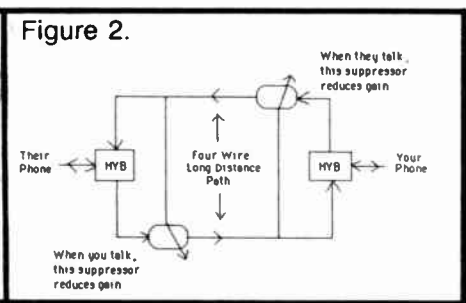
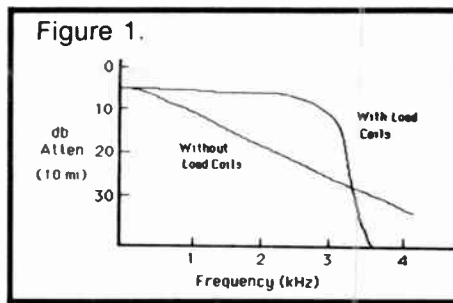
This approach allows the use of one-way transmission schemes like microwave hops and satellite links and per-

mits amplifiers to be easily inserted in the talk paths (see Figure 2).

A problem results when the hybrids have leakage: your voice travels to the far end and returns to you after the delay from the two paths.

This is an especially annoying problem when long satellite delays are involved. Echo suppressors work much like speakerphones. (In fact, the Western Electric speakerphones were a spin-off from echo suppressor designs.)

The naturally full-duplex phone system is turned into a mostly simplex one-way at a time system. When you talk, the suppressor's attenuator on your receive circuit kicks in, preventing the far end leakage from reaching your earpiece.



A "hang-time" in the attenuator control circuit ensures that the gain reduction continues to be activated for the duration of the echo tail.

Of course, the distant caller's audio is also removed. This can be very disconcerting during an animated discussion when both parties are attempting to talk simultaneously.

Since audio moves through fiber optics at the speed of light, the upgrading

of the long distance networks to the new technology should eventually alleviate this problem.

Next time, we'll explore the murky world of "terminal equipment"—phones and the back-room boxes they plug into.

Steve Church is president of Telos Systems, a manufacturer of broadcast telephone interface systems. He can be reached at 216-361-0463.

Writing Good Copy

(continued from page 22)
 sive or hard consonant sounds created by the letters; B, C, D, K, P, Q, T and even Z. Help others you may write copy for by underlining the power words, and note that they should be "hit" a little harder.

There is a difference between the written and spoken language. While incorrect grammar sends a poor message to the listener, don't be a willing slave to the written language. Think more in terms of phrases and statements than editorials.

Dialogue and comedy copy deserve special attention. A common mistake is to disguise a pitch by writing it in dialogue. In too many cases these spots sound extremely unbelievable. Listeners either tune them out or make fun of them.

Comedy should be approached with care. What's funny to you may not be funny to the listener. Even if your spot really is funny, don't expect it to stay fresh as long as a well written straight pitch. Jokes told too often get old quickly.

Think audience

Before you start your next piece consider to whom it's targeted, how often and how long it will air, and what its goal is.

After you've answered these questions select a treatment (comedy character, dialogue, straight pitch, etc). At this point, your selection of music, if any, will be narrowed down by your previous decisions.

Find your music and you have completed the circle and can begin fitting your copy points into the music.

Because the music is now an integral part of the spot, it can be higher in the mix. You can use the music posts to accent various copy points by raising the music level at the end of your copy lines when they end at obvious music post points.

Whether you're running eight or 18 spots an hour, cleaning up your station's copy and production is one of the easiest, most gratifying ways of improving your air sound.

Spot clusters are like mine fields. Each element of a cluster has the potential to blow off listeners. By giving careful consideration to your clusters, you can decrease tune-out and increase AQH. Try it and see!

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

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Power controller

Delta's APC-1 Automatic Power Controller measures a sample of the transmitter output power and, by interconnection to the transmitter's Raise/Lower power controls, causes adjustments to be made to keep operation well within the FCC limits.

Originally designed to provide a means for stations to operate under ATS rules, most recently the APC-1 has been used to provide automatic power control to older FM transmitters.

Use of the APC-1 eliminates the worry of under- or over-power operation due to tube aging or power line fluctuations, says the company.

The APC-1 lists for \$1750.

For more information, contact **John Bisset** at 703-354-3350, or circle **Reader Service 86**.



Console

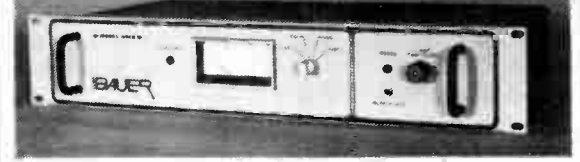
Broadcast Electronic's new Mix Trak 90 modular console was designed purely as an on-air radio console.

Users can choose either a twelve or eighteen channel mainframe and equip it with a wide variety of modules and options.

With the optional Source Sequencer, console operators can "program" a series of events that can be activated at the touch of a switch.

Available modules include both microphone and line input modules, each with Penny & Giles linear faders, VCA gain control, Hall Effect switches and balanced patch points.

For more information, contact **Tim Bealor** at 217-224-9600, or circle **Reader Service 82**.



FM exciter

Elcom Bauer's Model 690B FM exciter accepts a composite signal source and two SCA channels.

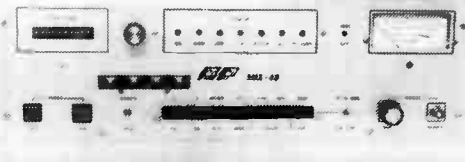
It is compatible with, and will enhance any audio processing system.

Frequency modulation is direct and incorporates phase-locked loop technology. Power supplies are controlled by integrated circuit regulators for stability.

The 690B's output frequency range is 87.5 MHz to 108 MHz, programmable in 100 kHz steps (or 50 kHz steps with an optional second crystal).

RF power output is broadband front panel adjustable from 3 W to 20 W.

For more information, contact **Paul Gregg** at 916-381-3750, or circle **Reader Service 80**.



FM exciter

POWER PAK Systems' SMX-40 is a fully synthesized FM exciter. With over 30 W of RF drive power, it may operate as a stand-alone transmitter. All modules are plug-in. The PLL module cover is silk-screened with a BCD program code to allow easy frequency change.

The SMX-300 and SMX-500 RF amplifiers are of broadband design using 50 V Motorola solid state power devices. An optional IPA allows either to be driven to full output with 6 W of input drive.

The amplifiers are fully protected against all overloads; they are powered with ferro-resonant power supplies.

For more information, call **Bob Richards** at 817-645-4274, or circle **Reader Service 84**.



Matrix switcher

JNS' 9000 series matrix switcher is an addition to the 8000 series modular rack frame system.

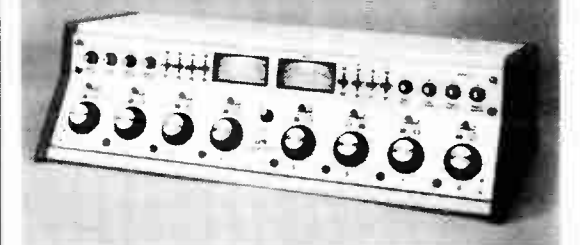
The basic building block is the 8000 series rack frame and the 8024 power supply. To this rack frame can be installed up to 16 crosspoint cards which can accept 15 stereo inputs.

One rack system is capable of switching 15 input sources to eight stereo outputs; eight crosspoints for left and right.

Each rack system also holds the decoders for left and right and can decode separate switching sources.

The control line requires only two wires. The two wire control will operate between the rack frame and the encoder card up to 300 M.

For more information, call your local **Allied Broadcast Equipment** representative, or circle **Reader Service 81**.



Console

LPB's new Signature III audio consoles include six, eight, 10 and 12 mixer dual mono and stereo consoles.

Signature III consoles offer a more modern look in the familiar "form factor" of prior Signatures. Knobs and VU meters are all new.

The consoles offer three inputs per mixer, rotary Shallco step or optional Penny & Giles faders, plug-in modules, LED peak indicators, switchable mic gain, all transformer inputs and outputs and RFI immunity.

For more information, contact **Charles Sheridan** at 215-644-1123, or circle **Reader Service 85**.

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BUYERS GUIDE

FM Transmitters, Exciters & SCAs

KFKF Elects Harris FM-35K

by Dick Wholey, VP, DE
Sconnix Broadcasting Company

Kansas City MO . . . As a company that purchases potentially successful radio stations and often completely revamps them from a technical and sometimes a programming standpoint, Sconnix

User Report

Broadcasting must work with multiple equipment vendors. Equipment quality is of paramount importance.

Last spring, to comply with the FCC's recent Class C specifications for antenna height and to increase broadcast range of our KFKF-FM station in Kansas City, Missouri, we purchased a Harris FM-35K transmitter.

This transmitter was to be installed with diplexing equipment and a new antenna at a tower with a height above the required 984' Class C regulation. We were diplexing with Kansas City's KPRS-FM.

The FM-35K features a single tetrode tube and provides 80% PA efficiency over the broad range of 14 kW through 35 kW.

Exceptionally low THD, IMD and high separation specifications of the Harris MX-15 FM exciter are maintained throughout the broadband IPA and PA stages of the FM-35K.

The transmitter also features built-in emergency condition and simplified problem-diagnosis capabilities.

We chose the Harris transmitter for several reasons.

First, we have always had a good working relationship with Harris as far as equipment reliability and technical support.

Second, we were impressed by this transmitter's technology. Because we were using a single transmitter—we didn't have an auxiliary transmitter at the new site—we wanted a transmitter that was highly reliable, and one with many of the latest diagnostic features for easier operation in emergency situations.

The Harris machine scored highest of

all of the transmitters we looked at in these areas.

In addition, we were aware of the Harris FM-35K's high audio quality. We have found over the years that using the MX-15 exciter provides us with the best audio quality, and that exciter is part of the FM-35K.

That fact, combined with the wide bandwidth design of the transmitter, results in what we believe to be the best audio quality available on the market.

Another reason we chose the Harris FM-35K is that its high operating efficiency (80% PA) translates into

power savings.

With the combined efforts of Jim Jett, KFKF CE, and Mike Bostic, Sconnix assistant DE, installation of the transmitter was very smooth.

The FM-35K went in on schedule 1 April 1987 without any major problems.

However, we did run into compatibility problems with the transmitters and diplexer after installation of the diplexing equipment, manufactured by Electronics Research, Inc.

KPRS also purchased a Harris FM-35K, and problems resulted from trying
(continued on page 34)

Solid State FM Faces Obstacles

by Marlene Petska Lane

Falls Church VA . . . By now most of us are familiar with the advantages solid state technology can bring to transmitters. To name just two, there are no tubes to replace (RF transistors have a life of about 10 years, I'm told) and the redundancy guarantees that you'll still be on the air if one or more amplifiers fail.

AM transmitters have reaped the benefits of solid state technology, but FM transmitters, except at low powers, have not been able to keep pace. Manufacturers say progress is slow for a number of reasons.

A key factor holding back FM solid state progress is the very nature of the available transistors.

The solid state devices used in AM

have been adapted from the power switching industry. They function in the power amplifier as switches, and can switch rapidly and efficiently at frequencies up to 1 MHz.

Industry Roundup

But in the FM band (100 MHz) no Class D solid state amplifiers capable of rapid switching have been developed.

What this means is that FM solid state transmitters, especially at high powers, will suffer from decreased amplifier efficiency. They cannot compete with the efficiency of tubes.

"The PA efficiency of an FM solid state transmitter would be at best 60% to 70%, more typically 50% to 60%, as compared to 80% to 90% efficiency in the case of FM tube type or AM solid state transmitter PAs," says Geoff Mendenhall, VP of engineering for Broadcast Electronics.

The high cost of the devices is another hindrance in the development of FM solid state transmitters.

"As a designer you look at the cost of producing a series of different powered transmitters," says Bob Weirather, director of advanced development for Harris. "But no cost savings are to be had from increasing the power levels of solid state FM PAs."

In the case of a tube type PA increased from 3.5 kW to 35 kW, there is a cost element of factor three to five in the PA, says Weirather. But in the case of transistors, the number of modules needed to make the increase scales exactly by a factor of ten—and actually even more because of combiner losses.

"The bottom line is that the cost of transistors alone, even to go to a couple of kilowatts, is going to exceed the cost of the tube," says Bill Hoelzel, senior VP of marketing for QEI.

Adding to the cost of the transistors is the cost of the circuitry to combine the stages together, as well the manufacturing expenses incurred in developing such necessities as mechanical heat sinks.

Despite these bleak facts, manufactur-

ers have built a few 1 kW solid state FM transmitters, although only Elcom Bauer plans to build higher powered models.

Elcom Bauer's 1 kW was shown at NAB two years ago.

"It was looked at with interest but nobody got real excited," says Paul Gregg, president of Elcom Bauer.

Gregg believes the disinterest stemmed from a limited 1 kW market and a general reluctance on the part of broadcasters to accept the technology, rather than its cost.

"I wouldn't say it was price that held it back. A lot was done in anticipation of Docket 80-90 and there was a lot of preliminary development," says Gregg, "but the market never really materialized."

QEI is in disagreement with Elcom Bauer, however. The company's 1 kW was built as part of a technological exercise that turned into a saleable product.

"The 1 kW was a nice mix of 500 W modules and additional technology with some combiners we wanted to work on anyway," says Hoelzel. The company sold
(continued on page 38)

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BUYERS GUIDE

QEI Sells Assurance

by Tim McCartney, CE
KBSU-FM

Boise ID . . . The New Jersey-based QEI Corporation offers low powered, solid state portable FM transmitters which can become part of a station's insurance strategy.

The 19" rack mountable unit occupies 10.5" of rack space and weighs 70 lbs. One person can lift the unit in and out

of even a small vehicle.

The transmitter runs on 115 or 230 VAC single phase, depending on the power

User Report

transformer connection configuration.

Foldback circuitry is activated if VSWR exceeds about 7%. Such action is indi-

cated by a front-panel LED, although its function is not labeled on the panel.

QEI now equips these low powered units with remote control as a standard procedure. Functions include on/off and raise/lower power.

As for metering, easily adjustable DC voltage samples are provided for the collector voltage and collector current of the PA stage. No fail-safe is provided; QEI explains that it is not required at the 300 W power level.

The construction of the 300 W unit is sturdy and operation is quiet.

Harmonic filter and directional coupler

circuits are located internally. Two externally mounted cooling fans move air across the power transistors' heat sink. RF connectors are N-type in and out.

The unit's specifications rate the unit's input RF power at 10 W or less, output RF up to 300 W, and harmonic spurious suppression at -70 dB.

Our unit is 69% efficient at 300 W, and tested AM noise at -63 dB. QEI recommends not driving the output greater than 300 W or 9.25 A of collector current, whichever comes first.

The technical manual supplied with our unit is at variance from the gear because QEI recently made changes in the equipment. QEI has not yet updated the manual but I am promised one when it is ready. Fortunately, a large and clear schematic is supplied.

We were looking for a low powered, low priced portable transmitter to mate easily with a variety of different exciters operating at several different carrier frequencies.

While another manufacturer offers transmitters with similar RF output levels, the equivalent model is not FCC type-accepted unless the company's exciter is mated with it (the units share a common power supply). This was far too much of a limitation for what we had in mind.

QEI, however, posed no such restrictions and earned our interest.

The design of the unit also offers an easy way to retune the input tuning capacitor for a null in VSWR when driving it with a different carrier frequency.

Easy access and a couple of turns dropped a 2.2:1 VSWR to 1:1 when changing carrier frequencies by 1 MHz. Greater changes require additional tuning of the QEI driver and PA stages.

For example, our unit as ordered was tuned to 91.3 MHz. We ran two different exciters tuned to that frequency into the QEI: Broadcast Electronics' FX-30 and an old McMartin B-910.

Both worked fine with virtually no VSWR. In fact, the BE/QEI combination was tested on the air for 10 hours one night and sounded terrific. The one-third reduction in power brought no reception complaints from the night's fairly large audience.

Back on the engineering bench, a new TTC/Wilkinson Model X exciter tuned to 90.3 MHz was fed into the QEI and a dummy load. The net result was VSWR in excess of 2.2:1 which was easily resolved as mentioned.

For KBSU, the following combination offers a needed amount of insurance for our growing network:

- Spare exciters (frequency agile)
- QEI portable 300 W transmitter
- 1200 W gas-powered electrical generator capable of indefinitely powering the exciter, transmitter and related equipment

Every imaginable kind of N adapter KBSU's expansion includes development of a three-station network. This demands flexible backup support in order to reliably serve the three communities involved.

QEI helps in this insurance strategy by meeting a need not filled by other equipment manufacturers.

Editor's note: Tim McCartney is a regular RW columnist.

For more information, contact Bill Hoelzel at QEI: 609-728-2020. The author may be reached at 208-385-3760.

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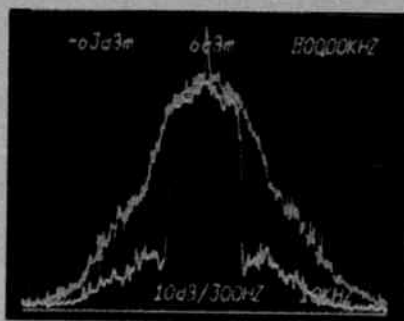
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BUYERS GUIDE

WRTI Puts BE FM-10A to Work

by Mark Humphrey, Asst GM & CE
WRTI-FM

Philadelphia PA ... When it was time for Temple University's public radio station, Jazz 90/WRTI to select a new 10 kW FM transmitter we considered almost every model on the market.

Of course we were most interested in high reliability, low operating cost and excellent audio performance, but the transmitter also had to be capable of fitting through a tight hallway and 35" doorway without knocking down walls.

We selected the Broadcast Electronics FM-10A, which we installed in January 1987. Now, after more than nine months of reliable operation, we are convinced that we made the right decision.

The FM-10A shares many of its subassemblies with other models in the BE transmitter product line. Our FX-30 has operated flawlessly since we first turned it on, and I can find no fault with its audio performance. It is mounted on chassis slides in a removable drawer, and is very accessible for maintenance.

BE has eliminated any microphonic problems by effective shock-mounting of the FM oscillator, so we didn't need to remove the exciter from the transmitter and mount it in an external rack.

The specified FM SNR is 75 dB, and we measured nearly 80 dB with the transmitter in operation.

The intermediate power amplifier also is mounted in a removable pull-out drawer. It contains its own power supply and, thanks to its 50 ohm output, can be operated directly into the antenna in case of emergency.

The 250 W RF amplifier and control/regulator assemblies are each mounted on heat-sinked modules which are easily removed for servicing. The RF amp employs two VHF power transistors in a push-pull broadband circuit.

The manufacturer of these transistors specifies that each is capable of over 160 W of output. In the FM-10A, the PA stage has a power gain of about 20 dB, so the IPA only needs to produce about 1% of the transmitter power output.

User Report

WRTI is licensed for a TPO of 7300 W. At this level, the IPA loaf along at just 78 W output, so there is plenty of headroom designed into this stage.

The power amplifier uses a cylindrical folded half-wave cavity, a unique feature in the BE product line. The PA tube is a 4CX7500A tetrode, which was recently developed by EIMAC for VHF service.

Cavity design

The reliability and performance of the cavity design has been quite impressive.

The plate blocking capacitor has been eliminated, and high voltage components are well spaced from grounded portions of the cavity. We have not experienced any arcing, flashovers or other dust-related problems.

The PA chimney is clamped directly to the anode of the tube and thus performs a bonus function as an extra heat sink.

Second harmonic suppression is achieved by positioning a series resonant circuit inside the cavity, rather than mounting a quarter-wave stub on the output filter.

This scheme is very effective; we measured our second harmonic at -108 dB following the low-pass filter.

Despite its high gain, the PA does not exhibit any instability or parasitic resonances.

Neutralization can be adjusted without opening the cavity door. One simply turns a calibrated dial on the back of

the PA assembly.

The only fault I can find with the construction of the PA is that it is necessary to remove several screws and two knobs in order to remove a panel to access the bottom of the tube socket. This is only a minor inconvenience.

In keeping with today's trends, the FM-10A is designed for wide PA bandwidth. This reduces distortion and improves crosstalk into the subcarriers, but I was concerned that we might have an intermodulation problem because our antenna is mounted just below the antenna of another FM station.

In installations such as this, wideband transmitters are more likely to generate third-order IM products which can exceed the FCC limit of -80 dB.

Just after we put our FM-10A on the air we checked the level of the predominant IM product. In our case it was predicted to fall at 84.5 MHz, because the other station's frequency is 5.6 MHz above our frequency, which is 90.1 MHz.

No IM problems

Using a precision transmission line sampler, a Potomac Instrument FIM-71 field strength meter and a General Radio tunable notch filter to prevent overloading the meter with the fundamental frequency, we searched for the IM

product and found it 105 dB down, well in compliance with the rules.

Output power of the FM-10A is regulated by an automatic power control circuit, which is also conveniently mounted in a drawer. It controls a motor driven Variac which varies the PA screen voltage.

The APC is designed to disregard momentary power fluctuations, and keeps the transmitter output within a "window" of about $\pm 2\%$ to avoid excessive wear and tear on the motor and Variac.

The APC's secondary preset power adjustment is useful for stations that need to reduce power when operating into an auxiliary antenna.

A "soft-start" feature included in the circuit allows the output power to be brought up slowly when the high voltage is first switched on.

The main transmitter controller uses familiar 4000-series CMOS logic for control and comparators for overload sensing. All of the control inputs are isolated from the CMOS circuits by optocouplers to avoid damage due to transient voltages.

All of the lines going in and out of the controller chassis are well RF-filtered. Let me assure any fellow skeptics that this scheme has proven to be absolutely reliable so far.

The front door of the controller enclosure can be opened while the trans-

(continued on page 38)



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BUYERS GUIDE

KCMW Stands By Larcan Xmtr

by Dan Davis, DE
KCMW-FM/KMOS-TV

Warrensburg MO ... Purchase of RF related equipment requires very careful consideration and planning if for no other reason than the fact that the decision will have to be endured for a long time.

KCMW installed a new Larcan FM T25L broadcast transmitter in the spring of 1986. The transmitter has given KCMW a greatly improved reliability over the last year and a half.

We knew our old transmitter inside and out and could just about predict problems by the calendar. Repairs could be made quickly but the failures came too often.

The new transmitter's reliability presents a different worry. If it does fail we will not have this in-depth knowledge of what makes it tick.

In addition to having a standby transmitter, we have been able to solve our problems with the help of the Larcan staff.

A plant visit

I visited the plant in Toronto and left on a first name basis with everyone, including the company president. When there are questions to be answered over the phone there are faces to go with the names.

The company's knowledge of its product and willingness to help at all hours

is very reassuring. Many of the employees are stock holders, which gives me the impression that they will be around for awhile.

The Larcan people have been building transmitters for a long time. The company's lineage includes the present LaBlanc and Dick Communications, Larcan and Canadian General Electric companies.

User Report

Much of the original Canadian GE talent is still at work designing and constructing the present day Larcan transmitter. This employee line spans some 34 years of experience in the broadcast business.

The performance of the transmitter meets or exceeds all its published specifications. We do not run an audio proof once a week but do run one often enough to satisfy ourselves of quality operation.

Just as important is the constant critical listening to the final air product, which has proven to be of consistently good quality. We play many compact discs and employ little audio processing.

The automatic power output holds within a percent or two after just a few minutes of warm up.

As with any new piece of equipment we had some minor early growing pains.

A high voltage interlock switch and filament buck/boost switch proved defective.

The final tube originally supplied showed some intermittent problems. Larcan quickly and cheerfully corrected these problems. We have had a year of near zero downtime other than storm-related electrical power outages.

The transmitter is fairly easy to work on. Some spine twisting is needed to reach a few things but it is a good compromise of cabinet layout versus cabinet size and needed floor space.

We run the transmitter at about 15 kW and have had no cooling problems. The present final has about 7000 hours on it with no sign of problems.

Service manuals and diagrams are very complete. All parts lists show the original manufacturers' own parts numbers and descriptions.

Larcan maintains a parts supply depot near St. Louis, Missouri. All communications are made to the Toronto plant for shipments to be made from St. Louis.

Uncomplicated control system

The transmitter shipped to us has a logic driven sequencer to control operation. Everything is started in the proper order and with correct time delays built in.

Overload conditions are shown by LED indicators which stay illuminated until cancelled manually. Thus intermittent overloads can be traced hours and days later.

Larcan now has a microprocessor-controlled sequencer with more features than the logic driven unit. It has the ability to log in memory any overloads and failures for weeks or months via 24 hour battery-driven clocks. The liquid crystal read-out panel will indicate the year, date and time the event occurred.

We have this new microprocessor control on our television transmitter which has been in operation flawlessly for nine months.

The worry that a relatively simple broadcast transmitter can be crippled by failures of a complicated control system is alleviated by Larcan.

Both the logic driven and microprocessor control system can be completely bypassed by a panel of manual switch controls.

Starting with blower and filament, on up to plate, screen and drive, each step of the operation sequence can be manually controlled.

The automatic control system can then be removed and serviced as needed. I must state that we have never had any problems with either type of control system.

I believe anyone shopping for a new transmitter should give the Larcan products careful consideration. We are, so far, happily living with our decision.

Editor's note: Dan Davis's 25 years of experience in broadcast include building a television station from the ground up. He's been CE at KCMW-FM/KMOS-TV for eight years.

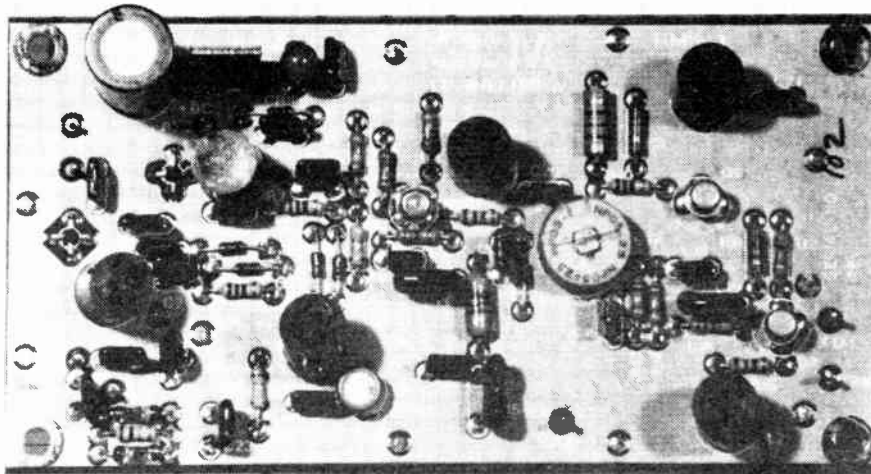
For more information, contact Charles Coyle at Larcan: 301-498-2200.

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stable digital tuner will be most convenient for monitoring use.

The BMK-1 assembly is extremely well-designed and provides stable, low-noise operation. The design assures operation over a wide range of input levels and no-compromise construction assures long life with trouble-free operation.

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BUYERS GUIDE

Continental 817A Makes Debut

by Johnny Bridges, CE
WYAY-FM

Atlanta GA . . . Y106 began looking for another transmitter when we agreed to lease space on a tower taller than our existing facility in 1985.

At the NAB in 1985, Continental announced their 817A transmitter, a one-tube design capable of up to 60 kW output. We felt that this would be an economical choice for a main transmitter since our 40 kW unit could serve as a backup.

User Report

Consequently, we purchased both the 60 kW transmitter and a high-speed, gas-powered antenna switch for the installation.

The new transmitter was shipped in early 1986, placed in the building and checked and tightened.

Once the physical installation was complete, we called Continental field service for the initial turn on, proof and setup.

Because it was the first unit installed, Continental supplied not only Ken Branton of their field service division, but also Ken Sides, the design engineer responsible for the transmitter.

The transmitter turned on without problems, and tuned into the antenna easily. The initial proof was good, and in a couple of days we began operating.

We noticed, and the Continental folks removed, some RF causing glitches in the 15 V power supply. This was because of RF pickup in the wiring harness.

13,000 hours

Because the design had never been subjected to an RF field (factory development is done into a resistive load) we felt that the designed-in suppression was quite good.

We currently have something over 13,000 hours on the unit and have had very few problems considering it's the first one in the field.

Our Continental representative as-

sured us that the factory would watch and support the unit closely. This has in fact been the case.

When a question arose over grid tuning, the factory test technician appeared promptly at our facility with wattmeter in hand to demonstrate the proper procedure.

Since the driver consists of two units combined, each of which has several output devices within it, tuning the driver into the grid is somewhat different from the classic approach of "maximize everything."

As a result of his trip several plastic components in the grid tuning section and around the final amplifier have been replaced with teflon, which has somewhat better RF characteristics in the FM band.

Company modifications

Continental has made several modifications to the unit based on operating experience in the field. Two blowers have been removed and replaced by improved baffling, and four power supplies have been reduced to two, all in the interests of greater reliability.

In addition, we've been told to expect replacements for several of the control cards because we've made modifications to the circuit side of ours as they became available.

How does the transmitter work? In a word, well. However, you must be sure to follow the book procedure used for tuning the final grid. Other than this it's a straightforward unit.

Everything on it is metered, either on analog meters or in the seven pages of text available both on the front-panel display, or remotely via modem, phone line and terminal.

The user is given the option of contact closure for remote control or use of an RS-232 bus for control and metering.

The control logic is battery-backed, so that the unit will wake up after a power failure (directly on-air if the outage is less than 30 seconds).

All the remote closures are opto-isolated, as are many of the internal overload circuits. Thus we don't anticipate

lightning problems with the unit.

The driver circuits use several low power semiconductors combined internally rather than one or two high-power ones. Thus the RF voltages involved are low on any one device. This should increase the driver reliability.

We can't say for sure about this, however. We've only had the driver stop once, due to overtemp from a failed blower.

The factory's response was to redesign some baffling inside the driver box to improve airflow and eliminate the blower

and its mate on the other driver. We don't expect to see the problem again.

Our tube has the highest number of hours of any on it (over 13,000) and shows no signs of stopping. EIMAC says the tube is not life-limited in this service as long as filament voltage is handled intelligently.

We see some variation in grid current between tubes (there are two more 817A units located at the same site) but it doesn't seem to affect their operation.

Each is stable over time. We haven't had any reason to think the tube will do anything but continue to operate for whatever its emission life may be.

The transmitter has two CPUs used for
(continued on page 38)

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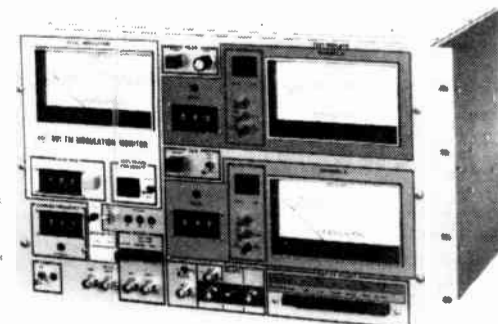
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BUYERS GUIDE

BEXT Design Key to Performance

by Dave Petric, CE
KACE-FM

Los Angeles CA ... Within the past year, I've had the opportunity to operate, in one way or another, various pieces of RF equipment from the BEXT line of exciters and solid state amplifiers.

Although these units are made with American and Japanese components, they are assembled in a country better known for designer fashion and fast cars than its broadcast equipment: Italy.

I must admit that it was the appealing design that first caught my attention. And the idea of having all the adjustment controls on the front panel, including the frequency of operation, was intriguing.

Because I supervise several stations and at times there is the need to exchange equipment, and because the BEXT line is conveniently front panel programmable, I arranged for a direct on-the-air comparison.

At the time, KACE had a good exciter on the main transmitter. In fact, every time I had to work on the main, putting on the back-up, the station staff would scream because the sound was so bad. It forced me to do maintenance at 3 AM.

Going back to the day of the demon-

stration, we installed one BEXT exciter on the back-up transmitter, and switched to compare the sound with the main.

On my stereo modulation monitor everything seemed to be okay, but you know that there is always someone at the station that doesn't like something even if everything is all right.

User Report

So I called the studio. "What do you think about the sound of this other exciter?" I asked. "What exciter? Isn't the main on now?" was the answer. The BEXT exciter was, indeed, transparent.

Later on, the group ownership needed a replacement exciter for its Milwaukee station, WLUM. Of course we decided to go for the 30 W BEXT exciter.

As soon as CE Tom La Machek put it on the air he noted an impressive improvement in the high end and the sound in general. The exciter has been on the air now since last winter. If it weren't for how good it sounds, Tom would have just forgotten about it.

Now I'm working on a project at a new transmitting site in Barstow, California.

This time, the BEXT guys had a used 500 W solid state amplifier available.

We chose to go for that to save some money, together with a new BEXT exciter. The exciter was, at this point, nothing new for me, but it was the first time I saw one of their amplifiers.

Because it was an older, used model we decided to upgrade it at the BEXT facilities in San Diego.

I was present with the BEXT people when the updating was done, so I saw the construction and design. Like the exciters, it is solid and well-designed.

As I was driving back from BEXT with essentially an entire 500 W FM station in just 14 compact inches, I tried to consider objectively their production.

I came up with a list of pros and cons. Reliability, serviceability, performance and solid construction, as well as conser-

vatively oversized heat sinks and cooling system are definitely on the pro side.

I also like not having any variable capacitor, nothing to tune on the RF chain and all adjustments on the front panel.

On the con side, the manual is definitely skimpy compared to others, but it still contains the schematics and basic necessary information.

Also the unit is so compact and intelligently built that once learned it is easier to work with, but the more modern, innovative design must first be learned.

As I made my way back to the station, I kept glancing at all the equipment sitting in the back seat of my car that the station had just purchased from BEXT.

I was sure of at least one thing: We'd definitely gotten a lot for our money.

Editor's note: Dave Petric is the CE for All-Pro Broadcasting.

For more information on BEXT products, contact Ann DeFazio at 619-239-8462. The author may be reached at 213-564-7951.

KFKF Selects Harris Xmtr

(continued from page 29)

to combine the two transmitters with the diplexer.

This, while not a fault of either manufacturer's equipment alone, unfortunately can be a typical problem for us—trying to integrate equipment from multiple vendors into a system that will allow efficient station operation.

This situation has a happy ending, though, thanks to tremendous vendor support. Both ERI and Harris stood behind their products, came to our aid, and worked together to solve the problem.

Since that time, operation has gone smoothly. The new transmitter has done everything it is supposed to do. It has even surpassed our expectations in some areas.

For example, we expected the broadcast range and audio quality to improve substantially from our old transmitter and antenna, but we didn't expect, listeners to comment on the improvement.

A major benefit, of course, was the expanded broadcast coverage area. Our signal-reach area has increased from a radius of about 32 miles to more than 44 miles since installing the FM-35K and a new antenna.

In addition, some of the FM-35K's features, including the front panel alphanumeric multimeter, allow a great deal of data to be stored in the transmitter. This

data provides engineers with a good record of the machine's behavior and operating constants.

Those features were not available on the old transmitters. They didn't give you the kind of detailed analysis that the FM-35K does.

Another benefit of the Harris FM-35K is that its diagnostic capabilities allow it to care for itself. It automatically adjusts power if necessary and diagnoses itself if a problem should occur.

This saves operator time and translates into cost savings, because our engineers don't have to make service calls merely to diagnose problems.

A welcome benefit, too, is the fact that the Harris sales and technical staffs are willing and able to help us integrate equipment from other vendors.

All in all, the Harris FM-35K has performed admirably so far—well up to our stringent standards for equipment in our revamped stations.

In fact, we're so pleased with the transmitter at KFKF in Kansas City that we have purchased another FM-35K for our WPDS-FM station in Tampa.

Editor's note: Dick Wholey has worked in broadcast engineering for 20 years.

For more information on the Harris FM-35K transmitter, contact Martha Rapp at 217-222-8200. The author may be reached at 305-925-1027.



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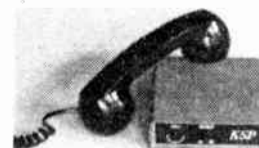
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BUYERS GUIDE

Pragmatist Updates CCA "D"

by Thomas R. McGinley, DE
First Media Corp.

Washington DC ... Pragmatic engineers all realize that any high power FM broadcast transmitter is basically just a couple of stages of tuned amplifiers and supporting power supplies. All the critical action happens in the exciter.

CCA has manufactured transmitters for about 25 years and has stuck with the same basic philosophy of building a quality product that is easy to maintain and can fit into any budget.

The design incorporates the very stable and broadband grounded grid PA final amplifier, which has been copied by numerous other companies. Other primary features include straightforward control and protection circuits, full metering and conservatively rated components.

CCA offers a full line of FM transmitters up to 27.5 kW in the new "G" series. All incorporate built-in HV power supplies. An improved exciter features a 20 W broadband output module.

All models 8 kW and higher employ the 5CX1500B IPA pentode which uses redesigned high-efficiency coupling networks capable of delivering up to 2200 W of RF drive to the final. The "8" version of this tube has virtually eliminated the premature failure problems encountered with the 5CX1500A.

The 5CX1500B has different inter-electrode capacities, so it will tune up differently. But it's a worthwhile improvement for any transmitter using this tube type.

With the advent of 20 to 50 W FM exciters, CCA realized that the predriver stage preceding the IPA in the 10 and 20 kW "D" models was really no longer necessary.

The 5CX1500B can be driven directly from a high power exciter via a pi section grid coupling network.

Eliminating the predriver significantly

improves AM noise and SCA performance by getting rid of the highest Q and most unstable stage in the transmitter.

The new CCA transmitters also incorporate improved air-flow and cooling capability.

The improvement adds a second 550 cfm Rotron blower to the PA/IPA cavity and double the area of filtered intake air.

User Report

First Media operates six CCA "D" model FM transmitters, all between 15 and 20 years old. Ron Baker at CCA wanted dearly to sell me new transmitters.

While I was contemplating replacing these rigs, I realized that many of the improvements available in the "E" and "G" models could be easily retrofitted into the "D" model units with a modest investment. Even profitable major market stations are running lean and mean nowadays.

While the transmitters have been reliable, I was not particularly happy with the tube life, power output headroom or the AM noise/bandwidth performance.

The tube life problem was attacked using two solutions. First the air-exhaust ductwork was shortened and enlarged and the high-altitude blower kits were installed in our 20,000D transmitters.

Increased positive pressure intake air was provided by cutting a much larger opening in the transmitter's back door for a larger filter panel and installing a large blower in the air-intake window of the transmitter building.

Second, the old 3CX10,000A7 PA final was replaced with a 3CX15,000A7, as was done in the "E" and "G" models. These tubes are exactly the same size.

The only difference is a larger filament in the 3CX15,000A7 which provides al-

most double the peak emission. This allows a cooler running filament at the same power output, which in turn provides increased tube life.

The only changes necessary to accommodate this tube switch are replacement of the filament transformer, filament chokes and rheostat.

Since a rebuilt 3CX15,000A7 only costs \$65 more, the cost of replacement parts (available directly from CCA) should be amortized after the first life cycle with the larger tube.

The switch is made easier by the fact that any 3CX10,000 series dud can be rebuilt into a 3CX15,000A7.

We made this change at WPGC in Washington on a pair of FM 20,000D transmitters running combined for 40 kW and the PAs are still running strong after 10 months of non-stop operation.

Changing the PA final tube type would have technically voided transmitter type-acceptance under the old rules. Since those rules have been modified with deregulation, the transmitter's output must only be checked for spectral purity with a spectrum analyzer.

Achieving good full power output headroom with any of these rigs is primarily dependent on driving the grid of the 5CX1500B IPA well into Class C saturation for optimum efficiency.

Other engineers I have talked with have had trouble maintaining a full 20 kW with the FM 20,000D. Most of the problem can be cured by carefully positioning and adjusting the very touchy link-coupled IPA grid network for optimum match, or by driving the stage directly from a high power exciter through a new pi section network.

If you're in the market for a new FM transmitter at a very affordable price, the new CCA "G" line deserves a good look. If your budget only allows a used transmitter purchase or if you need to get an-

other five years or more out of an old "D" model, the foregoing discussion may provide food for thought.

There's a lot of common sense value in those rigs, especially since most replacement parts are still used in the current models and are readily available from CCA.

Ron Baker would prefer to sell you a new transmitter but is also very willing to help resourceful engineers obtain improved performance from their older CCA FM transmitters.

Editor's note: Thomas McGinley has been in broadcast since 1964.

For more information contact Ron Baker at CCA Electronics: 404-964-3530.



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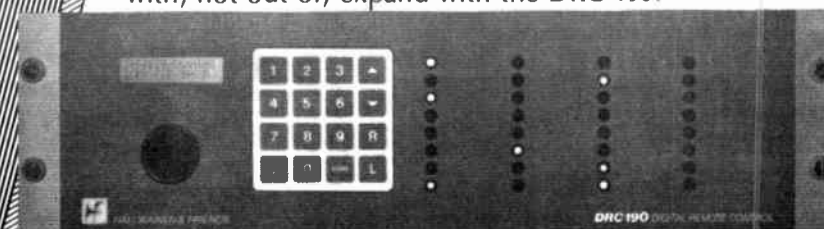
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BUYERS GUIDE

CSI Keeps it Simple

by Kirk Harnack, Owner
Kirk Harnack Engineering

Memphis TN ... FM transmitters don't need microprocessors, fiber optics, high-speed diagnostics and 16-bit error detecting serial ports for external PCs; at least

User Report

that's the premise behind the design and construction of CSI FM transmitters.

In November 1986 I installed a CSI T-25-F1 transmitter in Frenchman's Bayou, Arkansas for KWLN-FM. Despite power outages, unstable line voltage and lightning strikes to the 700' tower, the CSI transmitter performs quite reliably.

The T-25-F1 is a 25 kW FM transmitter consisting of two cabinets and an external low-pass filter. The driver cabinet is CSI's T-3-F1—a 3 kW two tube transmitter.

The PA cabinet uses a single 3CX-15000A7 tube to produce up to 25 kW.

Behind this transmitter's reliability is the most simple, uncluttered design on the market. CSI has made no effort to build a compact transmitter; indeed, every internal component is easy to reach, clean and service because of the voluminous cabinets.

Internally, both cabinets are similar in their construction. They use virtually the same PA cavities and have the same components wherever possible to minimize down time in case a failure does occur.

Another highlight of the transmitter's design is the easy-to-read meters. CSI uses large, accurate meters to show AC line voltage, filament voltage, plate voltage and current and forward power all simultaneously.

These meters are angled for non-glare viewing and are quite effective when

tuning the transmitter for best efficiency. A small multimeter on the T-3-F1 shows the IPA parameters.

Each of the tuning and loading controls on both cabinets are very "broad" in their action. This makes for easy and accurate tuning of the transmitter.

Further, the settings are quite stable. In 11 months of operation none of the tuning controls have needed to be moved from their original settings.

Installation of the transmitter proved to be almost enjoyable. (I'm speaking strictly for myself; the station owner is still miffed because I was reading the manuals while he was pushing and shoving the transmitter into place.)

After the cabinets were set and the

transformers and chokes were installed, hooking up remote control and remote sample voltages was simple.

Since the transmitter was installed in November 1986, we have been off the air three times due to transmitter problems. The first two were factory defects; an air-flow switch vane broke off and a blower time-out relay failed.

The third time, a power surge caused failure of a high-voltage rectifier stack in the PA cabinet. This may have been prevented with AC surge suppressors.

The exciter CSI provided with this transmitter is not of the high-performance type. It exhibits conventional specs for frequency response and THD.

However, since the grounded-grid design of the transmitter is inherently quite broad, the full benefits of a super high-performance exciter are easily realized when used with the CSI transmitter.

One point must be made about dealing with CSI after sale. They appear to be in the business of building and selling transmitters—and not in stocking a huge inventory of replacement parts.

Because of the transmitter's heavy construction and the use of commonly available parts, this should not be a problem.

If you're accustomed to 24 hour service and overnight parts delivery, this may not be the transmitter for you. But if you can do your own troubleshooting and have access to parts suppliers, the CSI 25 kW FM transmitter should prove a reliable unit and a good investment.

Editor's note: Kirk Harnack Engineering is a nationwide broadcast installation and troubleshooting service.

For more information, contact Bernie Gelman at CSI: The author may be reached 901-529-0098 or 901-353-4837.

Energy-Onix Intros the MK-25

by Joseph Bahr, Pres
WVIS-FM

Frederiksted St. Croix VI ... The Energy-Onix MK-25, 25 kW FM broadcast transmitter presently being installed at WXYX reflects the basic features of the new line of FM broadcast transmitters offered by Bernie Wise's newest transmitter manufacturing enterprise.

The MK-25 provides the broadcaster with an extremely reliable transmitter with considerable reserve in power output capability, low operating expense, an understandable modern control system, a form factor which reflects ease of accessibility and utilization of standard parts available from local distributors.

The basic RF chain consists of a 20 W solid state synthesized exciter that operates at only 5 W output. This unit drives a solid state broadband amplifier that can produce 300 W, but only 150 W are required in this application.

The solid state amplifier drives a

3CX3000A7 zero bias triode housed in its own RF box. It is capable of producing 4 kW, but is used for 1700 W.

The final stage, a 3CX15000A7, can produce 35 kW and really loafs when producing 25 kW. Its output efficiency is 80%; its plate dissipation is only 6125 W.

User Report

The transmitter contains two independent blower systems. The driver cabinet blower produces 230 cfm when 25 cfm is required; the PA blower produces 680 cfm when 275 cfm is necessary.

This conservative cooling, together with the utilization of filament regulated transformers and low dissipation, assures the user of three to five years of tube life.

The control system utilizes modern CMOS circuitry that is insensitive to RF or transients. The control panel indicates

the status of all interlocks and operational controls.

The system can be operated automatically or in a manual mode.

In addition to having VSWR protection the control system also contains a "fold back" circuit which prevents a mismatch from producing a reflection in excess of a preset value.

And it contains an automatic "Raise-Low" control system which maintains the transmitter power output constant independent of line voltage variations. This circuit is overridden when the VSWR exceeds a preset level.

The control system may be operated from either a local or remote position and automatically restores itself to operation in the event of a power outage. The delay in reapplying plate voltage is related to the off time.

The MK-25 is the only zero bias triode FM broadcast transmitter available which indicates the grid and plate currents of the vacuum tubes with meters at DC ground potential.

In addition to these meters, the MK-25 incorporates four directional couplers, two plate voltmeters, two filament voltmeters, one line voltage meter and an elapsed time meter.

The final feature which should delight all CEs are the two override panels which can be used in the unlikely event of a malfunction of the control system.

These override panels can only be operated when "unlocked" by a special key. They contain individual override switches for every major control.

Editor's note: For more information, contact Bernard Wise at Energy-Onix: 518-828-1690. The author may be reached at 809-778-6993.

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BUYERS GUIDE

Model X Exciter Gets a Retrofit

by Gordon H. Allison, Radio Sales Mgr
TTC/Wilkinson

Broomfield CO ... Although several hundred TTC/Wilkinson Model 8090X exciters have been sold in the past three years, the product remains largely unknown.

Its performance capability is comparable to CD players: SNR of 90 dB or better, frequency response good at all modulation levels and distortion less than 0.01%.

The exciter was given a separate AC power supply chassis, removing the line transformer from the exciter cabinet itself, preventing stray inductance from affecting audio quality.

Since a cooling fan's magnetic field could also indirectly generate audio hum, the 8090X exciter was designed without a fan.

A switch mode power supply was designed for voltage regulation. It operates from 28 VDC, switching at a 250 kHz rate. This frequency was chosen to be well above the 120 kHz bandwidth of the exciter to prevent output noise.

An input filter module holds the 250 kHz power supply signals inside the exciter while input audio signals are given low pass filtration to remove stray RF.

The exciter's active input audio amplifiers are critical to the audio system's SNR.

VCAs were used to attenuate the audio signals by using DC control voltages adjustable from the front panel.

Because no commercially available VCA has the required 120 kHz bandwidth and 0.005% distortion figure or a -75 dB attenuation range, we developed a novel Gilbert Cell push-pull VCA.

The exciter also utilizes a Class AB FET, rather than a Class C amplifier. It always provides a 50 ohm output match.

TTC/Wilkinson has made an extra effort to include monitoring for modulation, final amplifier input power and RF

forward/reflected output power.

Since the exciter's introduction, ongoing improvements have been made. The original exciter contained a 20 W output

Technology Update

amplifier. Today that has been upgraded to a 30 W version, running close to 40 W.

Improvements have been made on the driver circuitry where two resistors and switch mode supply switch transistors

were upgraded for improved reliability.

Current production units contain bipolar transistors and component changes to improve the 10 MHz reference source.

A factory-sponsored retrofit program will make the 10 MHz reference improvements available on all exciters which have not been previously upgraded.

Since the FCC now allows on-channel FM booster stations with power levels up to 20% of a station's licensed ERP, the Model 8090X has provisions to phase lock its output to a source transmitter.

The company also has a 10 MHz in-

put/output port allowing two 8090s to be locked together or to a stable 10 MHz source as a backup to the exciter's internal reference.

Those customers who use low to moderate amounts of processing reap the biggest benefit from the clean-sounding Model 8090X exciter.

The exciter's noise floor sits below the ability of most test equipment to measure.

The exciter's automated frequency control loops avoid overshooting and the attendant buildup of baseband noise, limiting peak modulation capability.

Editor's note: For more information, contact the author at 303-465-4141.

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Circle Reader Service 5 on Page 28

Circle Reader Service 35 on Page 28

BE FM-10A Installed

(continued from page 31)

mitter is operating without any strange behavior caused by RF pickup.

The transmitter is constructed in two cabinets, one for the high voltage supply and the other for the remaining stages. In our installation, it made sense to bolt these together, but they can be separated by more than 30' if necessary.

All air going into the cabinet passes through a standard 16"x20" disposable fiberglass filter which can be replaced with the transmitter operating.

The PA blower is driven by a hefty 2 HP motor.

It is still too early for me to comment on tube life, but we have logged over 6000 hours on our first tube and it shows no sign of emission loss.

Several hours after we installed our FM-10A, a major snowstorm shut down the Philadelphia area for two days. Our transmitter passed this test and has continued to operate reliably ever since.

We have had less than five minutes of down time, which occurred when a circuit breaker tripped due to a power line disturbance. We have had no component failures or other unpleasant surprises.

Our new transmitter sounds noticeably cleaner on the air than the old one it replaced even though we had upgraded the old unit with a modern exciter.

I attribute much of the improved performance to the FM-10A's wideband RF circuitry. Crosstalk into our 92 kHz SCA also improved significantly.

The synchronous AM noise of the new FM-10A measures about -52 dB on peaks with normal program audio and SCA in operation, according to our Belar FMM-2 modulation monitor.

The documentation supplied with the

FM-10A is among the best I've seen for a piece of broadcast equipment.

And, it's nice to see all of the safety features BE has built into the transmitter. In addition to interlocked shorting sticks, there are clear plastic covers on some of the high voltage points which could be accidentally touched.

There are safety interlocks on every door and panel where they are appropriate, but no interlocks on the low-voltage subassemblies where they would be needless and a nuisance.

We believe the FM-10A will be a good investment in the long run. It is obvious that BE has done a good job determining what is really important in an FM transmitter.

Editor's note: Mark Humphrey is SBE certified and entered the engineering profession "by taking apart the family toaster."

For more information, contact Bill Harland at BE: 217-224-9600. The author may be reached at 215-787-8405.

Continental 817A Debuts at WYAY

(continued from page 33)

metering and display/RS-232 drivers, with an arbiter to select the best one. We find that ours likes the #2 position, regardless of which card is actually in the #2 position.

Since it is position sensitive and has reacted this way only on our unit, we think there's something in or around the CPU cage resonant at 106.7 MHz.

When time allows, we will try some bypassing to see if the #1 CPU won't come back on. We're in no hurry; the #2 works fine and the transmitter isn't dependent on the CPU to operate anyway.

BUYERS BRIEFS

QEI's "New Reliables" include the FMQ-3500 and FMQ-5000 3.5 kW and 5 kW FM transmitters. A single tube design incorporating a grounded grid EIMAC 3CX3000A7, the transmitters are highly stable and never require neutralization.

The newly-designed 100% solid state IPA assembly consists of an automatic power control/splitter module, one (for 3.5 kW) or two (for 5 kW) 250 W amplifier modules and a combiner module.

Each amplifier module incorporates its own protective circuitry. Complete access to all IPA modules is provided by lowering a hinged front panel.

Any module may be connected directly to the final power amplifier, providing a quick "work-around" in the event a module fails. Modules may be removed and re-installed during transmitter operation.

The price of each transmitter includes an operating spare parts kit and a 15,000 hour tube warranty.

For more information, contact Bill Hoelzel at QEI: 609-728-2020, or circle Reader Service 66.

Broadcast Technology of Colorado has just brought the Model 1000 SCA generator designed by Bob German to the FM market.

The quality and price of the generator brings this technology within reach of budget conscious small market radio stations and also bigger stations that can use it as a back up to existing equipment.

The SCA carrier frequency is 67 kHz and 92 kHz simultaneous. Audio input level is 0 dBm to 10 dBm and input impedance is 600 ohms. Frequency response is ± 1 dB at 50 Hz to 7500 Hz.

An optional mute module and compressor module is also available.

For more information, contact Bob German at Broadcast Technology of Colorado: 303-641-5503, or circle Reader Service 78.

ing some of the control components from the second cubicle to the third might make cleaning a bit easier.

Editor's note: Johnny Bridges has 20 years of experience in broadcasting and describes himself as 'a country boy who enjoys sunsets.'

For more information, contact Joe Bradley at Continental: 214-381-7161. The author may be reached at 404-455-0106.

FM Waiting for Solid State

(continued from page 29)

a number of them, much to its surprise.

But the price difference between tube and solid state at that power level is not significant. The break point appears to be, at least from QEI's experience, at 2.5 kW for FM solid state.

QEI showed at NAB "two or three years ago" a 2.5 kW FM solid state transmitter which used the same design principles of the 1 kW.

"It was met with a resounding yawn," says Hoelzel. Part of the problem, he says, is that it was more costly than a 3.5 kW tube-type transmitter.

"We knew it would be more costly, but we thought there was a possibility of acceptance. We weren't right," he says.

Clearly the technology is here to make a high powered solid state FM transmit-

ter, but at what price?

Broadcasters are likely to hang onto their tube transmitters until the cost of the devices decreases and the efficiencies increase, perhaps through the development of switching capability and innovative transmitter design.

And manufacturers don't foresee that happening anytime soon.

"I wouldn't even hazard a guess of when it will happen. Last summer this whole industry was looking around wondering where the next sale was going to come from," says Hoelzel.

So it appears that the reported slow going of the transmitter market in general may have put off any hopes for solid state technology for FM transmission, at least until a point well into the future.

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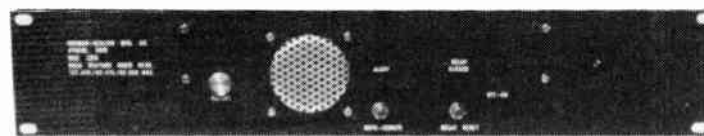
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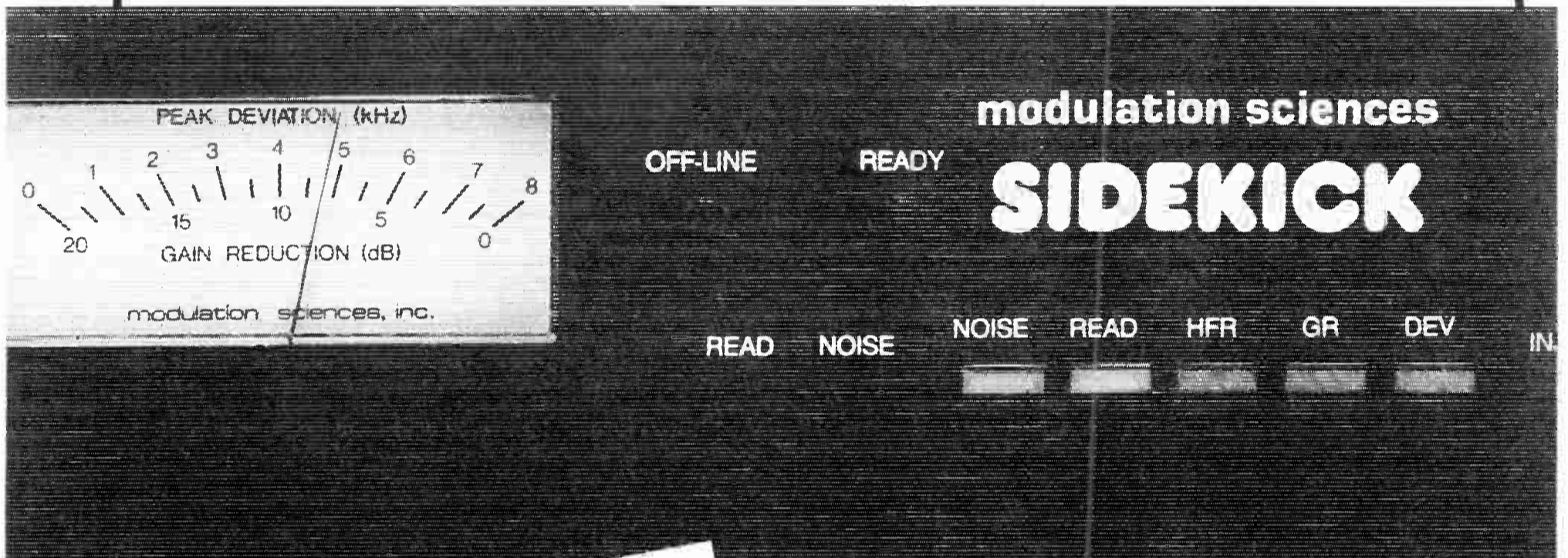
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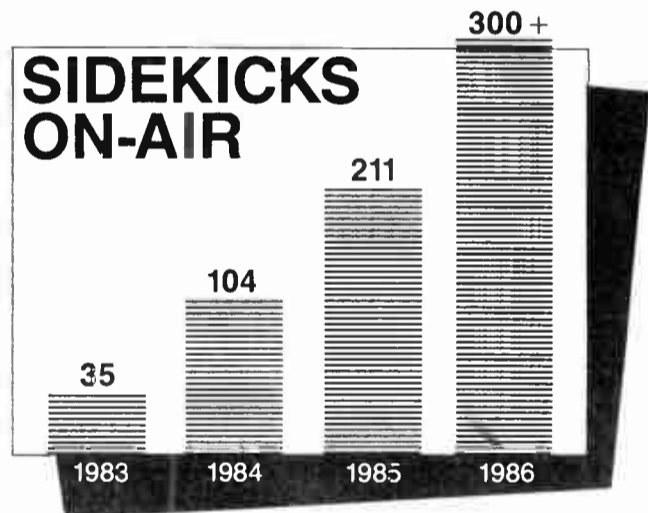
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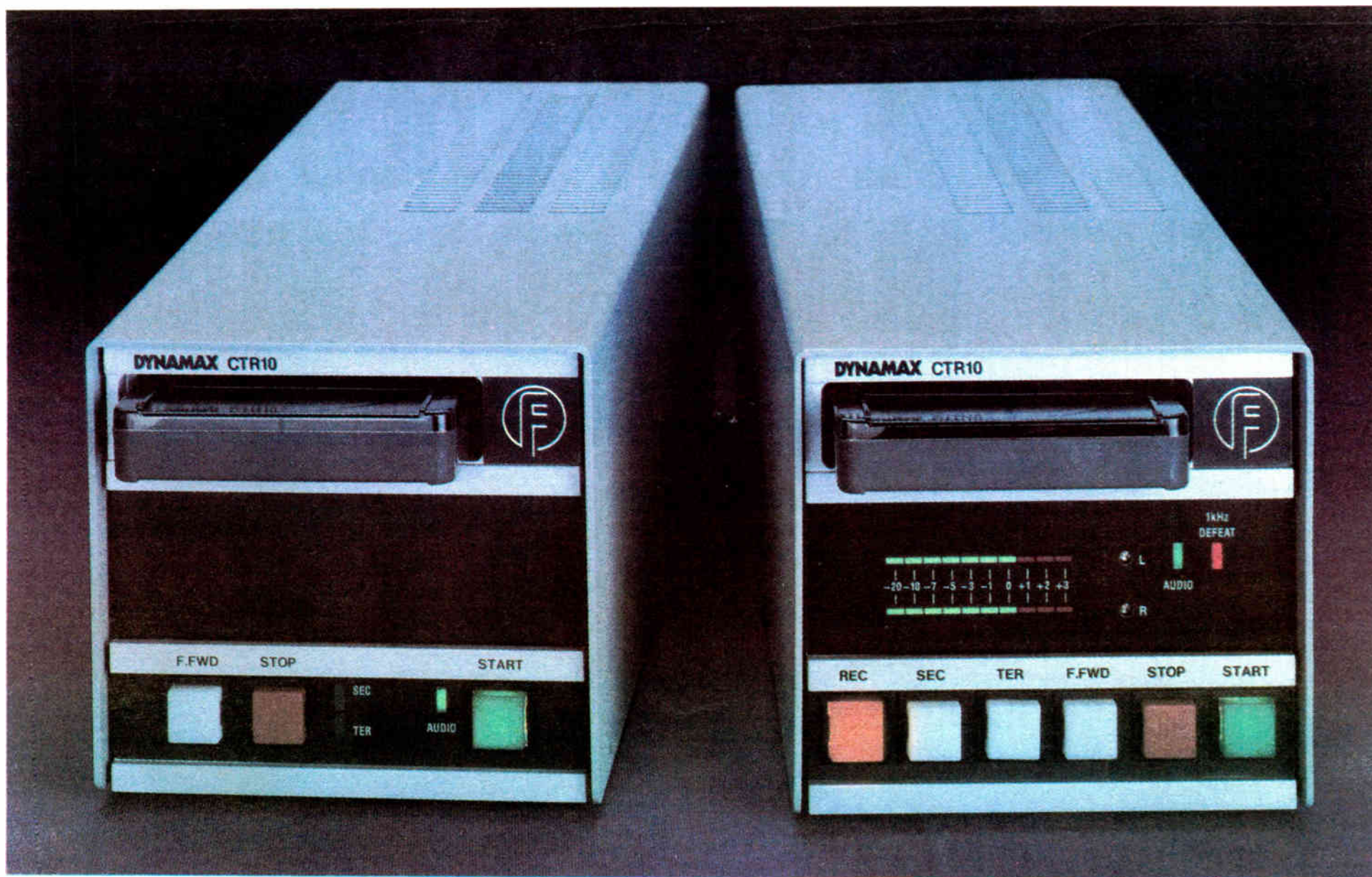
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