

# Multimode Petition is Filed

by David Hughes

Asbury Park NJ ... Press Broadcasting, owner of WJLK, a C-QUAM AM stereo station in Asbury Park, NJ, has asked the FCC to require that AM stereo receivers be equipped with a multimode chip.

If the FCC's so-called "marketplace" decision to allow the industry to select an AM stereo standard will not create a single standard, then the receiver industry should be required to make receivers that accept the two surviving systems, according to Press Broadcasting VP/Broadcasting Robert McAllan.

"If we can't get a transmission standard, then why not a receiver standard?" he asked. "Our proposal takes the gist out of the FCC having to pick one or the other system. It would be a relatively painless way of solving an ongoing problem."

The Press multimode proposal would allow broadcasters to continue to choose between the systems and use the one the station thought was technically better, McAllan said.

The Press petition, filed in early November, comes less than two months after Texar Inc., a Pittsburgh-based maker of audio processing equipment, asked the Commission to select an AM stereo transmission standard.

The competition continues between Motorola's C-QUAM system, which at last count had lined up more than 300 stations, and the Kahn-Hazeltine ISB system, with about 80 stations. Only about 10% of all US AM stations have converted to stereo.

The Press petition asks the Commission to "institute a rulemaking proceeding to add to the present rules requirements for the design of receivers of AM

stereo broadcasts."

"We propose that the Commission not select a standard AM stereo system, but rather that radio manufacturers be required to use AM stereo technology capable of receiving and delivering both Motorola C-QUAM and Kahn AM stereo systems," the petition indicated.

"The current stalemate over AM stereo standards has not served the public interest; neither broadcasters nor manufacturers," Press added. "The unsettled state of the situation is unnecessarily delaying the implementation and growth of this important enhancement of the medium."

Press added that, even with Motorola's lead in the number of stations it has signed, there is "no clear dominant AM stereo system in many individual markets," including WJLK's New Jersey/New York City market.

McAllan said that most of the stations in New Jersey operate with the C-QUAM system, while most of the New York City stations feature the Kahn system.

The petition chides receiver manufacturers for "not making high-quality AM stereo universally accepted. Meanwhile, the public is left to wonder why the selection of available AM stereo receiving equipment is so small."

Like the earlier Texar petition, Press said that "radio manufacturers are waiting for either the marketplace (the public) or the Commission to choose a winner before committing to AM stereo. The public is waiting for manufacturers to produce AM stereo radios. Neither appears ready to move without some direction from the Commission."

McAllan said that multimode chips costing about \$1 to \$2 per chip are available, and will become cheaper with mass production.

The petition maintains that "companies such as Sanyo (the S-X1070 unit) have developed multisystem chips which carry no significant cost penalty to manufacturers or consumers yet can distinguish automatically between the two systems and translate each system for delivery by the receiver." Sony units also feature a multimode chip.

Most AM stereo receiver manufacturers made receivers that accept only the C-QUAM system.

"The technology would allow the radio marketplace to freely choose between Kahn and Motorola without fear that either system would be rendered worthless," the petition continues.

Press indicated that its petition has re-

(continued on page 8)

## Antenna Site Waiver Rejected

by Alex Zavistovich

Washington DC ... An NAB-sponsored project for the development of two sky-wave-minimizing AM antennas suffered a setback recently when the association was refused use of a test site in Loudoun County, VA, a largely rural county approximately 40 miles from Washington, DC.

The Loudoun County Planning Commission voted 12 November to deny the NAB a waiver of zoning ordinances prohibiting large structures from being erected on agricultural land, according to Michael Rau, NAB staff engineer.

The NAB had sought to make the county the test site for a single monopole AM antenna designed by Richard Biby, of Communications Engineering Services, in Arlington, VA.

The planning commission's decision surprised Rau, who said comments from commission members included concern over the number of exemptions already granted this year.

Denial of the waiver seemed "arbitrary," Rau commented. However, he added, a careful analysis of the issue was made by Commission Chairman John Stowers, a supporter of the project.

Stowers could not be reached for comment.

The planning commission's refusal to grant exemption from the local ordinance does not necessarily mean the NAB will not be able to use the Loudoun County site, Rau stressed. The issue must now be deliberated by the county's Board of Supervisors, where, Rau said, "it is not uncommon to have a planning commis-

sion decision overturned."

In a related issue, the NAB met in November with representatives from Washington DC-based Howard University, which will be providing land in the Washington suburb of Beltsville, MD, as the test site for an AM array designed by Ogden Prestholdt, of A. D. Ring and Associates.

At press time, Rau said an agreement on use of the Beltsville location was being drafted. The document is expected to be ready by late November or early December.

For additional information, contact Michael Rau at the NAB: 202-429-5340. Contact the Loudoun County Planning Commission at 703-777-0246.

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## Regulatory News

# ARRL RF Noise Petition Denied

by Alex Zavistovich

Washington DC ... The FCC recently dismissed an American Radio Relay League (ARRL) petition which had suggested that home electronic equipment be labelled with information on its susceptibility to RF interference.

According to an ARRL spokesperson, however, the group plans to resubmit the proposal.

"(The FCC) has not heard the last" of the proposal, said Christopher Imlay, general counsel for ARRL, a nonprofit association of amateur radio operators. Imlay added that the FCC's decision to dismiss the petition without public comment was "a terrible idea."

In an October Memorandum Opinion and Order, the Commission denied a 19 June Petition for Reconsideration of the group's proposal. The petition suggested labels which would indicate whether a home electronic device incorporates shielding, filtering or circuitry designed to reduce the RF interference susceptibility.

A proposed label on devices without RF interference suppression circuitry would warn the owner that "as a result, the device may be subject to malfunction from nearby transmitters," according to the ARRL petition.

If the device did contain RF suppression circuitry, the label would warn that the design features may still not guarantee proper performance.

### Reducing complaints

Labeling of home electronic equipment which might be susceptible to RF interference was an attempt on ARRL's part to

reduce the number of interference complaints, Imlay said. He approximated the FCC receives about 68,000 such complaints each year.

In the Communications Amendments Act of 1982, Imlay noted, Congress suggested a number of possible solutions to the complaint problem, including equipment labeling. Seeing that "nothing was being done by the FCC or the industry," Imlay continued, the ARRL put forth its own labeling proposal.

The ARRL proposal, submitted last spring, stated that "labeling regulations are the minimum necessary to protect the public, to reduce the overall number of interference incidents and complaints, and to encourage manufacturers to voluntarily incorporate RF suppression circuitry in home electronic equipment and systems."

On 20 May 1986, however, the Chief Engineer of the FCC dismissed the petition under delegated authority. The petition "failed to take into account the need to establish criteria or standards to permit a qualitative assessment of the RFI susceptibility of a home electronic device," the FCC said.

In addition, the FCC deemed the petition to be premature because the issue of RF susceptibility of home electronics is being addressed by an ad hoc committee of the American National Standards Institute (ANSI).

### The ANSI Committee

ANSI Standards Committee C63 (the Ad Hoc Committee on Radio Frequency Interference Limits for Appliances) was assembled in the spring of 1986, according to Liliane Volcy, engineer in the

FCC's Office of Engineering and Technology. The joint group, comprised of the FCC, the IEEE, the NAB, the EIA and various industry representatives, is determining (among other things) whether to impose radiation limits on home appliances.

Imlay said, however, that the ANSI committee is a "red herring."

Since its assembly, the committee has suggested only one standard—a 1 V/m rejection standard for TVs and VCRs, Imlay said. The ARRL disagreed with the standard, Imlay added, because it failed to consider the standard 8 V/m amateur broadcast signal.

"Nothing will come of the committee for at least four or five years," he estimated.

The FCC further objected to the pro-

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## FCC Clips

### Cuban List Available

The FCC has made available an updated list of Cuban AM stations. The document features the calculated location and operating power of Cuban stations "to the extent possible through off-air observations."

The information contained in the list is what the US government considers to be the level of Cuban interference to US stations.

Extremely high-powered signals indicated by the list include a 150 kW station operating on 600 kHz, a 130 kW station on 630 kHz and a 100 kW station on 1380 kHz. At times, a 100 kW station has operated on 910 kHz, and a 300 kW station has operated on 1160 kHz.

A copy of the list is available for a fee from International Transcription Services, 2100 M St., NW, Suite 140, Washington, DC 20037. Contact Wilbur Thomas at 202-857-3800.

For information about the Cuban interference problem, contact Louis Stephens at the FCC: 202-632-6955. Technical questions can be directed to George Dillon of the Commission's Field Operations Bureau: 202-632-6345.

### Minority Stand Criticized

Members of the House Telecommunications Subcommittee criticized the FCC Commissioners for their plans to change the FCC policy giving preferences in comparative hearings to minorities and females.

In a legal brief filed in September, the FCC said its constitutional authority does not permit it to continue giving the preferences.

Several Congressional representatives claimed the FCC's attitude constituted a major backward step in civil rights reforms. They maintained that only 2% of the US broadcast stations are owned by minorities.

The Commission, in criticizing its preference plan, said some groups, will place a token minority or woman in a position of authority in order to gain a preference.

For more information, contact the FCC's public affairs office at 202-632-5050.

### No New Private Radio Service

In September, the FCC said it reaffirmed a November 1984 decision not to allocate 8 MHz of spectrum on the 900 MHz band for a new private radio communications service.

The new service would have accommodated "personal communications of the general public," the FCC said. It added that there were "insufficient grounds" for awarding the new spectrum.

The docket number is GEN 83-26. Contact Stuart Overby at 202-634-2443.

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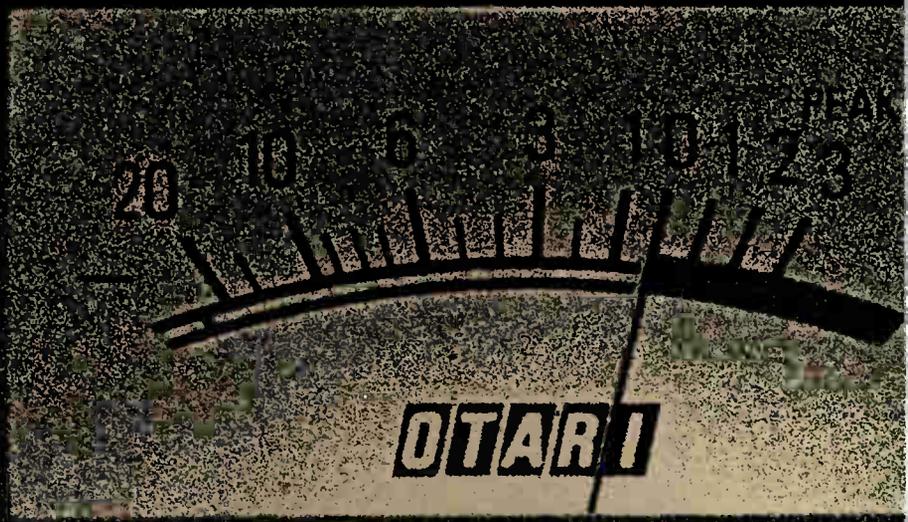
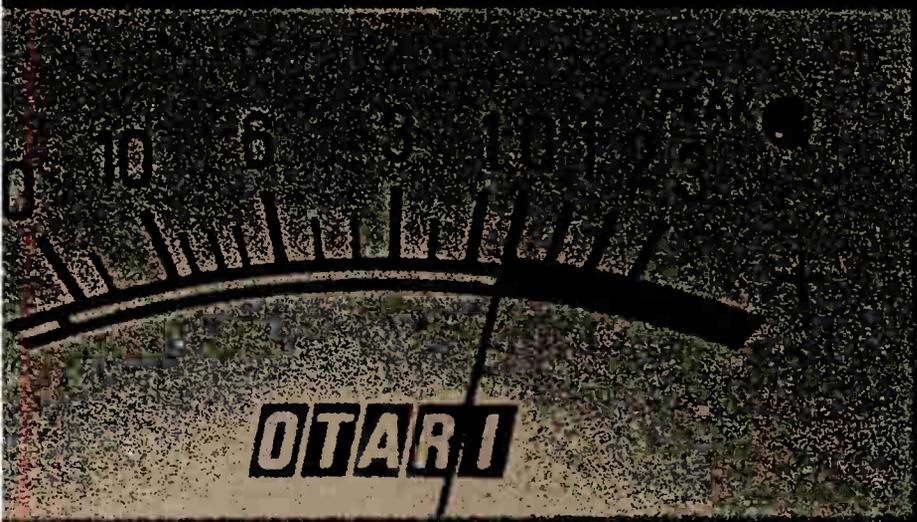
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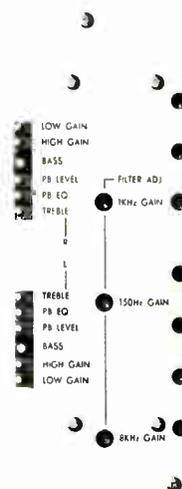
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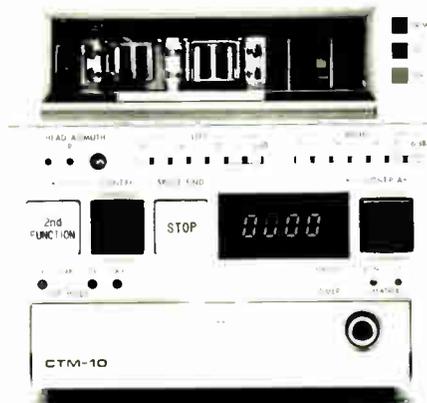
CTM-10 features the NAB record and play track configuration, Otari offers Maxtrax™ heads as an optional retrofit).



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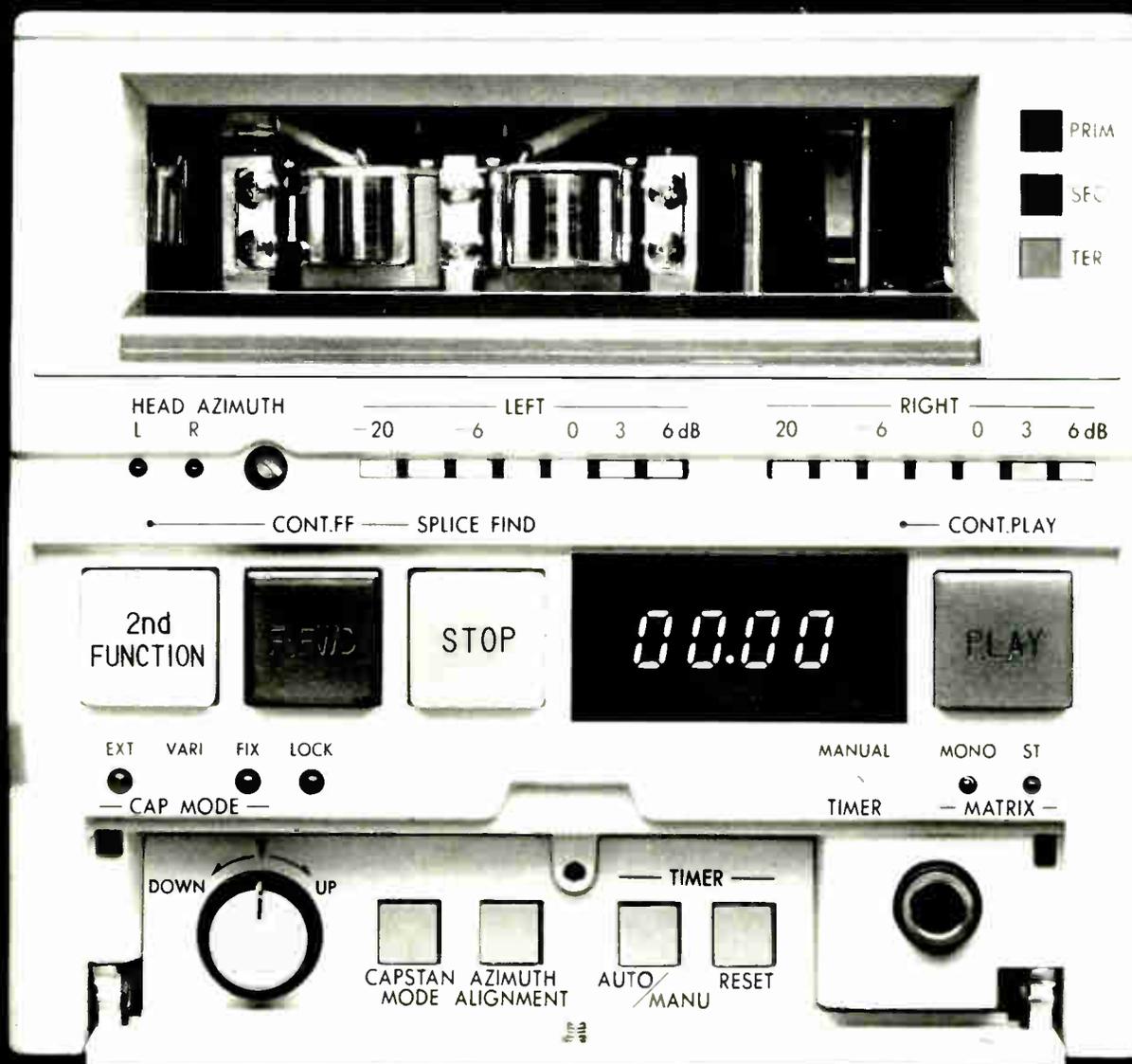
## MULTIPLE DECKS... INSTEAD OF MULTIPLE PROBLEMS

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The CTM-10 series of NAB audio cartridge recorders and players consists of three models: The CTM-10SR stereo record/play deck; the CTM-10MR mono record/play deck; and the CTM-10 mono/stereo playback-only deck (field convertible to record/play). A CTM-10R record module provides metering, level controls and electronics for the record decks. All units are identical in size and can be mounted three abreast in a standard 19" rack. (Note: Though the



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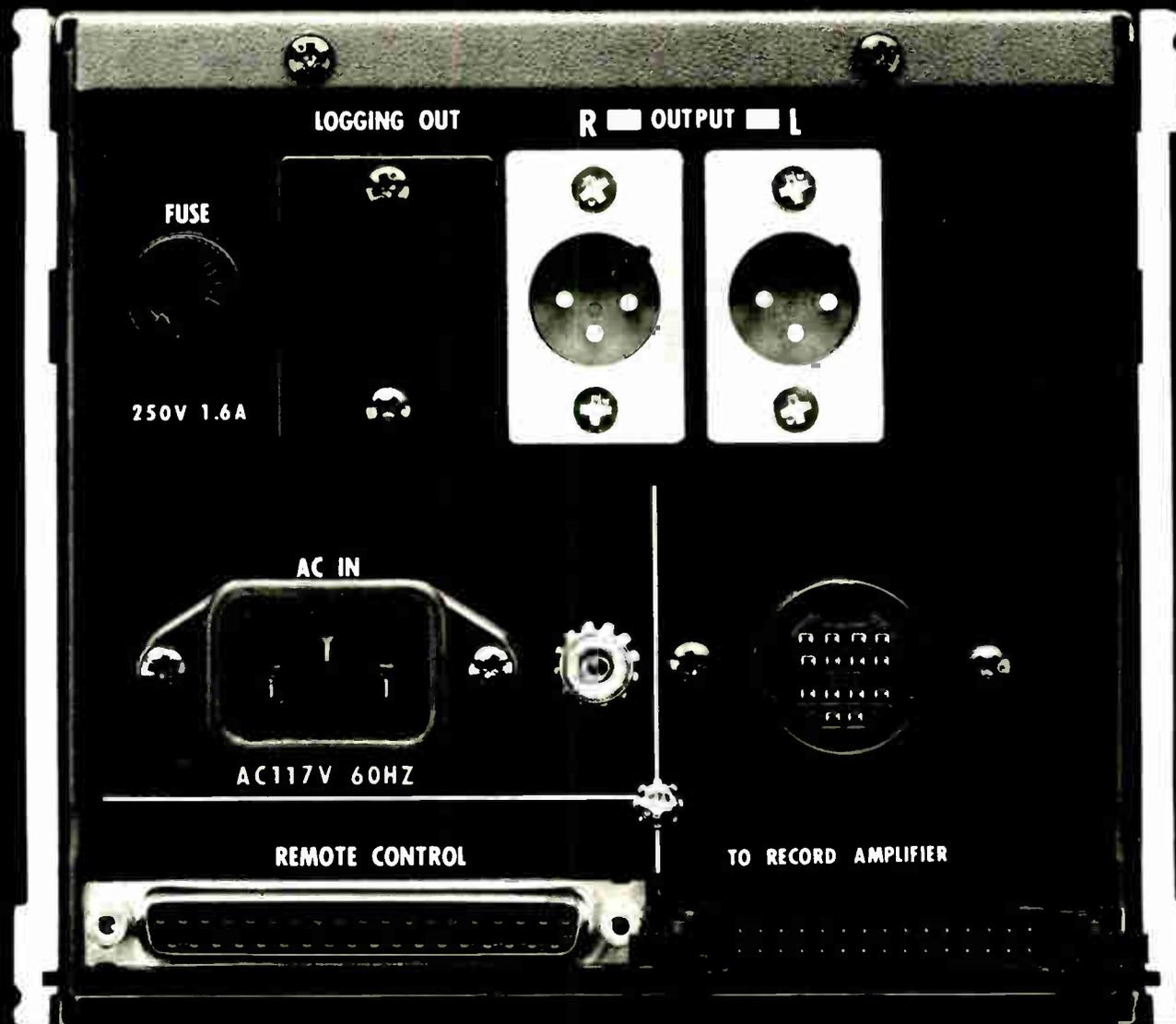
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For example, in a multiple installation, *fast-forward re-cue* can be used with any one CTM-10 deck while another deck is in *play*. And if maintenance is required, the CTM-10 decks can be serviced independently, still leaving the other cart machines on-line. Further, if the flexibility to "borrow" a cart machine temporarily for another studio is important to you, the CTM-10 fills the bill. A triple deck does not provide these conveniences.

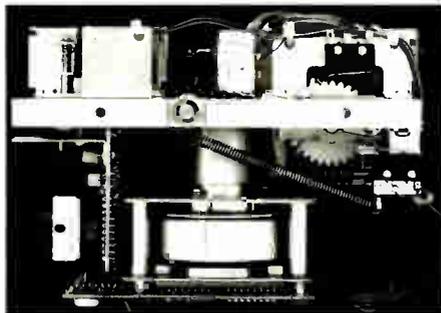
#### NEW FEATURES THAT MAKE SENSE FOR TALENT AND ENGINEERING

Instead of one playback head and one dummy head, as is usually the case with playback machines, Otari's CTM-10 playback-only deck provides both mono and stereo heads. This makes it possible for stations to upgrade to stereo later without purchasing new stereo machines.

Three tape speeds are available, so you can either double your play time by selecting 3.75 ips, or you can opt for the extra dynamic range and high frequency response available at 15 ips. In addition,

the CTM-10 record decks are equipped with HX-Pro™ bias optimization circuitry to provide increased high frequency headroom at any speed. (Please see a complete discussion of this valuable and exclusive feature later in this brochure).

The CTM-10 series also features active balanced transformerless inputs and cross-coupled outputs, plus low frequency reproduce equalization. A front panel headphone jack for cueing or testing carts off-line, and convenient front panel-mounted input level controls with SRL preset are also included.



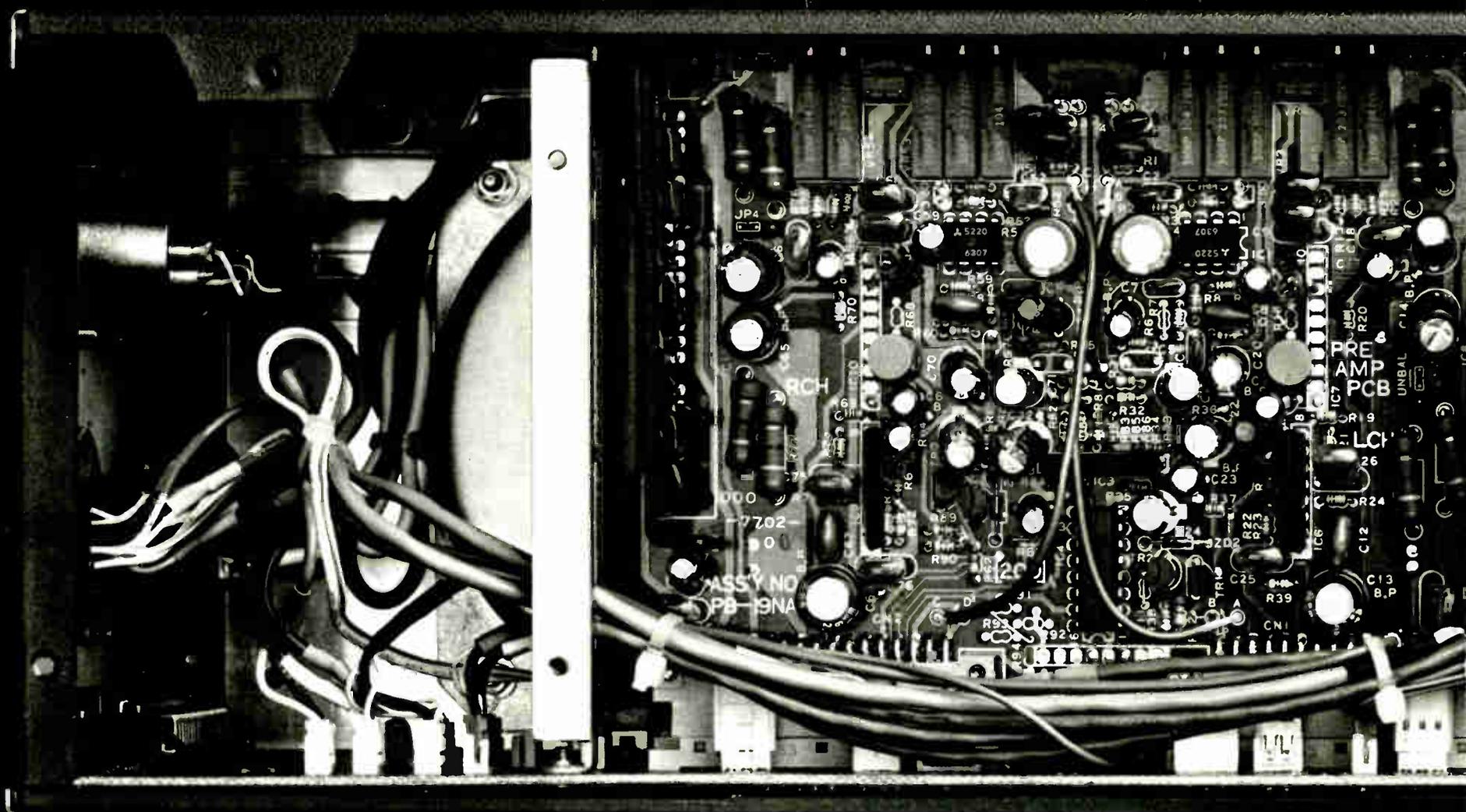
*Motor-and-gear pinch roller mechanism provides long-term stability and cooler operation*

Two signal matrixing modes are standard on the CTM-10RS. A mono-matrix provides compatibility with mono carts and machines, while a stereo matrix mode minimizes the effects of phase instability caused by cart or tape mechanisms.

#### CUE TRACKS CAN BE MORE THAN JUST CUE TRACKS WITH THE CTM-10

With the CTM-10, you may assemble or alter the cue track independently of the audio tracks. This is helpful when you've mistakenly put the secondary tone in the wrong place. Instead of bulk-erasing the whole cart and re-recording everything, you can selectively erase the cue tone, and record another in the correct location.

Using the optional *log mode*, facilities with automated bookkeeping computers or time-code based synchronizers and machine controllers will find the ability to put SMPTE/EBU time-code or FSK automation data on the cue track very helpful.



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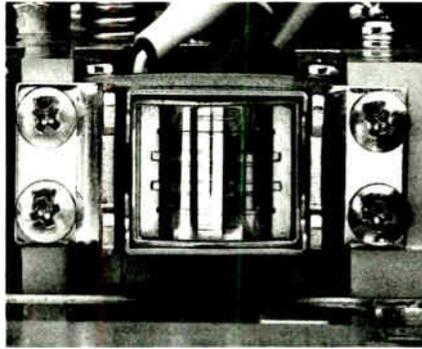
A 37 pin "D" connector on the rear panel provides for simple interface to such items as a console for fader start, a time compression device, an audio/video synchronizer, or a broadcast automation system. Vari-speed allows the operator to make a  $\pm 6\%$  speed correction directly from the front panel. If desired, the capstan speed may be externally controlled by a 9600Hz reference signal.

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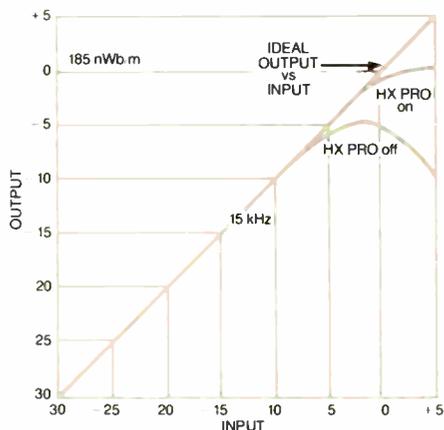
In an effort to bring newer technology to cart machines, we also incorporated adjustable record phase compensation into the CTM-10. It corrects for group delays and maximizes transient response, despite tape formulation or bias level. Phase compensation and HX-Pro combine to give your carts more "punch," even when played back on another manufacturer's deck!

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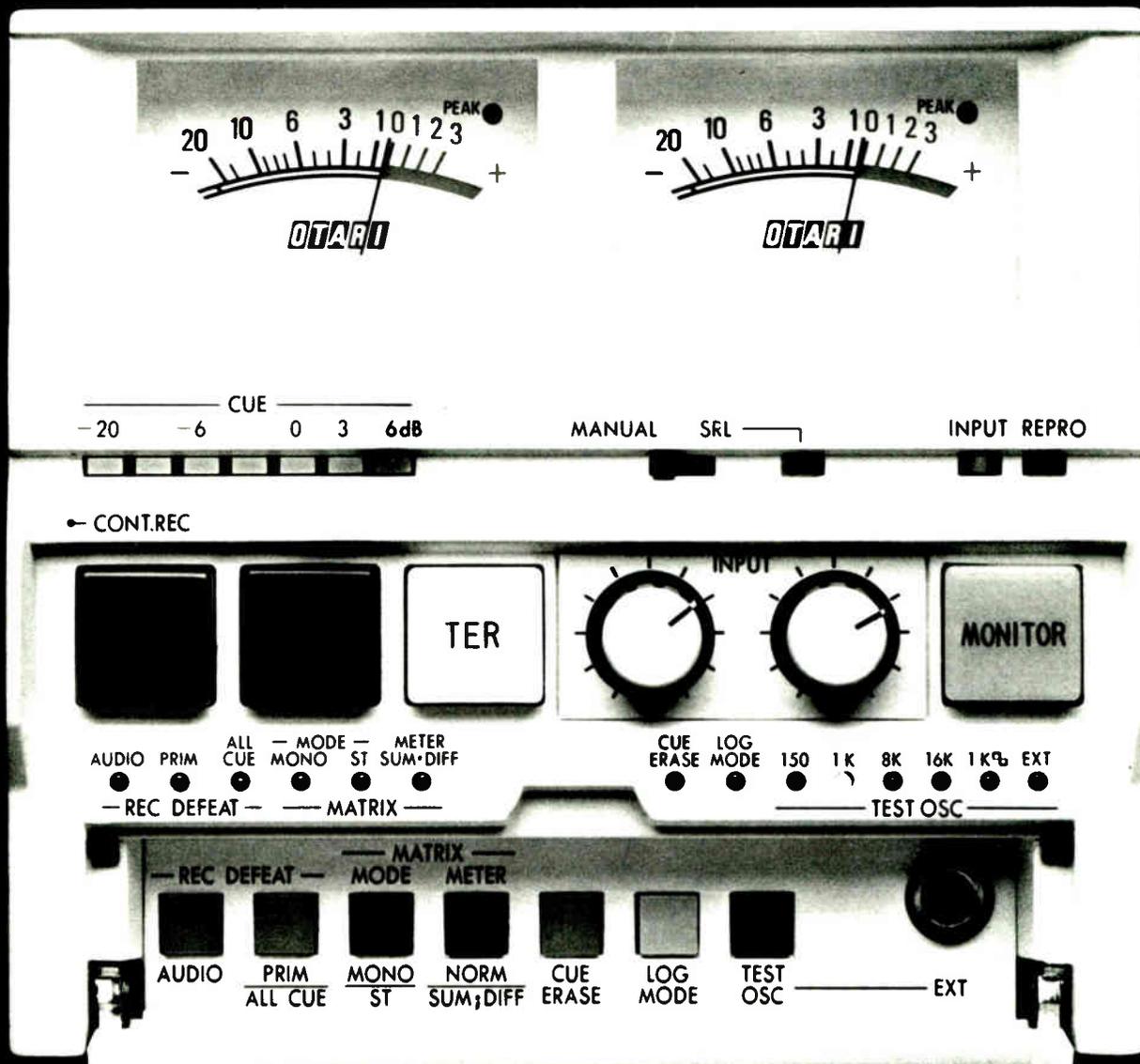
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- Adjustable record phase compensation



*HX-Pro bias optimization provides 15 ips performance at 7.5 ips (typical low-speed, high frequency curves shown)*



## Regulatory News

# FM Application Policy Toughens

by Alex Zavistovich

Washington DC ... In October and November, the FCC's Mass Media Bureau returned five commercial FM applications for failing to meet the FCC's "substantially complete requirement" of the new "hard look" FM processing procedures.

The Commission said that the "substantially complete" standard is used to determine whether to accept an application, assign it a reference number and process it. Under the "hard look" procedure, applications may not be corrected after the close of the window filing period.

The "hard look" approach to FM application processing was set out in the Commission's Report and Order on Docket 84-750, in 1985. Among the items necessary to consider an application substantially complete, the order stated, are antenna height above average terrain, above ground level, and above median sea-level.

The various antenna heights are "employed in a number of processing evaluations by the staff," the report continued, adding that "their absence, or the absence of any of them, renders the application not substantially complete."

#### Eliminating significant delays

The FCC, in outlining its changes to the application process, explained that the previous system allowed many errors in key parts of the application to remain undetected until "considerable processing time and effort had already been expended."

Errors in such fundamental parts of the application caused "significant delays" in the disposition of the improperly filed applications, as well as the processing of those properly completed, the FCC maintained.

To prevent improperly filed applications from bogging down the processing system, the Commission decided to return any application deemed not substantially complete. The applicant would, subsequently, lose his filing status.

In a Memorandum Opinion and Order issued 5 November, explaining the rejection of a FM application filed by Star Signal Corporation, the FCC explained some of the benefits to be derived from the 'hard-look' processing.

The FCC maintained that "reduction of frivolous and speculative applications" would allow processing of applications from serious candidates who are "ready, willing and able to rapidly bring service to the public."

Streamlining of the processing procedures would also reduce administrative costs, the Commission noted, which would allow more efficient use of its staff. The benefits "are critical to making the window filing ... process work smoothly and with minimal delay in processing large numbers of applications," the FCC contended.

#### Engineers' opinions

The new processing approach to FM applications has met with disapproval by a number of consulting engineers contacted by RW.

Louis du Treil, of the Washington DC-

based consulting engineering firm of du Treil-Rackley, said that, although the FCC's intentions were good, hard-look processing gave professional engineers "added responsibilities without added compensation."

The double and triple checking required to assure such meticulous completeness "makes engineering work more expensive," du Treil contended. He added that the extra burdens in filing had prompted his firm to consider not taking any more applications.

"I don't think (the FCC) should expect from the public what they can't do themselves," du Treil said, pointing out the addenda and corrections the FCC makes to its public notices and other documents.

Jules Cohen, of Jules Cohen and Associates, said he was sympathetic with the Commission's objectives, but felt that the hard-look approach was "going too far."

"As long as the data are there and can be extracted from the applications with-

out ambiguity, minor errors should not cause dismissal of the application," Cohen maintained.

If problems with applications exist, Cohen suggested, the FCC ought to continue the processing with the understanding that the problems would be corrected later.

#### Two-step processing

In a related issue, some FM radio stations have had to resubmit applications for the construction of antennas because of inaccurate data, causing a "two-step" application process.

Some stations specify use of directional antennas, for which consulting engineers must file construction permits (CPs) describing radiation patterns, according to John Reiser, assistant chief of the FCC's Engineering Policy Branch.

In evaluating the CPs, Reiser said, the FCC attempts to ensure that the antenna is installed at the correct azimuth to

(continued on page 10)

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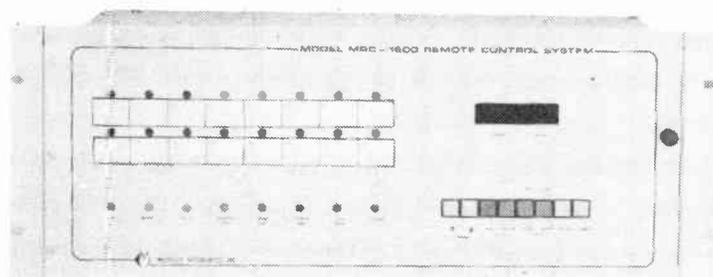
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## Opinion

# Sell No Machine Before Its Time

by Michael D. Callaghan

Los Angeles CA . . . Pity the duck-billed platypus. What an evolutionary mistake! It should never have happened nor should it have survived, yet it's still with us.

In their ambition to incorporate trendy and newfangled technology into their broadcast equipment, our vendors frequently seem to procreate apparatus that should never have survived delta testing, much less have been offered for sale. Yet—it got to the marketplace and, like the misfit platypus, much of it remains.

Ten years ago, cart machines were terribly unsophisticated; relays clicked when they started playing, the capstan motor needed just one capacitor to make it work (unless you wanted high-speed recue, and then you gained one more clanking relay), the cue sensors used L/C parallel resonant circuits and the audio electronics were primitive in design—they even used output transformers!

But they did just one thing and they did it well—they played and recorded carts. Almost all the maintenance problems involved fixing the power supply and compensating for head wear.

## New technologies

Then cart deck designers started implementing exciting new technologies in a two-step forward, one-step backward sort of way. Some of the very first RCA

Michael Callaghan is CE of KIIS-AM/FM, Los Angeles, CA, and a frequent contributor to RW. He can be reached at 213-462-6211.

opamps were used to simplify the audio circuitry, but the performance was embarrassing. These cart machines had no record EQ controls; the record equalization was adjusted by changing the bias!

Luckily, the idea was abandoned and individual transistors were reintroduced again.

Then, early consumer audio chips were introduced into the squelch cir-

side of them quickly reeducated ourselves.

Ceramic capstans came into being to provide a better grip and to last longer. But ceramic capstans don't conduct electricity, and neither do long-life ferrite heads. So those spinning shafts soon filled our studios with little Van de Graff generators that made the tape stick to itself, bind and fail.

“

*Our vendors frequently seem to procreate apparatus that should never have survived delta testing.*

”

cuitry. (Remember the MFC-6040?—it was designed for home organs!) These would intermittently produce the sounds of silence, and were abandoned in favor

## Guest Editorial

of incandescent lamp/photocell combinations. Then we had to be concerned about lamp life.

Output transformers were abandoned because they “added distortion” and couldn't pass square waves. (Until Moog introduced the synthesizer there wasn't an instrument on earth that created square waves anyway!)

Balanced “floating outputs” became archaic. Those of us used to transformer outputs and being able to ground one

The proposed solution for this was to mount a little carbon fiber brush on the deckplate that would stick into the cartridge, fondle the tape and drain off the charge . . . but it didn't work.

Capstan motors started out with a single speed, and when high speed recue became a desired feature, equipment planners added a second winding (and another relay) to spin things three times as fast. When the servo motor became practical, it meant we needed a more massive DC power supply instead—so we were introduced to the 10-lb power transformer and its attendant hum field.

## Microprocessor age

As “space-age” as any of these developments were, none of them could approach the fun designers had when the microprocessor came into style.

No longer was it necessary to use the relays—one small program built into a chip could run the whole machine! All it needed were a few connections to the solenoid driver, the front panel controls and the remote plug. (Properly buffered, of course, so unmannered signals from outside its own little digital world couldn't “zap” it.)

And why not have it divide down a crystal and control the capstan speed at the same time? After all, its little electronic grey matter was loafing anyway.

So what all this evolved into was a very cerebral machine. It represented the state of the designer's art. It used the latest audio chips. It didn't use output transformers; it used a ceramic capstan for long life. It had long-life heads. And it only cost about three or four times what the machines did 10 years ago.

## New designs bring new problems

But there were a few issues yet lurking—the microprocessors were unhappy with fast glitches in the power supply. The program in a microprocessor has a certain path to follow, going around the same loop over and over again, sort of like a bus route.

The program stops at the start switch and sees if it needs any attention. Then it moves along to the other switches. It might check the tone sensors to see if any tones have come along since it was there last. It may also stop and check to be sure the capstan motor is running at the right speed.

If not, it gives it a little boost or tells it to slow down until it checks back again. It continues all the way through the machine until it's done, and then it starts all over again. It makes this trip hundreds or thousands of times a second.

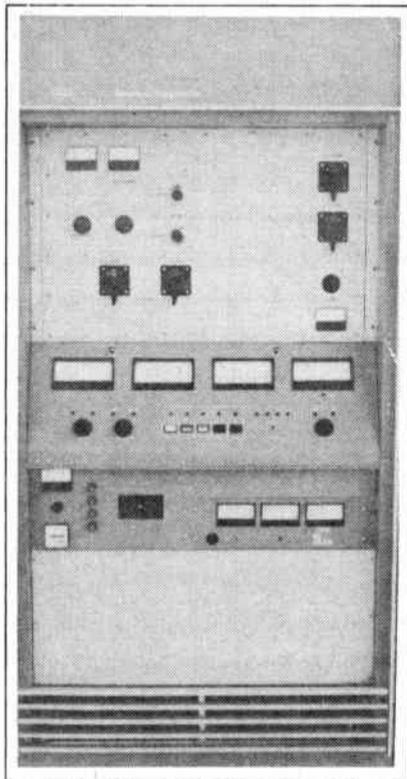
But, should the power supply hiccup, the program gets lost. Instead of following the right path, the microprocessor goes crazy. It goes places and does things it's never done before.

The result is a cart machine gone berserk. It may take off at triple speed on the air. It may stop dead. It may freeze and respond to nothing. It might stop the capstan motor and lock the solenoid up in a death grip until it smokes itself to ruin.

The *only* solution when this happens is to pull the plug, let the power supply die so the microprocessor can find its way back to the start of its route, and then start the machine up again.

It all kind of reminds you of the story of the microprocessor-controlled flashlight. It has three buttons: On, Off and

(continued on page 6)



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# 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).

## End protection of clears

Dear RW:

I'm sure most of you read the RW article about daytimers adding night power and how the NAB has had a hand in all the added time to some of the daytimers for the past couple of years.

Not all daytimers are relieved, however, and the NAB has not and is not helping daytimers as much as they would have you think, and if the class IIs are left out, we all could be. I want the truth known.

As you know, Mexican clears in the US recently got big relief from the FCC. The latest FCC Staff Report recommends "that the Commission consider elimination or reduction of the protection now afforded to secondary 'skywave' service, either nationwide or at least east of the Mississippi River."

Similarly, the FCC Staff Report asks whether the groundwave protection for Class I AM stations should be changed from their 0.1 mV/m contour to some less restrictive level, such as the 0.5 mV/m contour. In both instances, the NAB recommends "that this issue be placed on a *deferred* list" because it would cause "dissension." Obviously the clear channels would be the only dissenters. Right now the class IIs are, or should be.

The NAB did this despite an AM Radio Listeners Survey prepared for the National Telecommunications and Information Administration (NTIA) in which

they quoted in the household survey, "It is notable that *no* powerful Class 1-A clear-channel stations were identified among the three groups of stations that respondents tune in during the three listening periods."

A similar survey of truckers produced only one station mentioned over 100 miles away from the survey area. The NAB did this despite the public support the class IIs have. Is the NAB looking out for the class IIs? Are they paying attention to the public? The FCC Staff Report suggests relief. The NAB says *no!* Where are their priorities?

Whether you are a member of the NAB or not, if you are an owner or manager of a class II station, you need to know this organization is not working for you in the capacity you need it most. You cannot afford to wait for extended time.

If you are not a class II, you need to know that if the NAB can do this, they can do it to any part of the organization. Back before extended time for any daytimers, in November of 1983, Mike Rau, staff engineer for NAB, wrote me a letter in which he said "it takes much less signal to cause interference than to provide service. Accordingly, radio stations are generally better off (that is, have larger service areas) by adhering to established protection standards."

He also said, "I believe that existing AM allocations standards have served our industry well for many years. Indeed the fact that these standards exist at all is, from my viewpoint, one of the few real benefits of continued FCC regulation." He said this despite NAB's stand to help daytimers and commitment to deregulation. This I think reflects a very dangerous view.

I'm not telling you to quit the NAB. Neither am I trying to tell you they are a worthless organization. I am asking you to let your views be known to them. Ask them to say what they mean and mean what they say. Truthfully, did you know this was going on?

The truth is there is no ethical reason to protect the American clears anymore. The need of the community that local daytimers serve far outweighs anything except a greedy need by the 1-A clears. If we can do it with the Canadians, the Mexicans, with class IVs (unlimited time at full power, which they said could never be done), and increase class III time, why do we have to protect the American clears?

Tell the NAB you are against their recommendation to place the clear channel issues on the deferred list. The clears don't have the audience; they don't outnumber the class IIs by a long shot and they don't even have right or wrong on their side. If you are a class II, tell them you want them to represent you! Fur-

The Press Broadcasting petition requesting the FCC to mandate that all receivers sold in the US be multimode is, at first glance, intriguing. The proposal tries to solve the myriad of problems imposed on AM stereo by the existence of two incompatible systems. However, the Press proposal is neither legally feasible nor economically sound. It also raises the issue of performance standards.

First, the Press petition is not legally possible on its face. The FCC does not have the authority to regulate receiver standards. While the FCC could mandate a *transmission* standard, only an Act of Congress would carry the authority to regulate receiver standards.

Second, the proposal is not economically sound. Even if the manufacturing cost of a multimode chip were the same as a single-system chip, a multimode chip would still cost more because receiver manufacturers would have to pay two royalties to the remaining two system proponents. This cost would then be passed on to consumers.

Is the industry prepared to ask that royalties be paid to both system proponents for every AM stereo receiver sold in the US? Even if a system proponent has only 70, or 20, or 1 system on the air? What if a system proponent hasn't sold a system in a year, or stops selling systems altogether because there no longer is an economic incentive to sell?

Finally, it is hard to conceive of a multimode chip that would provide the same quality of performance for each system as would separate, dedicated chips.

Sales of AM stereo receivers have been dismal enough. A mandate that all receivers be multimode may cause manufacturers to stop producing AM stereo receivers altogether.

So far country after country has chosen a single national AM stereo standard. The US needs a single system too—chosen either by government mandate or economic attrition. Multimode is not the answer; it costs more, and poses performance tradeoffs and significant legal/procedural problems.

The answer to the US AM stereo problem is *one* system—a clear winner, and soon.

—RW

thermore, tell the FCC you agree with their staff report. Tell them how important local radio is.

Please, do it now. I don't think there is a "daytime only" board member at NAB. If the issue is deferred, some of us may not be around when or if it ever comes back up.

Terry W. Freitag, Gen. Mgr.  
WHNC  
Henderson, NC  
Member, NAB

## AKG accolades

Dear RW:

I just received the 15 October issue of RW and read with interest Ty Ford's article on "Good Mic Technique Essential."

This article should be run in every issue, if nothing more than as a continued public service announcement to many radio broadcasters.

Not only is the mic technique important, but so is the selection of the proper mic for the "station sound" and DJ/announcer's voice. One mic doesn't always "fit" every voice. AKG manufactures a broad range of microphones for most every application, in studio and out.

We think that Mr. Ford would be as happy with any AKG mic as he has been with the K-240. We appreciate his mentioning the K-240 in the article. It con-

tinues to be our best-selling headphone in our line of eight models. We will sell more K-240s in 1986 than in any previous year.

S. Richard Ravich, VP & Gen. Mgr.  
AKG Acoustics, Inc.  
Stamford, CT

## Better sound through stereo

Dear RW:

The time has come; AM stereo must get off the ground and start moving. All the arguments about systems are going to be wasted if there are no "ears in the forest when the tree falls."

I believe it is true that I have converted more AM stations to stereo than anyone else in the world, having completed more than 100 installations. (It may be obvious that they have been C-QUAM exciters using equipment from several of the manufacturers.)

I can truthfully say that most stations were done in one or two nights and the results have been fantastic. Many have proofed good enough to meet FCC FM specs. We have seen 40-year-old transmitters sound just great!

Most broadcasters were very apprehensive before the installation and were surprised how quickly the transmitter was brought into condition to pass C-QUAM specifications.

(continued on page 6)

## Radio World

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# Readers' Letters

(continued from page 5)

I believe a stereo installation is the best move a broadcaster can do to "clean up AM."

I have done several installations at stations that were previously using the Kahn system. In every case the stations were impressed with the improvement in quality with C-QUAM, both measured and audible differences. Knock on wood—I have not seen a station fail to become stereo and pass proof.

There are millions of automobiles out there right now listening in AM stereo and you can drive from coast to coast now and listen to AM stereo all the way.

You would not prefer to listen to FM in mono! Why AM? Most folks cannot tell the difference between AM stereo and FM stereo, but they do know the difference between mono and stereo.

Come on AM broadcasters—the writing is on the wall. The time to make a change is now.

Remember, FM did not become popular until stereo came along.

Remember looking for stereo FM receivers in the early '60s? The dealers did not understand stereo or have the receivers to sell.

Broadcasters are creative people and must make the first move. The receiver

manufacturers will follow our lead.

Now I ask you—what are you waiting for now? Please do it now!

Peter C. L. Boyce, Pres.  
MidAmerica Electronics Service, Inc.  
New Albany, IN

Multimode most sensible

Dear RW:

In regard to your 1 August story on AM stereo: David Hughes' news story "Marketplace Ruling Sought," states that Sony is only producing the CFS-6000

boom box and two car radios.

The fact is that these are the only models Sony America chooses to carry. Sony Canada has an extensive multimode AM stereo line, including 2 Walkmans, 7 home receivers, 2 tuners and the CFS-6000 boom box! Also neglected in the article was the new Sanyo multimode IC and Sanyo radios.

The way I see it, both AM stereo systems are viable and are going to be around. Multimode receivers are the only practical solution to this dilemma.

Broadcasters, let's put the pressure on

the receiver manufacturers, where it belongs, instead of fighting ourselves. In doing so, both systems (and all AM broadcasters) win.

Michael F. Ring, CE  
WINY  
Watertown, NY

RW replies: A reader in Johnson City, NY confirms that Sony multimode receivers are available in Canada. He sent RW a receipt and product information which he found at the Kingston Sony store in Ontario.

## Release No Machine Before Its Time

(continued from page 4)

Reset!

In an object like a food blender a computer makes sense. Different types of food need different grinding speeds for different intervals. But when we have the same kind of cart, with the same tape and the same bias and the same playback levels day in and day out, must we really take these chances?

Is it any wonder the machines of old are worth so much? Why are they so hard to find? And why are they so costly when we do find them? Why did one leading manufacturer stop making them with a thud when the new "state-of-the-art" machines (with the new state-of-the-art prices) were causing his warehouses to sag?

It isn't just tape machines that are affected. We've all had encounters with

sticking crystal oven circuits that lock up year after year and don't get redesigned, with remote control systems that respond as much to temperature changes as they do to the equipment they control and with excitors needing "selected" MC1013 ICs to make them work.

What about the leathercraft company's most popular, new, mass-produced IBM compatible computer where you have to type in "beep off" in BASIC to turn the beep on? All of these "designs" should never have left the factory.

What hurts the most is when manufacturers don't seem to care when confronted with these blunders. There seems to be a cavalier sort of "we'll fix it when we get around to it" (or at least in the next model) sentiment.

Is there a chance the new stuff is be-

ing launched before it's ready? Do all these problems in the field mean the decision makers have lost touch with the real world and the way their equipment is used?

When was the last time a manufacturer called to tell you about a latent problem that had been uncovered? Have you instead had to rely on your network of engineering friends to find out, or tell an engineer of a problem with his equipment? Is it my imagination, or is the magnitude of this problem fairly new?

Perhaps we should reevaluate the direction we're heading. Paul Masson, the vintner, says he won't sell a bottle of wine before its time. That is a solid and valid philosophy. Manufacturers of broadcast equipment would do well to emulate the lesson.

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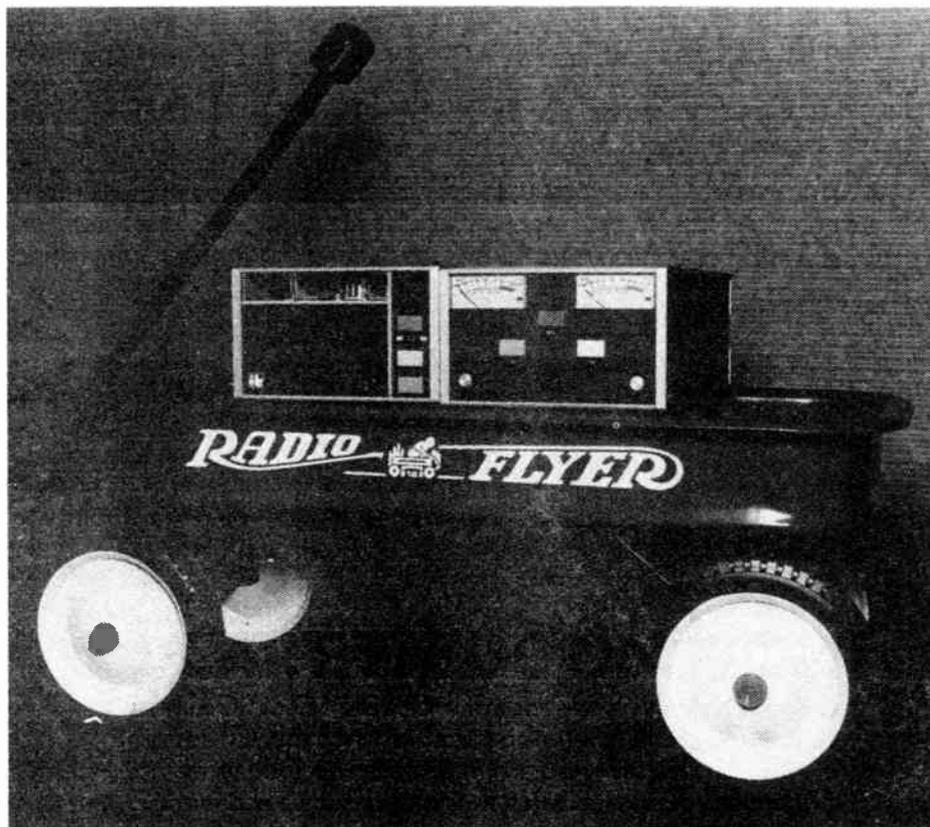
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# NAB, Exhibitors Work on '87

by David Hughes

Washington DC ... Directors of the NAB Exhibitors Advisory Committee met 7 November with NAB convention officials in an attempt to avoid exhibit floor problems at the March 1987 NAB show, to be held in Dallas.

"NAB indicated that they are planning a lot of improvements," said Al Fisher, Ampex, who serves as chairman of the committee, which is composed of representatives of firms that exhibit at each year's NAB spring show. "They (NAB) were very much aware of problems at the last show," which was also held in Dallas.

According to Fisher, discussion at the Washington, DC meeting centered on the improvement of food services and restroom cleanliness at the Dallas Convention Center, tighter floor security and more frequent bus service to and from the multitude of hotels in the Dallas area.

Another sticky issue involved the lack of air conditioning on the floor during booth setup and tear-down.

Another major issue among exhibitors involves NAB's methods of determining "seniority," which is the deciding factor in booth size and placement.

Fisher said the committee had a "lengthy discussion" on the formation of guidelines on how an exhibitor's seniority will be affected by mergers and acquisitions.

While the talks will do little to solve booth placement issues at the 1987 show, it may have an impact on the 1988 and 1989 shows, both slated for Las Vegas, he maintained.

Fisher said the NAB's legal department will draft seniority guidelines to be reviewed by the advisory committee at

its next meeting, scheduled for late January. Once approved, copies of those guidelines will be mailed to exhibitors, he said.

NAB Exhibit Director Ed Gayou, who attended the meeting, said the exhibitors committee wanted "more definitive" guidelines on "how space is assigned." He categorized the meeting as "very pleasant."

At RW's press time, Gayou said the

NAB was "on the verge of a sellout" of floor space for the March show.

### October meeting

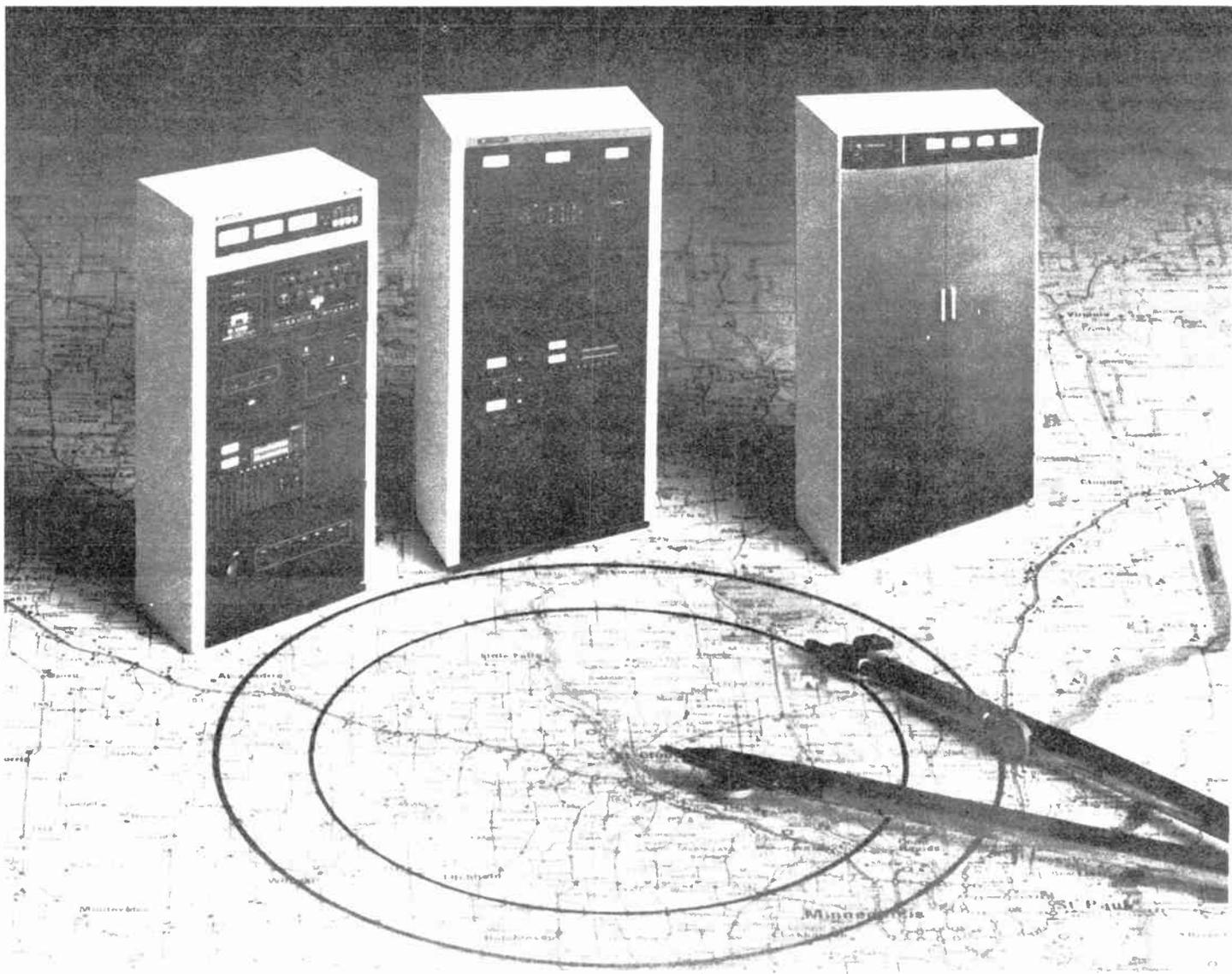
Individual exhibitors were encouraged to air their gripes at an earlier committee meeting 28 October held during the Society of Motion Picture and Television Engineers (SMPTE) show in New York City.

Irwin Ungerleiter, of Sony, who

chaired the meeting in Fisher's absence, listed the issues that were to be discussed at the 7 November meeting, including the seniority issue.

One of the approximately 40 exhibitors at the meeting said that his firm lost its seniority when it changed its name. Others questioned how the NAB would determine seniority if two firms merged, or one was purchased by another.

*(continued on page 10)*



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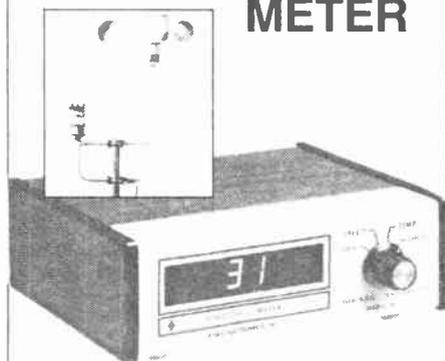
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# Multimode Petition Filed at FCC

(continued from page 1)

ceived the support of Price Communications, which owns six AM stations, including 50 kW operations in Buffalo (WWKB, formerly WKBW), Ft. Wayne (WOWO) and Albuquerque (KKOB, formerly KOB).

In a letter dated 14 November to the FCC, Price President Robert Price said his firm "vigorously supports" the multimode petition. He added that "the current stalemate between Motorola and

Kahn . . . is frustrating the full development of this critical improvement in AM stereo standards."

## The Commission's position

The FCC, during the years Mark Fowler has been chairman, has been reluctant to set receiver standards other than those dealing directly with interference issues.

While the Commission has gone on the record in support of overall AM im-

provement issues, such as the development of a preemphasis/deemphasis curve, it has maintained that such requirements should be voluntary—influenced by market forces and not by new regulations.

Bill Hassinger, assistant to FCC Mass Media Bureau Chief James McKinney, said that the Commission is deferring any action on AM stereo issues, including the Texar petition, until after the National Telecommunications and Information Administration (NTIA), which sets communications policy for the executive branch of the federal government, releases a promised report on AM stereo at the end of the year.

The NTIA report is expected to examine whether a de facto US standard exists and whether the FCC and Congress should be called upon to set AM stereo transmission and reception standards. The organization has started conducting a survey of all AM stations on the stereo issue.

"At first blush, this (the multimode receiver standard) is not the sort of thing I see the Commission leaping into," Hassinger told RW.

In any case, FCC officials have indicated that a Commission ruling on receiver standards would have to be backed by Congressional legislation. Other similar noninterference receiver standards, such as the all-channel TV receiver act in the early 1960s, which re-

quires all TV sets to feature all VHF and UHF channels, were backed by an Act of Congress.

## Congressional authority needed

Eb Tingley, the engineering head of the Electronic Industries Association (EIA), which represents receiver manufacturers, said that in order for the FCC to set a multimode AM stereo receiver standard, it would have to be granted "new authority" from Congress.

The "Goldwater Bill," Tingley said, authorizes the FCC to set some interference and radiation standards for receivers. However, it does not deal with issues such as whether receivers must offer both AM and FM bands, or whether they must offer stereo compatibility.

Congress, he added, had to give the FCC authority to implement the all-channel TV standard.

The situation is different in Canada, where that nation's Department of Communications may formally adopt the C-QUAM standard early next year, following an endorsement from the Canadian Association of Broadcasters. The association also asked the government to set minimum AM receiver performance requirements.

Even though the FCC does have the power to regulate some aspects of receiver interference standards, Tingley maintained that the EIA "does not like the idea of mandatory receiver standards as a general principle."

Although he would not comment on

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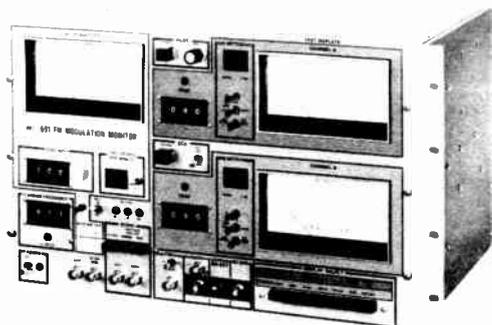
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# Multimode Receiver Plan Filed

(continued from previous page) the specifics of the Press petition, he said that EIA would work to keep "the manufacturers' options open" in the AM stereo arena.

However, Bruce Franca, an engineer with the FCC's Office of Engineering and Technology (OET), said that the Commission's ability to set receiver standards is open to interpretation. The Communications Act of 1934 may give the FCC enough "latitude" to set future noninterference-related transmission and receiver standards "where deemed necessary."

Yet, he maintained, that authority could be weak and open to challenge.

NAB Engineer Mike Rau added that his organization has no plans to campaign for the manufacture of more multimode AM stereo receivers. However, the NAB has gone on record in the past in favor of multimode receivers, he said.

The NAB has been encouraging AM stations to go stereo, but has not taken a position on whether the Commission should set a transmission or receiver standard.

## Kahn, Motorola respond

McAllan said Press has sent its proposals to both Kahn and Motorola. He indicated that Kahn Communications may support the proposal.

Several other industry sources also in-

## RF Noise

(continued from page 2)

posed labeling program on the grounds that it "could imply that a standard had been developed that would assure the proper functioning of a home electronic device in the proximity of a properly operating licensed transmitter."

The ARRL, however, held that "a review of the wording of the two alternative labels makes it apparent that a choice between them requires no threshold engineering evaluation, but rather a factual assertion one way or another."

## Continued monitoring

In its denial of the labeling petition, the FCC said it would "continue to monitor" the ANSI ad hoc committee to determine the effectiveness of its efforts to create an "industry-developed standard with voluntary compliance."

The Commission said it would consider setting mandatory standards and provide for enforcement if voluntary efforts do not produce enough RF susceptibility control "within a reasonable time frame."

Until that time, the FCC maintained, "intervention in the matter ... would appear to be premature."

Imlay said that, because the Communications Amendments Act did not legislate the issue, the ARRL had no hope of overturning the dismissal of the labeling petition in a court of appeals. He added, however, that the proposal would be resubmitted at a later date.

For additional information, contact Christopher Imlay at the law offices of Booth, Freret, and Imlay: 202-296-9100.

dicated that, in light of the current AM stereo deadlock and the continued numerical lead the C-QUAM system maintains, Kahn may well rally its forces behind a call for a multimode standard.

“*McAllan had said that Motorola may not be too thrilled at the plan, since the corporation could lose its opportunity to establish the single US standard.*”

One industry source said he was surprised to find that the owners of a C-QUAM station, and not a Kahn station, were proposing the multimode receiver standard.

Kahn Communications President Leonard Kahn could not be reached to comment on the Press proposal.

Motorola AM Stereo Manager Frank Hilbert said that while the multimode petition could result in a "constructive" assessment of the AM stereo situation, he maintained that multimode technology has already failed.

"I don't know of any successful multimode system," he said. "Receiver manufacturers have had their shot and have failed." He pointed out that fewer than 2% of the AM stereo radios produced are multimode, and he said that percentage is declining.

Motorola's November bulletin mailed to C-QUAM stations was highly critical of the Sanyo multisystem integrated

circuit.

"The reasons for rejecting the concept are as strong as ever: cost (including a much higher royalty loading), size, complexity, number of external components, technical performance, pilot tone reliability, production testing, servicing, lack of a second source, etc. etc.," the bulletin indicated.

McAllan had said that Motorola may not be too thrilled at the plan, since the corporation could lose its opportunity to establish the single US standard. However, he indicated that any plan that would convince the 90% of the US AM stations that haven't yet gone stereo to make the switch would mean more AM stereo business for Motorola.

Texas President Glen Clark, whose petition for an AM stereo transmission standard still awaits FCC action, said that he and McAllan "had the same goal

to improve AM radio," even though they were taking different courses.

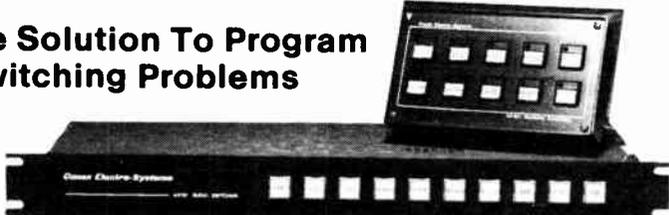
However, he said he doubted that receiver manufacturers would back the multimode plan because it would be "cost prohibitive" to install multimode chips that automatically sense whether it is receiving a Kahn or C-QUAM signal. Sets equipped with a manual switch would be less expensive, he said, but consumer confusion would cloud that prospect.

"The future of the AM stereo issue in the US rests with the outcome of the NTIA report," Clark said. "Until now we've had no national pulse or tabulation of the (AM stereo) situation."

For more information on the petition, contact Robert McAllan at Press Broadcasting: 201-774-7700. Contact Kahn Communications at 516-222-2221, or Motorola at 312-576-5304.

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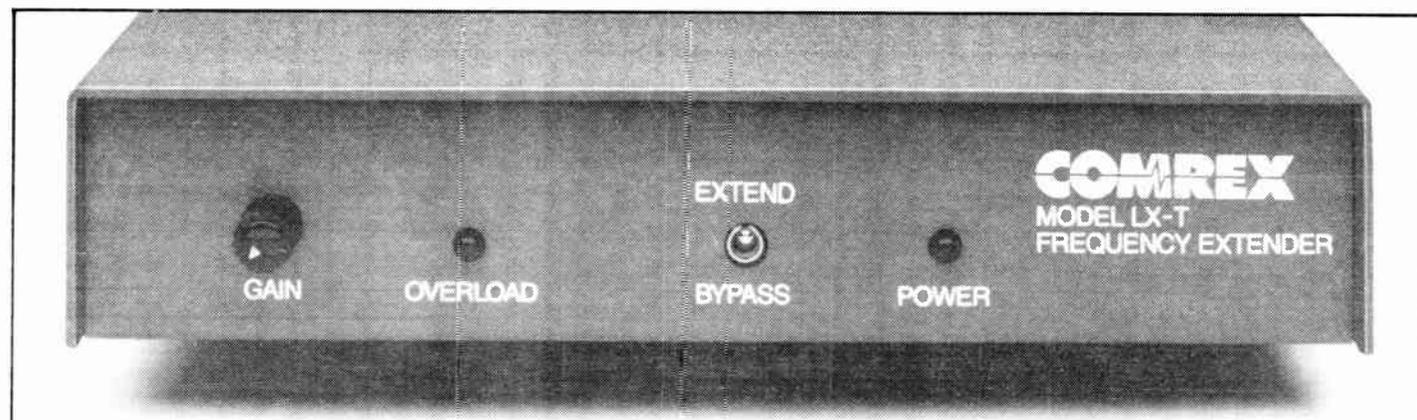
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Circle Reader Service 32 on Page 31



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# '86 Radio Financial Report Out

by Alex Zavistovich

Washington DC . . . Average total salaries in radio last year comprised between 36.1% and 51.7% of the total expenses for stations in various market sizes, according to the recently released NAB 1986 Radio Financial Report.

The report, which provides more than 12,000 findings and over 100 tables, includes findings on station types (AM full-time, AM daytime, AM/FM and FM), market sizes, station sizes and formats.

“

*Of the survey's 128 daytime AM respondents, for example, 4.9% of station expenses went to the engineering department.*

”

Of the survey's 128 daytime AM respondents, for example, 4.9% of station expenses went to the engineering department, a cash average of \$10,945 yearly. By comparison, the 333 fulltime AM stations responding to the survey indicated that 5.8% of their expenses went to the engineering department, or an average of \$87,784.

AM/FM combos directed 5.7% of their total expenses, or \$70,946, to engineering, while FM stations spent 4.1% on engineering, an average of \$66,181.

The report defines engineering expenses as "the direct costs of operating and maintaining studio and transmitter

equipment, including salaries, wages and bonuses."

The survey data are presented for station managers and other interested parties to compare individual station performance, according to NAB Financial Analyst Cynthia Stanley.

## Management tool

A GM might use the report as a "management tool," Stanley said, to determine where his station fits in the most apt category. Revenues in the station's population range might be compared with other stations in the market, she suggested.

In preparing the report, the NAB sent questionnaires that requested information on stations' 1985 revenue sources, departmental expenses and specific line items. Stations were assigned population categories either by their Arbitron radio metro area population or by the number of people in the county of license.

According to the NAB, of the 8,606 stations on the air during the survey, "1,336 facilities representing 1,901 radio stations completed the survey."

The survey's response rate was 22.1%, which was low, admitted Stanley. According to the report, "past studies have shown that this annual survey tends to produce higher response rates among stations in larger markets and those with higher revenue."

The survey is mandated to have a response rate above 30% for next year, Stanley added.

## Report categories

Each table in the financial report breaks down its findings by average response, 25th percentile, 50th (median) percentile and 75th percentile of responding stations in each revenue and expense

category. The study shows the 75% category, for example, as having "revenue or expense equal to or greater than that of 75% of responding stations."

The total salary expense is a new item in this year's report, the NAB said. Other entries include revenue sources, departmental expenses (which involve depreciation, amortization and cost of broadcast rights), and advertising department expenses.

Average advertising and promotion departments represented between 2.5% and 15.1% of total expenses, depending on the nature of the stations and markets covered in each table.

As a percentage of total time sales, the

NAB said, local advertising ranged from 70.5% to 91.1% of the stations reporting for different market sizes. Tradeouts and barter show less variance, the report indicated, with stations reporting an average range of 2.1% to 6.3%.

According to Stanley, next year's survey will be conducted with the assistance of a "big-eight accounting firm," Stanley said. Although Stanley said no final agreement had been reached, she said the study may possibly be carried out as a joint project with Broadcast Financial Management.

The NAB's 1986 Radio Financial Report is available from NAB Station Services: 800-368-5644. The price of the survey is \$95 for members and \$195 for nonmembers.

For additional information, contact Cynthia Stanley at 202-429-5377.

## NAB, Exhibitors Plan '87

(continued from page 7)

Ungerleiter stressed that most of the floor and space decisions for the 1987 Dallas show have already been decided. He said he hopes the committee's input can modify the NAB's procedures for future spring shows. "We are trying to develop guidelines for 1988 and beyond," he said.

The 1987 NAB show will feature four full days of exhibits, from Saturday to Tuesday. Some exhibitors complained that they did not like having two weekend days as exhibit days because attendees had to miss personal and family time rather than business time to attend exhibits.

The NAB has announced that the theme for its March 1987 show will be "Broadcasters . . . Serving Local America." Because the show will start on a Saturday instead of Sunday, the engineering conference will begin on Friday, instead of Saturday as in previous shows.

For more information on the exhibitors issues, contact Al Fisher at Ampex, 415-367-4161, or Ed Gayou at the NAB exhibits office, 314-721-7717. For information on the 1987 NAB show in general, contact Bob Hallahan at NAB: 202-429-5350.

## Procedures Toughen

(continued from page 3)

provide protection from interference to other stations.

Once an antenna is built and tested, however, its pattern may not be the same as was filed in the CP, he noted. In those instances, he added, filings may need to be readjusted.

When applications become a two-step process, some groups may be quick to find fault with the consulting engineer for not specifying a greater radiation pattern, Reiser said. However, he contended that proper filing of applications must be a "three-way responsibility" on the parts of the station, the consulting engineer and the antenna manufacturer.

The consulting engineer may be at fault for not having more detailed information, Reiser noted, but antenna manufacturers must also be responsible for providing more than just average data. Station management must also examine antenna pattern claims more closely, he added.

For additional information, contact John Reiser at the FCC: 202-632-9660. Contact Louis du Treil at 202-659-3055, or Jules Cohen at 202-659-3707.

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Circle Reader Service 5 on Page 31

# Learning to Handle Delegation

by John M. Cummuta

Chicago IL . . . The platoon was pinned down at the base of the hill. Machine-gun fire swept across the tops of the fox-holes. The lieutenant in command was on the radio with his commanding officer.

"Lieutenant . . . we can't wait any longer to take that hill. Now I want you and your people to just charge up there, right in the face of that fire, and secure your end of the flank."

"Yes, sir!" The radio clicked off and the lieutenant turned over his shoulder. "Sergeant! We can't wait any longer to

## Engineering Manager

take this hill. Now I want you and your people to just charge up there, right in the face of that fire, and secure our end of the flank."

In the corner, the corporal turned to a private. "The boy sure knows how to delegate, don't he?"

That, unfortunately, is many people's concept of delegation—passing the buck downward. Still another group, usually new bosses, misunderstand delegation as a downward relinquishment of their new-found authority to someone who didn't earn it like they did.

According to the *American Heritage Dictionary*, to "delegate" means to authorize and send a person as one's representative. So, in a sense, it is a handing off of one's authority. The misconcep-

tion, however, usually lies in the emotions that surround delegating. People generally don't "feel" comfortable when someone else is representing them—when their capabilities are judged on the performance of someone else.

What makes this doubly hard is that a person is usually promoted because he or she is the best at performing whatever

task is being managed. So this new boss is now in command of a department or function, staffed with people who weren't as good at the job as he was—or they would have been promoted.

Our new boss now faces the frustrating reality that no one down there is likely to do the job as well, as quickly or as efficiently as he could. He sits at his

desk feeling that his performance as a boss is being judged by the performance of his department, yet the best player isn't even in the game—sort of the "Pete Rose" syndrome. Feeling he was the best player on the team, Rose couldn't delegate the playing solely to his players; he has tried to be both boss and employee.

*(continued on page 12)*



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John Cummuta is RW management editor and GM at WCFL, Chicago. Call him at 312-963-5000.



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# Learning to Delegate

(continued from page 11)

The crippling fallacy lies in the mistaken concept by the new (and sometimes not so new) boss that he's still being judged by the same criteria he was judged by when he was one of the worker bees. Only in the smallest organizations might this be the case. Generally, the boss is examined in light of a completely different set of standards. One of those is his ability to delegate.

Delegating is the definition of being a

boss.

Being a boss means that the most valuable use of your time is usually in doing such things as conceptualizing, planning and controlling. In other words, you can't be bogged down in the trees or you won't be able to see the forest.

If you are a boss, how many fires have you found yourself putting out—just like you used to when you were one of the guys—and you thought, "I could set up a system to avoid this, if I just had a lit-

tle uninterrupted time to think it through?"

You might also wonder how many great new opportunities you've missed because you didn't have the free-form time to just mull them over; you were too busy going through the motions of the job.

Another reason for delegating is the simple fact that, with more people tackling the various projects, you'll get more done.

But probably the most important reason for delegating is that you'll develop your people. Earl Nightengale, the great motivational speaker and writer, while

vacationing in Australia, noticed while out along the offshore reefs that the coral on the calm lagoon side of the reef was dull, while the side that faced the surf was awash in vibrant colors.

The guide explained that the tiny ocean creatures which formed the coral barriers thrived and grew when challenged by the surging tides and turmoil. But the organisms on the inside of the reef, where the water was calm, were weak and grew much more slowly.

The same principle holds for your employees. If you handle all the challenges, stresses and tensions of your department or station, you're denying them the fire that will temper the steel of their character. You're denying them growth.

## Obstacles to delegating

Almost without exception, the major obstacle to effective delegation is the feeling that "I can do it better myself." After all, you're the best—that's why you're the boss.

While that's probably true, it's a fallacy to think that doing all the major or difficult tasks yourself is the way to get the best performance out of your department. You can't do everything, and the overall performance level of the department will be held below what it would be with everyone pulling equally on the oars.

Many new managers haven't yet realized that they are no longer being judged by their individual performances, but rather on the overall record of their department or station. In other words, they are being judged more as a leader than as a worker. The question is: "Are they developing their people to do their jobs well?" not "How well are they doing all the jobs themselves?"

Whether or not we'd like to admit it, another common barrier to delegation is the insecurity or fear that someone down there in the workforce might actually outshine us. The new manager needs to develop an understanding that any enlightened management or ownership will credit them for developing a newly capable employee under them.

## Benefits of delegation

The first benefit of delegation is higher departmental productivity. With more people performing meaningful and important work, more good things happen per unit of time. It's simple math.

Another positive result of regular delegation is a redundancy of experience in the department. The more people who have an opportunity to take on the challenges of whatever area you manage, the more people who can fill in for each other should the need arise. No job will remain undone just because a certain person isn't there.

You'll find that regular delegation produces happy and fulfilled employees. The more responsibilities, challenges and obstacles employees get to face—within reason—the more valuable they see themselves to the organization. This raises self esteem, and thus morale and productivity.

Finally, assuming that you got promoted into your present job because you're a born leader, you'll probably be promoted again. If you've been a delegator, you'll already have prepared your successor—and that's good management.



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"AM Stereo is the most phenomenal sound I've heard in 40 years of owning this station.

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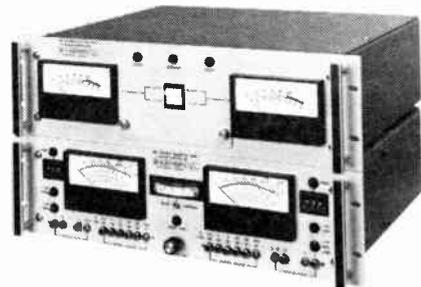
work the way it should. Literally trouble-free. Plus, it's got the numbers to back it up: over 65 systems operating in the U.S. and worldwide.

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## "Next Time You're In Annapolis . . ."

"Stop by and I'll personally give you the deluxe station tour.

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DELTA ELECTRONICS



# How to Avoid Stylistic Crutches

by Tyree S. Ford

Baltimore MD ... Two months ago, "Producer's File" started its own equipment poll. The four questions asked were:

1. What mic or mics are you using in your air or main studio?
2. What mic or mics are you using in your production studio?
3. What mics would you like to be using?
4. What mic have you tried and not liked, and why?

After all the counting was done, the two mics most in use tied for first place: the Electro-Voice RE-20 and the Shure SM7. (Current list prices per Radio Resources, Inc. are \$545 and \$542, respectively.)

Other mics that were on people's wish lists were the Neumann U 87 (\$1,100) and the AKG C414EB (\$895).

Both winners are dynamic mics, and both are condensers.

Many respondents mentioned that they liked the Sennheiser 421 and 441, but found their EQ adjustments too accessible and too easily tampered with. Tony Tudisco of Sennheiser's New York office asked me to remind you that the 441-U3 comes without the adjustable EQ feature. Perhaps a locking device or cover would further increase the 421's acceptability.

I'd like to hear from you 421 users to learn if the variable EQ is a problem for you, and how you handle it.

Bernie O'Brien of Radio Resources, Inc. mentions that he drilled a small hole thru the EQ ring and inserted a set screw to prevent the ring from being moved. I doubt Sennheiser would accept repair work for a botched job under their warranty.

Incidentally, Sennheiser has brought one of their older dynamic designs out of the vaults this past year; it's the MD 409 U3 (List price \$249), a classic design that's gaining the attention of some broadcasters.

There are many mics suitable for air and production work, with as many reasons for choosing each one. Often the leading reason is cost. If you're in the market to change or upgrade, stay in touch with your suppliers. Earlier this year there was a special on Sennheiser

*Ty Ford, a radio audio production consultant, helps stations optimize their use of production equipment and airstaff skills. Call him at 301-889-6201.*

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One final observation of the poll results. In over 75% of the studios responding, the same model mic was used in both main and production studios. If your studios aren't equipped this way, put it on your list of things to do soon! Matching mics in air and production studios will increase the overall consistency of your air product.

## Producer's File

In the upcoming months, "Producers File" will be conducting a "Mic Off." If there is a mic you would like included in the comparison, contact me as soon as possible.

Now here's this month's poll:

1. What kind of turntables and tone arms are you using?
2. What kind of phono cartridges and preamps?
3. What kind of cart machines and music carts?

Please include any positive or negative comments. As usual, my answer box will take your message as long as you speak. The number is 301-889-6201.

In the same article in which we featured the mic poll, we also talked about mic technique, breath control, projection, resonance and intonation. If you are an engineer, I hope you passed that part of the paper on to the PD or to the airstaff.

Please continue to forward this information as we go further into vocal performance, discovering how the parameters of mic technique combine to become "style," how to recognize crutches

and how to eliminate them.

When an announcer begins a career, he or she begins to polish the elements of performance. Prior to that time—whether in broadcasting school, collegiate mass communications or college radio—those elements are usually still being assembled.

Anywhere along this path, novices may find and use various stylistic crutches that will limit their potential.

There are many types of crutches. All of them leave their print on a person's style. In fact, sometimes a person's style consists of a *collection* of crutches.

An important part of an announcer's job is to bridge together a series of sometimes unrelated ideas while giving the impression that they are all part of a solid stream of consciousness. Crutches often appear where two ideas meet in that stream, such as when the announcer's eyes are in search of the next piece of copy, the next cogent thought, or the correct start button on the console.

Words like "weatherwise" preceding a weather forecast are crutches. You can turn a crutch into a bridge by using *intent*. Instead of "weatherwise," set up the forecast with your calls or aural logo as in, "WLIF weather." Provided you haven't overused your calls earlier in the break, it's a logical place for them. Remember: A crutch can be a bridge, but a bridge is never a crutch.

You may choose the Spartan approach and eliminate as many crutches and bridges as possible. Going directly from the last word of a live tag or liner to, "It's 75° ... " will feel awkward at first and requires you to think ahead. The result is reduced verbal clutter and increased program momentum.

When you become a master of the

transitional elements of a stop set, you will realize that your mind has reached a state of dual awareness.

Part of you is concentrating on reading liners, copy, etc., and the other part is listening to how the whole thing is going while preparing to deal with the next program element.

In this state of awareness, you become your own "Producer." When this first happens, the Producer is usually passive or reactive. While reading a piece of copy, it suddenly occurs to you that you don't have the next record cued up. You're dead!

With practice, the Producer becomes active, and an internal dialogue occurs between the Performer and the Producer. The Producer strongly suggests that you grab a long jingle, a drop in or any other element while you cue up the record. All of this happens *while* you're reading a spot!

To make things even trickier, this dual awareness is rarely ever constant. There are times when, due to the slings and arrows of outrageous fortune, the Producer goes out-to-lunch. On days like this, conscious effort is required to keep things together. Pre-planning stop sets, which you should be doing anyway, becomes absolutely essential.

At least as important as how smoothly the elements are dealt with is the character of your voice. This character varies according to format energy level and the particular persuasion of the PD.

There are several mutant character styles odiously prevalent in broadcasting today: The Puker (pronounced PEW ker), The Big Smile and The Big 'O.' In a future issue we'll take a close look at where these styles came from and why you should avoid them.

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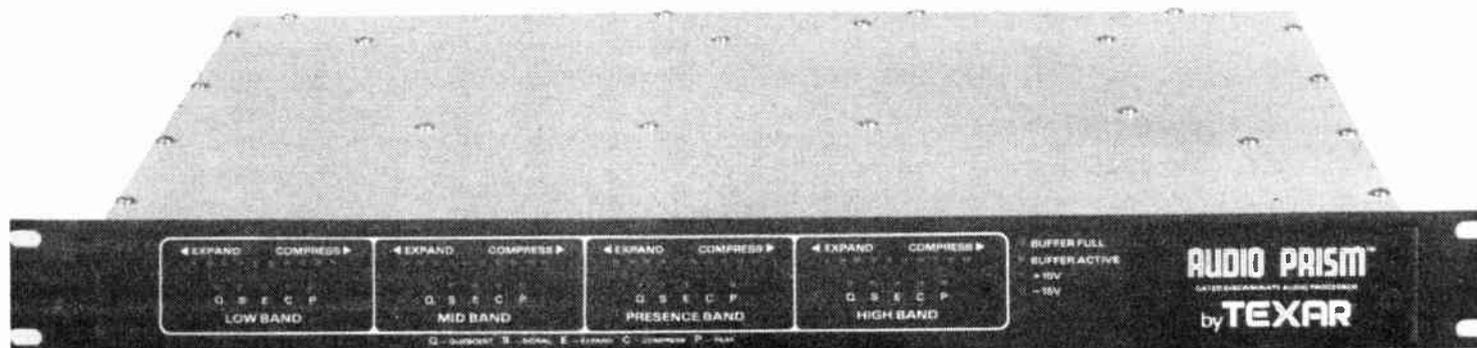
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We designed the RCF-1 in response to many telephone calls from AUDIO PRISM users over the past 18 months. While each call was unique, two recurring questions emerged: 1) "Sometime ago, we bought AUDIO PRISM'S to stand out from the crowd, but the competition has caught on and caught up. Today, they have AUDIO PRISM'S too. What can we do to re-establish our lead?" And 2) "What can we do to get more low-end bass?"

Exploring ways to further increase the modulation power of the AUDIO PRISM/Optimod combination, TEXAR engineers determined that the limiting factor was in the attack and release times of the Optimod. This is not to criticize the Optimod, a well designed and respected unit, but it is to recognize that competitive market situations require many broadcasters to use it in ways other than for

which it was originally designed. Intended to operate on raw, unprocessed, console output, its operation included a generous safety margin to accommodate operator inattention. Face it: not everyone runs perfect levels.

The conservative design of the Optimod prevented these indiscretions from ever getting on the air. But today, many broadcasters precede their Optimod with the digitally controlled AUDIO PRISM. In these cases, the safety margin is no longer necessary. What if you could say to your Optimod, "I'll take care of the ups and downs in average level; you worry about making modulation?" That, in very simplified terms describes the operation of the RCF-1. (Not surprisingly, the RCF-1 should *not* be used in a barefoot Optimod, as there will be no safety margin for an overdriven board.)

Making more low-end bass available to users was a simple extension of the RCF-1. The original card 5 had a predetermined, fixed amount of bass which it would permit. Beyond that, it would reduce the gain of the low frequency stages. As you mixed in more lows on the AUDIO PRISM'S, the Optimod would simply take them right back out. Today, the RCF-1 has a "BASS BOOST" control which allows the user to dial in all the

low-end bass one could want.

Card 5 is a plug in board, so installation of the RCF-1 takes less than 3 minutes. Adjustment takes less than one. No readjustment of the AUDIO PRISM is required.

To install the RCF-1, simply open the front cover and access panels of the Optimod. Turn off the Optimod power switch and pull out the original card 5. Slide the RCF-1 in its place and turn the power back on. Replace the access panel with the new one provided and set the RCF-1 controls to the recommended settings. That's all there is to it. No complicated soldering. No complicated modifications to circuit boards. No readjustment of other controls in the system.

Best of all, this additional power doesn't require giving up quality! The RCF-1 is actually *cleaner* than the original card 5 adjusted for the same loudness, so you don't have to sacrifice quarter hour maintenance for more cumes.

See what the power of the RCF-1 can do for YOUR signal. Arrange for a demo of the TEXAR AUDIO PRISM and RCF-1 today! Already own AUDIO PRISM'S? You can upgrade to the RCF-1 for only \$425, but act fast, because the price goes up soon. Call your favorite distributor, or call Barry Honel at (412) 85-MICRO.

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# Create 'Computer' Voices with Gadget

by Ronald F. Balonis

Wilkes-Barre PA ... My "third best" production device/gadget is what I call the Production Modulator. It's a device that enables the production of pseudo-synthetic, computer-like sound by modulating audio with audio.

The effect's success, like the other two (see the 1 and 15 November issues of RW) depends heavily on the skill and creativity of the production process; because it requires a high degree of listener attention, it can wear itself out quickly

## Chief Engineer

with overuse, but, in moderation and in the hands of creative production types, it is a unique production differentiator for a station.

Modulation in the audio range, as a production effect, basically changes the pitch of a sound, independent of its duration. Depending on the modulating and modulated frequencies, unique, unnatural and curious qualities of aural consonance and dissonance can be generated.

Although many strange and unusual effects can be made by applying a modulation process in the audio band, the primary use for the Production Modulator at WILK has been the creation of a pseudo-computerized-voice effect in real time. For that purpose, a single, low

Ron Balonis is CE at WILK, Wilkes-Barre, PA and a frequent contributor to RW. He can be reached at 717-824-4666.

audio frequency signal in the range of 10 to 30 Hz is used to modulate a voice.

### Tradeoff in articulation

The tradeoff in the use of this Production Modulator, and many other synthetic audio effects, is a loss of articulation in the sound, especially speech. The resulting decrease in intelligibility limits the amount of the effect that can be effectively used.

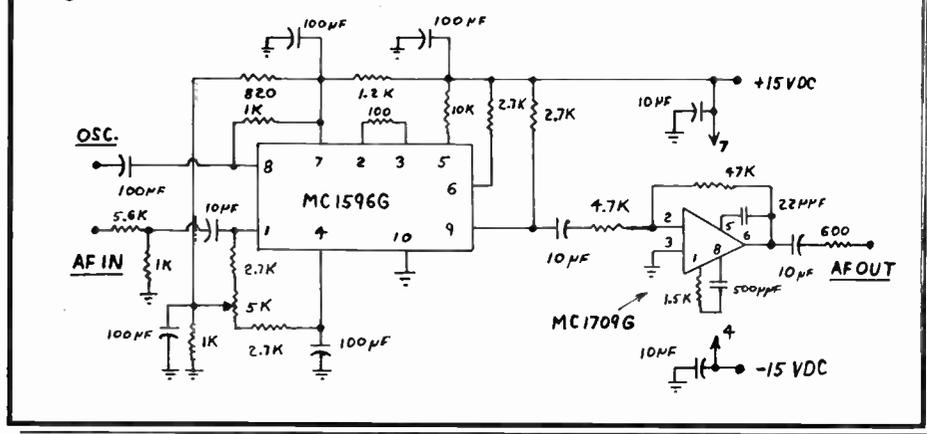
For the Production Modulator, the articulation loss with speech/voice results from the alteration of the natural harmonic relationship in the speech and from the double sideband mix—upper (normal) and lower (inverse)—that the modulator generates. Generally, the lower modulating frequencies produce the more acceptable sound, but the actual best frequency depends to a great extent on the characteristics of the speech/voice.

### One basic IC

The Production Modulator owes its existence and circuit simplicity to a single monolithic integrated circuit, the MC1596G by Motorola. The MC1596G is a balanced modulator-demodulator IC, and, the circuit configuration of the Production Modulator is essentially that given in Motorola's spec sheets. It's the application circuit (slightly modified) for using the IC as a Single Supply Balanced Modulator with the modulating audio as the carrier input and the audio modulated as the modulating input.

The MC1596G is available from Motorola distributors, or from RCA as an SK3233 or Sylvania as an EGC973. The

Figure 1.



output amplifier IC, a MC1709G, is also available from RCA as an SK9177 or from Sylvania as an EGC909.

Circuit layout for the Production Modulator is not too critical; just use the ordinary audio frequency precautions as to shielding and grounding. For ease of null adjustment, the pot should be a multi-turn trimpot of some sort, but it's not absolutely necessary.

### Operation

Operationally, the recommended modulating audio (audio oscillator) level should be about 60 mV. Levels greater or less affect the depth of the null (normally greater than 40 dB down). The modulated audio level should be about 300 mV. In Figure 1, the input pad and the output amplifier maintain the overall gain at near unity.

At WILK, the Production Modulator

interfaces into the production console in the same way as the Phasor and several other production devices/gadgets (spring reverb, compressor, equalizer). These devices, unbalanced at a nominal level of 0 dBm, are switched in/out by a lever switch between the summing amplifier and the output amplifier of the production console.

The production device connection scheme, with proper shielding and good wiring practice to avoid ground loops, is an economical way to have a selection of audio effect devices for production while at the same time simplifying the way to use them.

The Production Modulator provides an easy way to generate the occasionally needed computer-like sound or speech. However, it, like the Phasor, is a pseudo-approximation of the true effect. The key

(continued on page 19)

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## Contract Engineering

# Troubleshoot FM 5K, 20K, 25K

by Steve Conover

LaVista NE ... One of the possible causes for AM noise generation from the FM-25K transmitter can be directly traceable to two factors: voltage differences

between the regulated IPA module voltages and the voltage difference between the unregulated IPA supply voltage and the module regulated voltage.

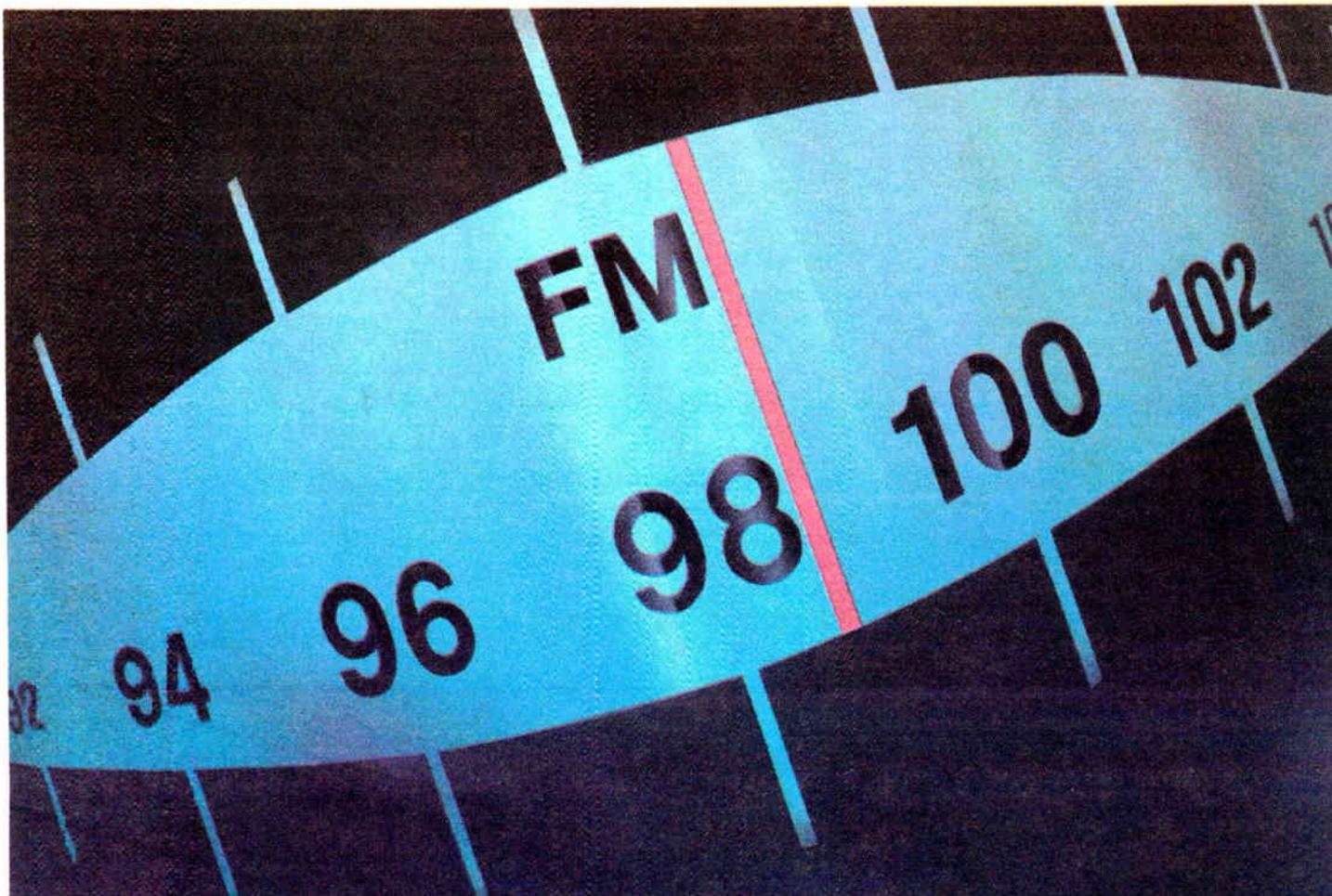
Before analyzing these two points, it is first advisable to read and fully under-

stand the principals of operation regarding the complete section IPA section of the FM-25K transmitter.

As the load presented to the voltage regulators within each RF amplifier module is increased—or, in other words,

more power is being demanded of the amplifiers than is really necessary for proper operation—a difference between the unregulated and regulated voltage is reduced toward a zero value.

Under normal operating conditions, the difference between the regulated and unregulated should range from 5-8 V, with a nominal voltage of 7 V being the ideal. When a condition of an excess of 8 V exists within any given RF module, overdissipation of the pass transistor heat  
*(continued on next page)*



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Circle Reader Service 50 on Page 31

## TV Put to Good Use

by Steve Bromell

Casper WY ... Contrary to popular belief, television does have a socially redeeming value. It can be used to fix radio stations.

I'm sure many of RW's readers have sat at a transmitter site just waiting for some creepy little intermittent to blow the rig off the air, only to have it happen when their back was turned while they got a fresh cup of coffee (beer in some areas of the country). Then they get to sit for another couple of hours staring at the meter that will give them a clue—only to have the rig behave itself.

Try this. Our company does it frequently, so I can deduct my new camcorder on my taxes as a business expense. Set up a video camera and recorder and tape the meter or meters in question.

Aside from just taping the thing, there are several other tricks you can pull at the same time:

- If the recorder has an "on-tape" counter, you won't have to look forever for the event; merely go to the place on the counter that corresponds to the outage time you noticed on your watch while you were laying on the sand at the beach.

- When playing back the tape, the slow-motion and stop action features allow you to see fast meter deflections that may not be detectable at normal speed.

- Most recorders also have remote control start and stop for those occasions when the problem only happens at certain times of the day.

There are a couple of things to remember, though. A camcorder doesn't have the recording time of a separate recorder/camera combination, because camcorders record at high speed for best quality.

Conversely, recorder/camera combinations, particularly when run off AC, can be vulnerable to strong RF fields. Try before you buy.

Finally, if you also use the machine for personal purposes, be extremely careful of which tapes you leave here and there around the station (except in Nevada).

Steve Broomell is president of Broadcasters Service Company, a consulting/engineering firm in Casper, WY. He can be reached at 307-266-2107.

# Contract Engineering

## Troubleshoot Xmtrs

(continued from previous page) sink for the given module will be exceeded because the heat sink is limited to an 80-85 W of heat dissipation.

When the difference voltage is below 5 V, thermally induced noise voltages and reduced ripple rejection ratios of the regulator IC begin to approach a point where the AM S/N begins to deteriorate the overall performance from the transmitter.

When the IPA section is operating below its nominal operating point, which would increase the difference voltage above the 8 V upper value, the voltage regulators may have a tendency to inject electron shot noise into the RF amplifiers because of the high gain present within the load sensing loop.

Should the difference be less than 5 V, reduce the drive from the exciter slightly while monitoring the performance of the IPA forward and reflected power and the final output power from the transmitter. This reduction in exciter drive may require a slight retuning to reestablish correct operating balance. Reducing exciter drive will reduce the demand load upon the regulators and therein increase the difference between regulated and unregulated voltages.

In both cases, exciter drive into the IPA section, IPA drive into the final amplifier and final amplifier tuning and loading are important variables that must be carefully monitored during the process of operation in order to obtain the best AM S/N versus transmitter efficiency and RF power output.

When the tuning of the final amplifier has been completed, remeasure the unregulated IPA supply voltage and the regulated voltage from each IPA module and compare the results.

If reducing the exciter drive does not increase the differential voltages without the loss of transmitter output power, then retap the T-zz primary to obtain the  $7 \pm 1$  V.

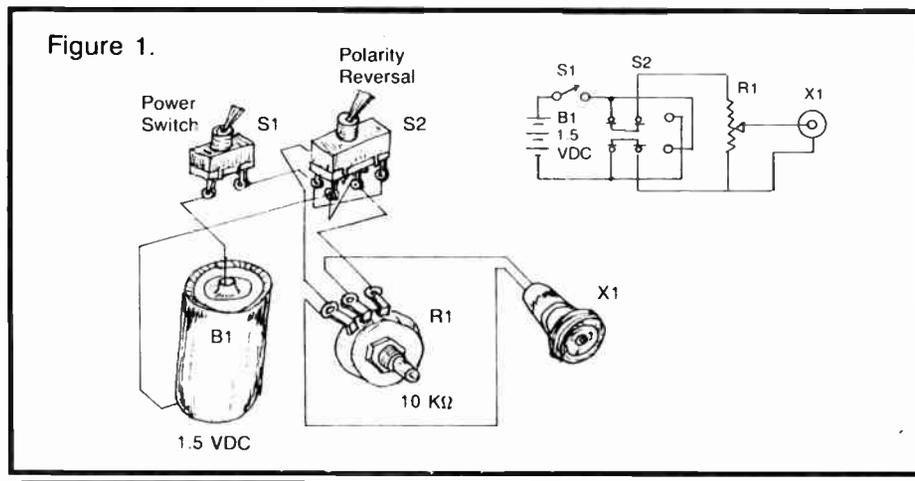
For the FMD-50K dual transmitter, if the difference between the unregulated to regulated voltages is above 8 V, adjust R-pp to reduce the difference to around  $7 \pm 1$  V.

Once this has been accomplished, the next step will be to make small variations in final amplifier tuning and loading controls while monitoring for AM noise reduction and yet maintaining the best efficiency from the transmitter.

This procedure is a *trade-off* function, which means when you try to tune the system for the least amount of AM noise generation, the trade-off will come from the efficiency portion of the transmitter's operation. As with all trade-offs, you will need to keep efficiency as close as possible to the original test data sheet values and still attempt to lower the noise.

There can be no clear-cut statement regarding the amount of efficiency loss that can be tolerated from the FM-25K; therefore, good engineering judgment must be adhered to.

The following procedure may be used to either test or reestablish a VSWR over-



load point for most Harris FM transmitters using diode detection of the forward and reflected RF power to operate the VSWR overload circuitry.

### VSWR testing: Harris FM-5K-FM-20K

A word of caution regarding the increasing or decreasing of transmitter power output: to accurately retune the transmitter to a new operating power, the engineer must have a calorimetered dummy load of known characteristics. Without such a load, you will have no real way of knowing just how much power the transmitter is actually providing to the antenna.

The use of commonly available dummy loads for the purpose of calibrating

the transmitter output power are not normally accurate enough without being first calibrated against a traceable standard. Without this load, there is no way for the engineer to know accurately just what power the transmitter is generating and, therefore, the installation could be operating above or below the assigned power, which can lead to other problems.

Use of the indirect method of power calculations may be used, but *only if* it can be proven that the percentage of transmitter efficiency is accurate.

For the purpose of this test, the use of the transmitting antenna can be used if there have been no major changes in the (continued on page 18)

Steve Conover is a radio consultant and contract engineer with Calhoun Engineering Services, LaVista, NE. He can be reached at 402-339-8743.

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# Test, Maintain Xmtrs

(continued from page 17)

system since its installation. The substitution DC supply (see Figure 1) can be constructed from a single-cell battery, a 10,000 ohm potentiometer, female single-conductor high impedance microphone connector, power switch (SPST) and polarity reversal switch (DPDT). The entire unit can be built into an appropriate bud box for convenience of operation. I have added the polarity reversal switch into my unit to

improve the unit's flexibility in coping with other transmitter RF sampling systems.

The procedure is like multiplying a mathematical formula by one on either side of the equal sign; the resultant is still the same. What you will be doing is much the same procedure. You will substitute an external DC voltage for the DC voltage sample from the transmitter's thru-line pickup probe.

An indication of equality between the

probe voltage and the substituted external DC voltage will be the power meter on the transmitter.

Assuming everything else is OK, the testing or resetting of the VSWR trip point is accomplished as follows:

1. With the transmitter at its normal operating power, verify the forward power meter is calibrated to indicate 100%, or the assigned power output if the meter is calibrated to indicate watts. If the forward power has not been changed, no adjustment will be necessary.

2. Ensure the transmitter tuning is accurate by monitoring synchronous (or in-

cidental) AM noise on the modulation monitor. Make minor adjustments to the transmitter's tuning, looking for a dip in the AM S/N indication on the modulation monitor.

3. Shut down the transmitter and remove both red (forward) and yellow (reflected) power sample connections from the transmitter's directional coupler.

4. Be careful while removing these connections. Grasp the body of the connector with one hand while turning the connection ring with the other. In the center of the connector is a 500 pf RF bypass capacitor that resembles a phonetic insulator. This capacitor is delicate and can be easily broken.

5. Substitute the DC battery voltage into the red forward power sample connector and adjust the supply pot for an indication of 100% forward power, then reconnect the red connector to the transmitter's directional coupler.

6. Without disturbing the supply pot setting, apply the voltage to the reflected yellow power sample connector and ad-

“ “  
*The procedure is like multiplying a mathematical formula by one on either side of the equal sign.*  
 ” ”

just the VSWR calibrate pot for an infinite meter indication or full scale, whichever is proper for your transmitter.

7. Switch the forward/VSWR/VSWR Cal. switch to the VSWR position. At this time the power meter should be beyond the full scale indication. Now adjust the DC battery voltage for a VSWR indication of 1.5:1.

8. With the DC substitution supply still connected to the reflected yellow connector for the metering circuitry, restore the filament power to the transmitter and adjust the PA VSWR overload threshold set pot until the transmitter VSWR overload light just extinguishes. Make note of the position of the pot and again adjust the pot until the VSWR light just illuminates. Next, set the pot back until the VSWR light just extinguishes and leave the pot in that position.

9. Reconnect the yellow reflected power sample connector to the directional coupler. Remember to hold the body of the connector with one hand while turning the threaded ring with the other hand to prevent damage to the 500 pf bypass cap in the body of the connector.

10. Turn on the high voltage supply for the transmitter and bring it up full  
 (continued on page 19)

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## New Products

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Inovonics has introduced a new FM stereo generator with provision for FMX™, the coverage-extension system developed jointly by the CBS Technology Center and NAB.

The firm's Model 705 features digital

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entire range.

The FMX™ system is available as a plug-in option for the 705 Generator.

For more information, contact Inovonics at 408-458-0552.

## Put Transmitters to Test

(continued from page 18)

power and verify the forward and reflected power indications on the transmitter's power meter.

### Variations with other xmtrs

Many older transmitters do not have any VSWR overload indication lights. Generally, older transmitters don't include VSWR overload protection circuits in the first place. For those older units, this procedure won't be of much service.

Some transmitters do include VSWR overload protection circuitry that has basic adjustment procedures. Those procedures should be outlined in the maintenance section of the technical manual. Typically, the adjustment circuit comprises a low resistance potentiometer across the VSWR overload relay, or the DC reference input to a voltage comparator IC will be the adjustment pot.

This procedure will work well for the Harris FM-5K through the FM-20K series transmitters. In the field, I have found the accuracy of this method typically will exceed the accuracy of the meters used for power output indication.

For other transmitters, it may be necessary for you to study the documentation to fully understand the method and calibration of the VSWR overload protection provided within your transmitter. If the information is not clear or is missing altogether, which is not uncommon with most products on the market today, consult with the manufacturer for the details necessary.

The majority of the adjustments and alignment procedures used on many of

the transmitters today are simply common sense applications of basic engineering test methods. In the manufacturing of products, the cost of test equipment is also important, and if something simple will yield accurate results without major financial investment for test instruments, it is in the best interest of the manufacturer to follow the least-cost route.

There are many such test methods available to you, the engineers on the front lines of broadcasting. In future articles, I will endeavor to share some of these methods and practices with you, to save you time, cost and improve the reliability of the equipment you maintain.

## Modulator

(continued from page 15)

to effective use of this (or any other sound effect, for that matter) is to keep in mind that a sound's sound is as much an in-the-head perception as anything else.

Production devices/gadgets have their place in production, but there is one practice and skill that's necessary to effectively put them and everything else together into a finished product.

Since the beginning of reel-to-reel tape, to splice or not to splice is never the question. In audio production, it's the rule and the true way to a creative synthesis. Tape editing and splicing will be the subject for the final installment on some of the audio production tools I have known.

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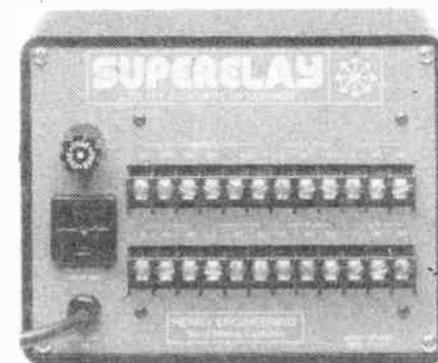
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Henry Engineering's new multipurpose control interface unit has wide application in a typical broadcast control room. It is designed for controlling the various equipment functions that need to be switched when, for example, a control room mic is turned on. Examples include: EBS receiver mute, intercom speaker disable, telephone bell disconnect, skimmer recorder start, On Air warning lights, and so on.

Superelay can be controlled by any console's "muting" output, or by any external switching circuit. It provides six double-pole relay outputs, plus a switched AC output that can directly power 300 W of On The Air tally lights.

The AC is switched with a solid state synchronous relay so there are never



any pops, buzzes or arcing. Superelay can also be connected to any dial-up telephone line for control of external equipment when the line rings. It is available from most equipment distributors for \$195.

For more information, contact Hank Landsberg at Henry Engineering: 818-355-3656.

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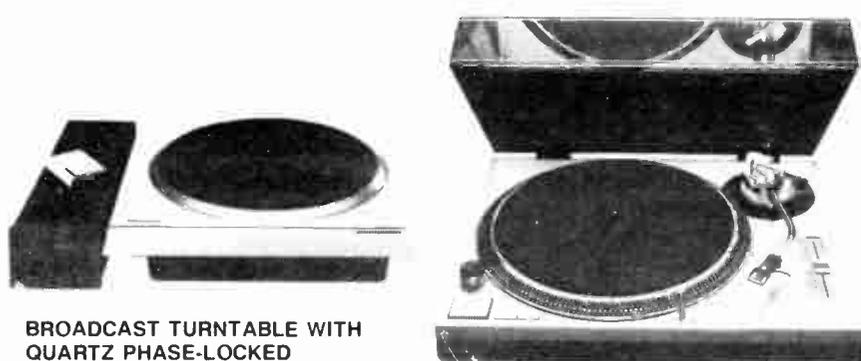
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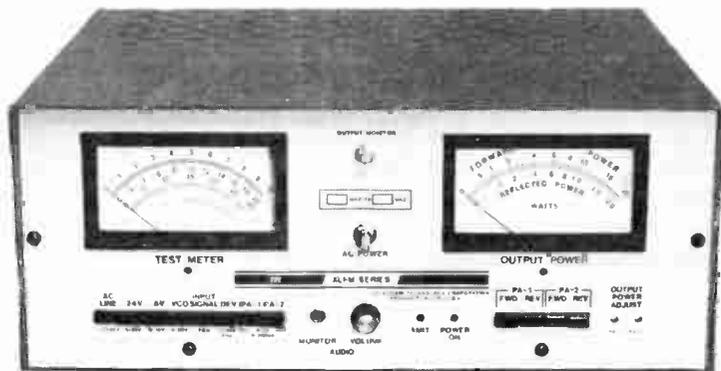
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# Buyers Guide

Cart Machines

## Series 3000 Endures Abuse

by Michael R. Fleming, CE  
WTTS-FM/WGTC-AM

Bloomington IN ... Broadcast Electronics' Series 3000 of cart machine is changing the old adage from "You get what you pay for" to "It's possible to get more than you bargained for."

This series features a well-designed head bracket assembly, straightforward electronics and a clearly written instruction manual. And, most important, the Series 3000 is extremely reliable.

### User Report

Today's engineer needs to be more concerned than ever before with budgeting, maintenance man-hours and inventory. BE's 3000 cart machines are relatively low cost, easy to repair and (due to mostly standard parts) have low inventory needs.

#### Less expensive to buy new

When WTTS/WGTC prepared to move to new facilities, we decided that equipment consistency was important. We knew that, due to an increased number of studios, more equipment was needed.

The question was whether to add to

the cart machines we already had or opt for all-new machines. The machines on hand tended to run hot, causing cart warping, premature electronic failures and unstable operation.

All-new and different machines seemed in order. We purchased 20 playback and five record/playback 3200 machines. Surprisingly, we spent less money on the BE 3200s than if we had added to the machines we already had!

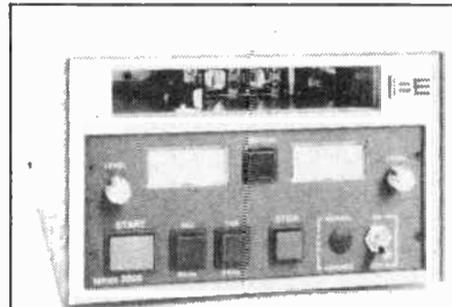
WTTS/WGTC now has two on-air studios, two two-track production studios, two news studios and a four-track studio. All are equipped with BE's 3200 cart machines.

#### Durable, easy to maintain

The head stack of any cart machine is the heart of its performance. The head stack of the 3200 is made of a diecast aluminum alloy, making it very rugged. The azimuth may be adjusted without affecting the zenith or height, and there are no azimuth lock-down nuts to change it after it has been set.

BE's precision spring provides the counterforce necessary to maintain stability. Stability remains true even under the stress of "slam dunking" the cart into the machine.

The 3200's simplicity, too, is an advantage. There are no microprocessors or exotic circuitry involved in starting or



Broadcast Electronics' 3200 RPS cart machine

stopping the machine, generating or decoding cue and auxiliary tones.

Components are of the garden-variety type, i.e., LM3900, RC4558, IN4005, MC7824 and others. All are easily replaced. Capstan motor bearings can be purchased from BE or at a good motor bearing house, thereby bringing the cost of rebuilding a motor down to \$10 to \$15.

The 3200 is one of the easiest machines to repair, but its reliability reduces the number of repairs necessary.

All indicator and control functions, and all cue track input and outputs are available on the rear panel as standard

features. The 3200 has some factory options, such as voltage and frequency other than 115 V/60 Hz, automatic/manual fast forward, secondary and tertiary cue tones, rack mounting (desk top, standard), and will accept NAB sizes A and B cartridges.

In my opinion, the only drawbacks to the 3200 are the lack of a flashing indicator advising the operator that the cart has already played, and the need for a start/stop control interface between many consoles and the machines.

To date, no problems have occurred due to the lack of an indicator, but the addition of this feature would be handy. We used an ordinary NPN switching transistor to provide the interface.

In all, WTTS/WGTC is extremely pleased with Broadcast Electronics' Series 3000 cart machines. Reliable and cost effective, the 3200 is a cart machine I would recommend to anyone.

*Editor's note: For more information, contact Bill Harland at Broadcast Electronics: 217-224-9600. The author may be reached at 812-332-3366.*

## Omega is a Safe Bet

by Bill Betlej, Dir Grp Eng  
Shenandoah Valley Bdcstg Group

Staunton VA ... The OMEGA cartridge machines from International Tape-tronics Corporation/3M signals the completion of a major upgrading of the ITC product line, utilizing the latest technology available. Just as the DELTA Series replaced the Premium line, so now, too, the OMEGA replaces the PD-II line.

In designing the OMEGA cart machine, ITC had several goals. Obviously one was to meet the lower-priced machine market, but ITC also wanted its machines in that price range to have stereo capability.

#### Exceptional audio

The PD-II was only a mono machine; OMEGA playbacks are available both in mono and in stereo. To make the machines stereo required a beefed-up head stack.

The final design is very close to the head stacks on the DELTA and the 99B ITC units. This alone is a big plus when considering the OMEGA features.

ITC also improved the audio quality by using audio circuitry similar to that used in the DELTA machines. The 5500 Series opamps make the audio practically indistinguishable from that of the DELTA and even the 99B.

Total harmonic distortion (THD) specs are identical for both the OMEGA and the DELTA—1.5% or less. But remember, THD is mostly dependent on the quality of the tape in the cartridge.

We tested with Capitol AA-4 cartridges and exceeded the specs both with a new cart and one known to be good. The same test with a cart known to be over a year old yielded nearly 3% distortion that should be a clue to those

### User Report

of you who are still using cartridges that were wound four and five years ago.

Frequency response numbers are also the same for the OMEGA and its higher-priced sister machine, the DELTA— $\pm 2.0$  dB from 50 Hz to 16 kHz. The DELTA does have a 4 dB advantage in SNR specs over the OMEGA.

ITC boasts that their machines always outperform their printed specs. That was true with the seven playback decks we purchased. SNR never measured less than 56 dB. One machine measured 61 dB!

There are some other novel ideas employed in the OMEGA machines. The power supply uses a toroidal power

(continued on page 23)

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## Buyers Guide

# Tomcat Bares Claws at KNXR

by Tom H. Jones, Pres and GM  
KNXR

Rochester MN . . . The Pacific Recorders & Engineering (PR&E) Tomcat is the first cart recorder KNXR ever purchased.

That might sound like a misstatement for an FM station launched in 1965, but it's true! We bought our first cart recorder, the Tomcat, in 1980.

Coming from a recording studio background, we were accustomed to the clean, wide-range, quiet performance of 15 ips reel-to-reel machines. We were aghast at how commercials recorded in our studios sounded once they were carted and aired by various radio stations.

### Biased against carts

So, when we put KNXR on the air (97.5 MHz, 100 kW, 1,055' HAAT) we already had a built-in bias against carts as a dependable, high-fidelity broadcast medium.

The first two years, KNXR's spots were recorded on acetate discs. Meanwhile, we tested and evaluated numerous cart recorders. Audio consistency from cart to cart was nonexistent. The electronics had very little headroom; there

was a lot of hiss and distortion, poor high-end and plenty of phase shift.

We discovered that if we recorded the lubed cart tape directly on a 2-track reel-to-reel recorder (on the top track), then loaded the recorded tape into an empty cart, we could attain amazingly consistent cart playback almost equal to the reel-to-reel sound. And that is how

## User Report

KNXR made carts for 13 years! Other stations envied our cart sound but shook their heads once they saw how we attained it.

At the 1980 NAB exhibit, the workmanship and aesthetics of the Pacific Recorders consoles really caught my eye. I grudgingly agreed to look at their Tomcat cart recorder.

### KNXR does a double take

I was pretty well resigned to the fact that cart recorders were not even worth considering—that they were a doomed, half-rate audio medium. When I was told that the Tomcat was really a reel-to-reel recorder in disguise, I started to get

interested!

One of the prime reasons we purchased the Tomcat was the elimination of the obsolete, narrow audio track width used in other cart machines in favor of two 80 mil audio tracks which PR&E calls "Maxtrax."

The wide tracks, in combination with a 3 dB higher standard recording level (250 nWb/m instead of the customary 185 nWb/m), produces a noticeable reduction in tape hiss. Add to these novel features the ability to record at 7.5 ips or 15 ips and you really have the beginnings of an audio source that will stand up against a reel-to-reel recorder.

### Sturdy chassis

The mechanical construction of the Tomcat is superb. It is a hand-tooled machine—it doesn't look like it was put together from off-the-shelf components in someone's machine shop.

Heavy-duty, precision-milled aluminum makes for a very rigid chassis. The double-sided, groundplane-shielded printed circuit cards are precisely etched and assembled. They are immediately removable from a convenient card cage. All adjustments are accessible simply by sliding the machine out on its rack

mount.

I am convinced that the circuitry in the Tomcat accounts for its formidable sound. Extensive use of the 5534 high-speed, low noise IC amplifier chip and even the redoubtable Dean Jensen JE-990 opamp in the reproduce circuitry told me this machine was no slouch!

The capstan motor/pinch-roller assembly is impressive. It was specially designed by PR&E, and is custom manufactured. It is an integrated module utilizing a ceramic capstan as part of the DC servo motor.

The pinch-roller mechanism is unique in that it uses a compact, rotary solenoid and an actuator cam to engage the pinch roller. Most other cart machines use a linear solenoid with a chain pulling the pinch roller up into position and some sort of mechanical pressure adjustment. Not so with the Tomcat.

Pinch-roller pressure is adjusted electrically with a pot on the mechanical interface card. Because the rotary pinch roller solenoid is a constant-current device, roller pressure is regulated despite variations in tape thickness or other mechanical factors.

There's even a "cart fail" indicator that illuminates should a cart with too tight a wind be used. An air dashpot on the pinch-roller mechanism keeps engagement and disengagement noise to a

(continued on page 31)

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## Buyers Guide

# ITC Omega Rugged, Reliable

(continued from page 21)

transformer. That unit costs less, is more efficient, generates less heat and uses less space in the cabinet.

## Flashing lights

Microprocessing is used in the control circuits. This allows some nifty options that don't drive up the cost of the machine. Among them are a system of flashing lights incorporated in the start and stop buttons. They are user selectable.

The run light illuminates when the machine is running. It will also flash upon detection of the 150 Hz secondary tone.

The stop light (or ready light) is on steady when a cartridge is loaded. It can be programmed to flash when a cartridge plays through the 1 kHz primary cue tone and stops. The OMEGA also has a repeat-play lockout feature which is programmable.

Don't underestimate the usefulness of the flashing lights. Our people had great fun kidding about the "flashing lights, bells and whistles." However, most came back to say just how much they liked the useful information they could get at a glance from those flashing lights.

The OMEGA has a secondary cue detector standard (a generator is standard on the record unit) which was lacking in

the PID-II series. Although the unit does not have fast-forward capability, it will mute audio at the completion of the secondary tone.

One feature that is extremely useful if the unit is to be used as a phone-answering machine is the user-selectable motor

alized that for less money we could get the same number of decks in the OMEGA series, plus an additional deck for one of our production studios.

Since the heart of the OMEGA machine is so similar to the DELTA, we gladly gave up minor features to get

for one reason—they were both quickly and easily corrected with the aid of the very thorough technical manual and the superior service support from ITC. It should also be pointed out that ITC's toll-free number is good for orders and service.

ITC made many of the design decisions based on marketing research, and also maintained the quality standards that engineers have come to expect from them. They wanted a low-cost machine that could be used in areas other than music playback, such as newsrooms, phone answering and other special purposes.

All the while, they were making a machine that could be used for music playback. If you can't or won't justify the \$2,000 to \$2,200 price of a "higher-quality" playback deck, you can safely consider the OMEGA's suggested retail of \$1,270.

You will get ITC quality, premium deck specifications and one of the best service backup programs in the industry.

*Editor's note: For more information, contact Chuck Kelly at ITC/3M: 800-447-0414 or collect 309-828-1381. The author may be reached at 703-886-2377.*

“ Don't underestimate the usefulness of the flashing lights. ”

speed. Seven-and-one-half ips is standard, but it can be dropped to 3.75 ips.

Although the OMEGA unit does have its share of features, it doesn't have as many as the DELTA or 99B units. However, when purchasing a cartridge machine, it does not make sense to pay for more than you will use.

We selected two 99B recorder units for our stereo production studios. By doing so, we assured ourselves that the product we were turning out was as good as it could be.

We then selected OMEGA playbacks for our on-air studios. We had considered two DELTA tri-decks, but ration-

"more bang for the buck" by way of an additional deck.

Was that decision a mistake? Absolutely not. The machines have been in 24-hour-a-day service since installation in January of this year. We have had only two minor machine faults.

One deck slipped through the ITC warehouse doors without a minor factory circuit modification. The motor board on another deck was slightly misaligned.

I make note of both of these problems

## WKSZ Keycart Plays Like a Professional

by Doug Fearn, CE  
WKSZ

Media PA ... When WKSZ needed a reliable tape cartridge player for the production and sales departments, we considered a variety of machines. We wanted a rugged machine that could withstand the abuse often encountered when nontechnical personnel use equipment. It also had to be simple to operate.

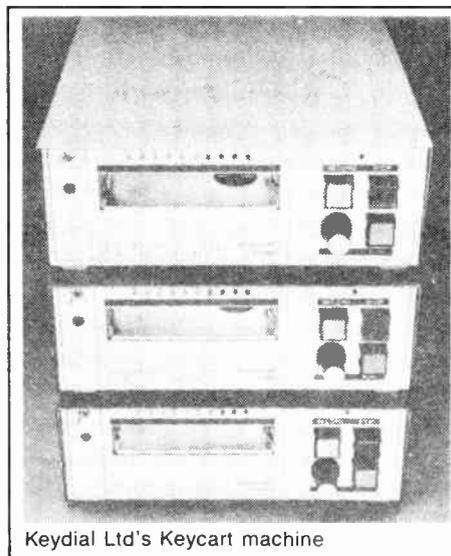
The Keycart machine, made in

### User Report

England and sold by Radio Systems in Edgemont, PA, seemed to be ideal. We purchased a monaural playback-only machine, and it has been in use now for over six months with virtually no problems.

### Pro needn't be expensive

This is a very inexpensive unit (we bought ours for under \$600), but fully professional in performance and appearance. It is available in mono or stereo, record/play or playback-only. The record units are the same size as play-only, but feature an LED meter and front panel record level control.



Keydial Ltd's Keycart machine

Operation of the machine is self-explanatory, with only two controls on the front panel: play and stop. The stop button illuminates when the cartridge is properly inserted, and the play button is lit while the tape is running.

There are no levers to engage. Inserting the cartridge moves the pressure roller into position and the play button activates a small solenoid to complete the engagement of roller and capstan.

The motor starts as soon as the car-

(continued on page 30)

## International Tapetronics Corporation/3M The World Leader In Cartridge Machines

More International Tapetronics Corporation/3M cartridge machines are installed in radio stations around the world each year than all other manufacturers' cartridge machines combined ... and for good reason. For almost two decades, ITC equipment has maintained the standard of excellence in reliability, audio quality, and long-term cost effectiveness; backed by ITC's legendary status as the industry's service leader.

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- DELTA Cartridge Machines, "Today's Most Popular Cartridge Machines"
- OMEGA Cartridge Machines, "Affordable Performance You Can Trust"

- ESL V Eraser/Splice Locator, combining quick erasing and splice locating into one simple step
- ScotchCart® II Broadcast Cartridges, reel-to-reel audio performance and five times the average life of its nearest premium cartridge competitor
- The FB-1 Interface converts an ITC cartridge machine into a potentially profitable telephone information service

3M's vast financial and technological resources have combined with ITC's proven commitment for delivering uncompromising product quality to insure that when newer technology emerges, it will come from International Tapetronics Corporation/3M, "The Leader in Reliability and Service."

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# 3M

## Buyers Guide

# Dynamax Rates High

by Margaret R. Bryant, Eng Mgr  
KQXT

San Antonio TX ... During recent construction for a new studio, I chose the Fidelipac Dynamax CTR100 series record/play and play-only cart machines.

I had been impressed with demonstrations I had seen of the CTR100, but

### User Report

wanted to know how the machine stood up under use. So I called several people who had CTR100s.

All the users I talked with expressed satisfaction with both the machines and the service from Fidelipac. Interestingly enough, no one missed certain features that are on other cart machines.

I ordered several CTR100s and found out first-hand why everyone I had talked with was so pleased.

Perhaps the best feature of the machine is the Cartscan. The appropriate label on the side of the cart lets you indicate your choice of matrix stereo, discrete stereo, mono, elevated level, or an "aux" you can set up however you want.

The Cartscan feature allowed us to intermix our carts. It saved us a lot of time and expense when we moved to new studios. Our mono carts did not have to be re-recorded to be played on a stereo machine.

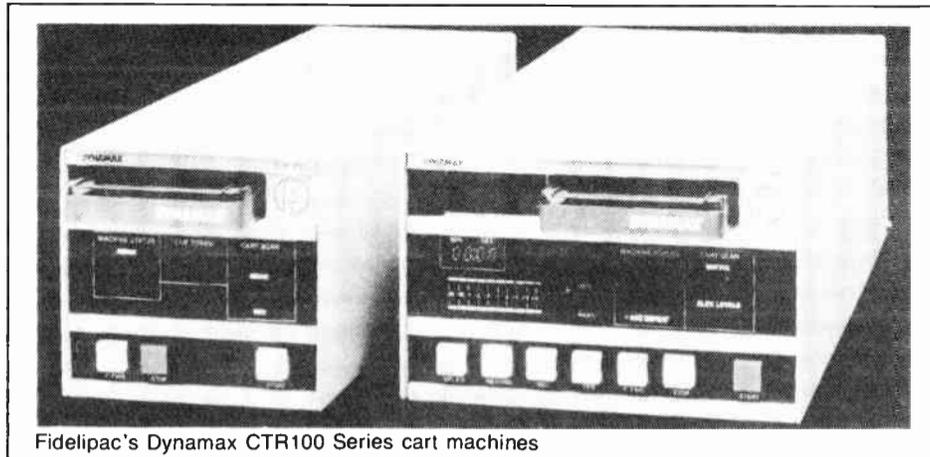
I was concerned the labels might not hold up to the abuse of repeatedly being inserted in the machine, but so far there have been no problems.

The front panel is laid out very well, and the switches and diagnostic indicators are easy to understand and use. The timer functions in fast forward as well as in regular speed.

The splice finder and varispeed are two of the other many features. Although we have not had the opportunity to use it, the machines have SMPTE time code compatibility as well.

Fidelipac has taken the time to think about some of the little things. For example, there is a small switch in the right front of the cart slot that enables you to clean the pressure roller without having to trigger some microswitch deep inside the cart slot.

The service department at Fidelipac is just as good as the machine. The one minor problem I had with one machine was taken care of immediately.



Fidelipac's Dynamax CTR100 Series cart machines

Fidelipac was also very helpful in answering my questions. Their parts purchasing procedure allows you to pay a handling fee to order a 10-cent part, rather than making you meet a high minimum order.

The only problem I found with the machine was in the "D" connector for remote control. The cut-out in the back panel doesn't seem to be quite large enough to slide the connector smoothly into place.

Audio also is on a "D" connector. This makes it a little difficult to connect test equipment. Since both left and right channels are on the same connector, it is also difficult to interrupt one channel but not the other during troubleshooting.

To solve this problem, I constructed a box and jumper cables so I could bring the inputs and outputs out to barrier strips. Now test equipment can be easily connected or channels interrupted.

All in all, I found the "D" connectors to be only minor inconveniences in a machine that performs very well. I have been very pleased with the performance of the machines and, given the chance to purchase cart machines for new studios again, the CTR100s would be at the top of my list.

*Editor's note: For more information, contact Art Constantine at Fidelipac: 609-235-3900. The author may be reached at 512-220-3100.*

## Phasing Woes Ended

by Jerry L. Bowers, DE  
KSO/KGGO

Des Moines IA ... Count the times you have heard, "That cartridge is out of phase" or "That cart has phasing problems." The endless battle of proper phasing on audio cartridges will never cease—or will it?

At the 1986 NAB show, the Howe Audio Series 2300 Phase Chaser caught my eye. Upon discussing the unit's capabilities with Howe engineers, I knew it was exactly what KSO could use to solve its cartridge-phasing problems.

Music programming on Des Moines' number one AM radio station is recorded 99% of the time on audio cartridges. We have no phase-stabilization cartridge recording equipment.

The major phase-shifting item in cartridge recording is "the cartridge." Each exhibits its own phase shift characteristics.

Have you ever had a cart with one stereo channel completely out of phase—180°? The Howe Audio 2300 Phase Chaser has a circuit that, upon sensing such a condition, inverts the phase of a channel 180°.

The result gives the mono listener correct audio. When correctly-phased audio is supplied, normal status phasing is switched in again.

Have you ever heard a cart with all highs or all lows missing? This occurs when a cart has a great amount of phase shift. The Phase Chaser automatically aligns the time relationship between right and left channels.

At KSO, our jingles are phase-delayed

corrected and our commercials are phase-advanced corrected. Given any source that needs phase correction, the Phase Chaser reacts.

What happens if a stereo source all of a sudden loses one channel? Within 3 sec the Phase Chaser switches the one good channel to both channels. The mono listener, L+R, always receives the best, loudest and cleanest signal. The stereo listener always has two channels.

### User Report

And, if an engineer wants to run some audio tests, the one front-panel switch "bypass" totally switches the Phase Chaser out of the circuit for tests. One touch of this switch again switches it back in the audio path.

With AM stereo relatively new on KSO, most of our listeners are still monophonic. The Phase Chaser allows 100% correct mono and stereo audio for broadcast.

Should a broadcaster having stereo phase problems desire to always have a good mono and stereo-correct audio source, then the Phase Chaser has the solution.

One can tell that I am sold on this unit. Our problems are gone. Our thanks go to Howe Audio.

*Editor's note: For more information, contact Bill Laletin at Howe: 303-444-4693. The author may be reached at 515-265-6181.*

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## Buyers Guide

# Maintain Carts on Routine Basis

by Bart Bagdasarian  
Marathon Products Corp.

**West Boylston MA** ... Cartridge machine maintenance is of paramount importance, though often neglected and relegated to unscheduled trips to the repair bench. The primary task of keeping cart machines "on air" should be scheduled as routine operational practice.

To promote effective control and avoid time-consuming workloads, consider the use of cartridge configuration tools that can clean and polish transducer heads, indicate machine speed and roller-to-capstan pressure.

### Head cleaning, polishing

The Model 301 Marathon Tape Head Cleaner encapsulates, in a cartridge, both cleaning and polishing belts. The tool is programmed for a cycle of operation that runs automatically for 20 seconds when activated. A cue signal then stops the cartridge, avoiding repetition and possible damage to delicate tape heads. Care must be exercised that the cue tone is not erased.

The entire cleaning and polishing belt consists of several sections spliced in order to pass a silicon-carbide-impregnated tape to initially clean the heads of collected debris.

Then a high-micron chromium-oxide tape continues the cycle to polish and fine-finish the heads. For lubrication of the endless loop, the two sections are interspersed, also at beginning and end, with regular back lube tape.

The cleaning carts are good for approximately 400 operations. One pass is sufficient to keep heads clean when applied at regular intervals.

### Measuring torque

Another cart configuration tool that has exceptional value in routine maintenance of cart machines is the Model 302 Torque Tester. It develops a reading which conforms to the NAB standard for pressure roller to capstan force.

The cartridge accessory is inserted at the tape deck entry, and the machine is activated with the start switch. A moving indicator arrow can be seen through an aperture on top of the cart. The arrow will advance to a mark which indicates the degree of force the pressure roller exerts against the capstan.

Depending upon the reading, the transport may be adjusted to correct within the manufacturer's specifications. Caution should be observed to allow the Torque Tester to return to the "rest" position after each trial.

A second reading should be made after adjustment to confirm specified force. The tool is most useful in compensating and ensuring that wear on rollers and spring tension force is within required parameters.

Another feature of tape cartridge transports is that they require you to assure that tape speed of 7.5 ips is maintained constantly. A cartridge designed

to ensure this dimension is the Marathon Model 303 Speed Indicator.

In this tool, the rotating platform within the cartridge is operated by a tape load that operates endlessly when the cart is inserted and the machine started.

Imprinted on the platform are strobe bars for both 50 or 60 Hz current source.

A cord set provided with the Speed Indicator has a neon lamp attached so that when the line is plugged into a 115 V outlet, it may be beamed over the bars, showing through the cover of the cart.

The flashing lamp will stop the strobe bars if the transport is operating at re-

quired speed. If markings appear to be revolving clockwise, tape transport is running too fast. If marks revolve counter-clockwise, transport is below standard speed. Finally, adjustment should be made to either speed up or slow down the machine with the cart removed from the deck.

*Editor's note: For more information, contact the author at Marathon Products: 617-853-0988.*

# RADIO

*Classics*

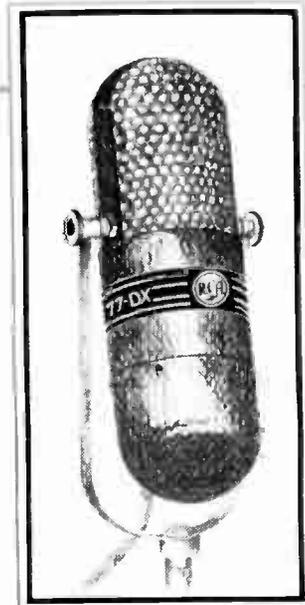
What makes a *Radio Classic*? Timeless design, flawless performance, outstanding value, and above all — bullet-proof reliability. Because, in radio, we don't coddle our classics.

The RCA 77DX is one such product. It set new standards in microphone performance. Even now, decades later, its quality still endures. Arrakis Systems' SC audio consoles are *Radio Classics* too. Introduced in 1980, the SC series set new standards in design, performance and value. Today, Arrakis SC consoles are the choice of more radio stations worldwide than any competitive unit in their class. Shown below is the 2000SC, an outstanding value at \$4695. Like all Arrakis audio consoles, the 2000SC is ultra-reliable. And it will continue to deliver outstanding performance as the years go by. After all, that's what it takes to be a *Radio Classic*.

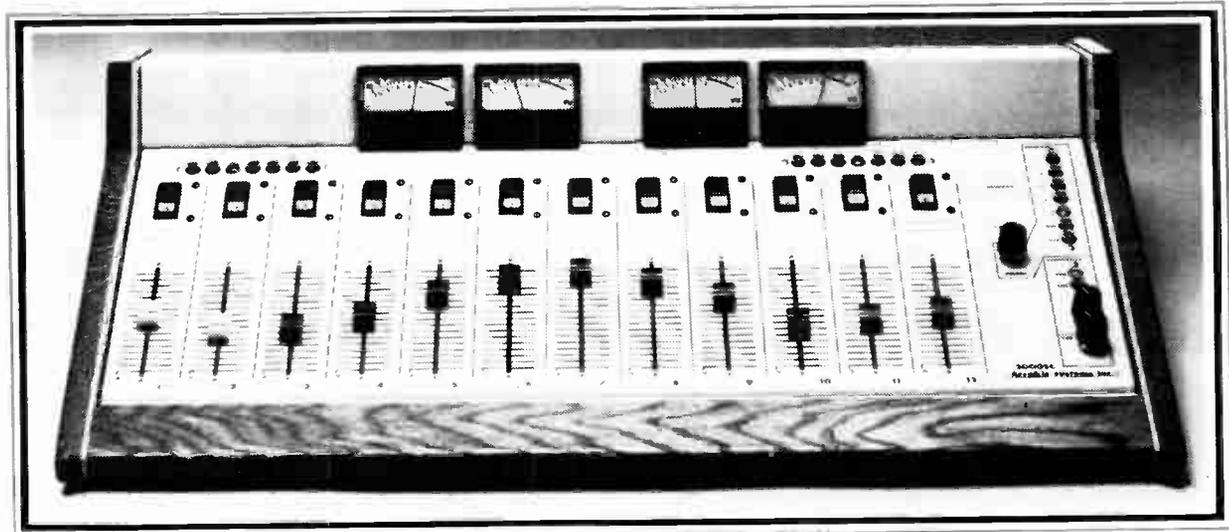


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Circle Reader Service 16 on Page 31

## Buyers Guide

# Otari Expands Line with CTM-10

by Bill Ford, Western Reg Sales Mgr  
Otari Corporation

Belmont CA . . . At the last NAB Convention in Dallas, Otari displayed for the first time the CTM-10 NAB format cartridge player/recorder.

Manufactured in accordance with accepted NAB standards for broadcast cartridge recorders/reproducers, the CTM-10 utilizes A and AA size cartridges.

### New technology, new applications

One of the things that Otari hopes to accomplish with the CTM-10 is the introduction of a melding of various recent advances made in recording technology.

Dolby HX-PRO bias optimization circuitry is a standard feature in the CTM-10 recorders, the same found on Otari's large-format professional multitrack tape recorders. HX should not be confused with noise reduction schemes; it requires no "decoding" circuitry.

HX is actually a dynamic bias control circuit that monitors the amount of bias applied during recording; the bias level is adjusted proportionate to the high-frequency program material, thus increasing high-frequency headroom and

decreasing the "self-biasing" phenomena commonly incurred when recording high frequencies at high levels.

The most apparent and immediate benefit to the broadcaster is a noticeably better sound off air, without the need to invest in any "processing" gear.

At 7.5 ips, HX-PRO will provide a minimum of 7 dB improvement in high-

frequency output at 15 kHz, and even more at higher frequencies.

The most audible benefit to the producer is that it is now possible to obtain the frequency response at 3.75 ips that would usually only be obtainable at 7.5 ips operation. Broadcasters may now get 7 minutes from a 3.5 minute tape, while still receiving the same performance



Otari's CTM-10 Series cartridge broadcast recorder/reproducer

they've been used to in normal operations.

Utilizing standard XLR connectors, a unique connector arrangement allows either pin two or pin three to be the "hot" pin. In conjunction with the active balanced inputs and outputs, this arrangement allows the deck to be easily interfaced into any studio environment.

### Reliability is paramount

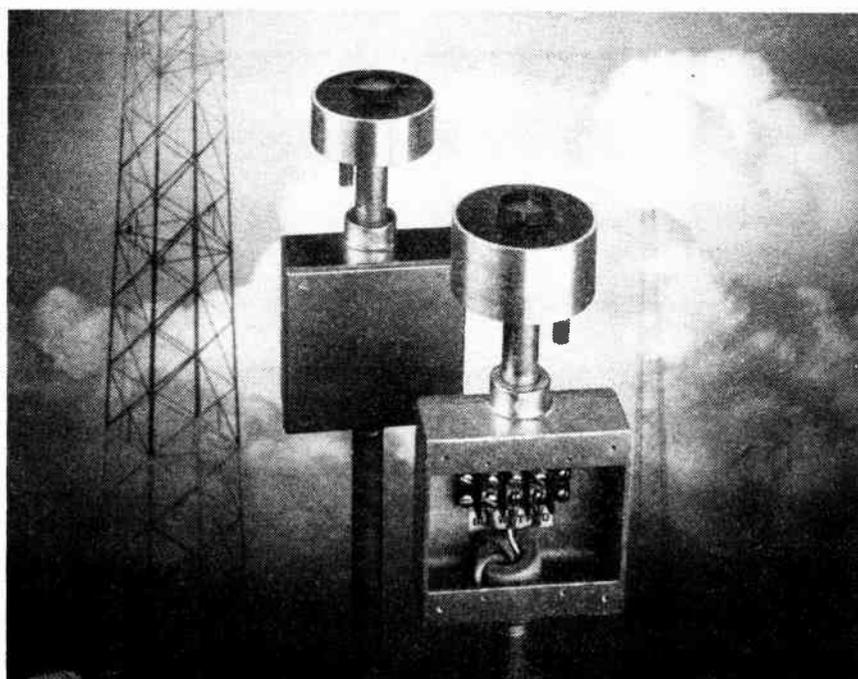
Cart machines receive more use and abuse than any other single piece of equipment in the broadcast studio. If the machine cannot stand up to the rigors of the "crazed, all-night DJ," the chief engineer certainly won't put up with the deck being on his service bench all the time.

The CTM-10 was designed with ease of serviceability being of paramount concern. The top, bottom and side panels can be removed easily for fast access and problem-free maintenance. Because all printed circuit boards (PCBs) have plugs for wiring harnesses, no soldering is required to remove or replace any board.

The CTM-10 is actually two separate units that connect by two simple multi-way cables. The CTM-10 is the playback unit and the CTM-10R is the record electronics unit. The CTM-10 is available separately as a playback only unit, while the CTM-10R record electronics will be packaged for sale with the CTM-10 as a

*(continued on page 29)*

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## Buyers Guide

# CDs on Carts: A Capitol Idea

by Joseph Kempler, Dir Tech Mktg  
Capitol Magnetic Products

Los Angeles CA . . . Many radio stations are broadcasting music programs directly from CDs. Those which broadcast primarily from cartridges copy their CDs onto carts, just as they have always done with vinyl LPs.

There are some quality-conscious engineers and PDs who are somewhat uneasy about the sound quality of such copies, reasoning that a broadcast cartridge cannot properly reproduce what is contained on a CD.

In many respects they are quite correct. Many cartridges which use older types of tape and plastic parts with grossly deficient guiding means certainly can't do justice to a CD, or even to a good LP.

## Carts challenge CD sound

These sacrifices in sound, while quite common, need no longer be accepted. Newer carts are available with many superior features. Several years ago, Capitol Magnetics took on the challenge of producing such state-of-the-art products.

The design goal required that the audible sound quality in an A-B comparison between a CD and a cartridge copy recorded from that CD be essentially identical, so neither the golden ears at the radio station nor the home listener could tell the two apart. Such quality would remain over the entire normal life of the cartridge.

Undeniably, this was quite a tall order, but I believe it has been successfully met by Capitol Magnetic's AA-4 broadcast cartridge.

The key to meeting this goal, of course, was the development of a new tape which not only faithfully reproduces a CD, but also is virtually free from any perceptible noise, distortion, dropouts and other garbage.

The goal was accomplished at a tape speed of 7.5 ips without resorting to such exotic materials as chromium dioxide, metal powders and the like which, while capable of high performance, are totally incompatible with any of the present cartridge recorders/reproducers.

## Passes listening tests

Is such a tape possible? If the acceptance criteria were to be established by laboratory measurements comparing a CD to a copy made on a tape, particularly in dynamic range capabilities, the answer is no. No analog recording on tape can match the 100 dB dynamic range of a CD without some fancy compression-expansion methods.

Fortunately, though, in the real world of music, the true measure of sound quality is the subjective perception by ear and not by meter. The design goal was to be met by subjective listening.

This is entirely fair, since it has been demonstrated in many critical auditions and blind tests that music reproduced from a good-quality tape with a flat re-

sponse of about 40 to 16,000 Hz and SNR of about 60 dB will quite accurately reproduce the music contained on a CD.

Of course, tape alone cannot do it; a high-quality recorder/reproducer is certainly required to bring out the best that the tape is capable of.

A practical tape meeting these requirements is Capitol Magnetics' SGS-4 tape, developed specifically for the AA-4 cartridge. This cartridge was introduced to broadcasters in a series of "hands-on" demonstrations by recording the cartridge from a CD and simultaneously playing both back in an A-B comparison. Hundreds of audio professionals reported *no audible difference*.

The SGS-4 is a premium-quality tape made from a pure ferric oxide and operates at normal ferric bias levels.

Getting the contents of a CD on and off the tape is but a small part of the overall problem facing the broadcast cartridge designer.

If this were to be accomplished on a reel-to-reel recorder/reproducer, it would have been the end of the story; doing this in a cartridge is an entirely different matter. There were quite a few additional obstacles to overcome.

Consider, for instance, that a 10-minute cartridge containing 375' of tape and wound in an endless coil less than 3 1/2" in diameter is continuously sliding on itself over its entire length and must run flawlessly for numerous passes.

Motion must take place with very low wow and flutter to meet broadcast standards, without transfer of the graphite

lubricant to the oxide side of the tape, which would cause dropouts or depositing on the heads, where it would cause high-frequency losses.

Thus, in addition to the excellent magnetic properties, a good cartridge tape must be backcoated with a suitable lubricant which meets all of these requirements. The lubricant in the SGS-4 is the same one used in Capitol Magnetics' A-2 and AA-3 carts.

*In the real world of music, the true measure of sound quality is the subjective perception by ear and not by meter.*

Cartridges too, being made of plastic and subject to molding tolerances, warping, stress relief and such, are not well suited for effective tape guiding and can easily degrade stereo phase and high-frequency response. Demanding precise tape guiding from molded plastics would be foolish, or at least unrealistic.

## Machine-guided tape

A much more practical—yet very simple—design concept developed by Capitol Magnetics does not allow the

cartridge to do any tape guiding. All the AA-4 cartridge must do is store the tape, feed it to the record/playback heads with specified holdback tensions and then take it up again. Tape guiding is done by the machine only, with no interference from the cartridge.

No special electrical adjustments are necessary to optimize the AA-4 to copy a CD or any other demanding music source. Bias settings for AA-4 are not overly critical; the adjustments recommended by the cartridge recorder manufacturers are fine.

We advise, however, that you correctly set the record equalization so that overall record/playback frequency response is as flat as the recorder is capable of. The nominal, maximum record level for the SGS-4 tape is 250 nWb/m, but going over by 1 to 3 dB on peaks will usually do no harm.

Having done this, put a hot CD in your player, copy it on the AA-4 cart and switch back and forth between the CD and the cartridge. If it doesn't sound like the CD, the problem is not in the cartridge.

Once recorded, this high level of performance, including the stereo phase, should remain unchanged for the life of the recording.

If you are among those skeptical broadcasters who are still uneasy about entrusting that great sounding CD to a broadcast cart, try copying it on AA-4 and prove to yourself how good a cartridge can sound.

*Editor's note: For more information, contact the author at 213-461-2701.*

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## Buyers Guide

# Cart System Still Not Perfected

by Carl Martin, Pres  
Audi-Cord Corp

Normal IL . . . The broadcast (NAB) endless loop cartridge was born from need when local radio changed in the 1950s to a music-and-news format from the longer segments common to earlier

programming. The fidelity of local production on disc was generally poor, and the reel-to-reel machine was too cumbersome to provide ease of live operations. It was from this need that the evolution of the cartridge system sprang.

George H. Eash filed a patent for the forerunner of the 'Fidelipac' design of an

endless loop cartridge in 1954. This device encountered difficulty because the tapes available were not satisfactory, and a graphite lubricator block was ineffective for acceptable results.

### Tape formula search

By 1957, the Eash patent was revised to include tape which had been back-coated with graphite and had 'pencil lead' lubricators embedded within the supply hub. These improvements were moderately successful, and the cartridge was used widely in low-speed background music applications.

The Eash cartridge was adapted in 1959 to the broadcast industry and applied at 7.5 ips. The cartridges typically were used for short monophonic commercial announcements.

By the mid 1960s, the demand of the NAB cartridge and the Lear 8-track cartridge resulted in a large quantity of tapes made especially for them. These were back-lubricated tapes with oxide formulations which were relatively soft and matte in character to avoid turn-to-turn adhesion in the supply hub.

Most provided good results, except that their bandwidth was limited to moderate acceptability for the critical listener.

In the earliest tape cartridge transports (Viking Corp.), a pressure roller with a diameter of approximately 0.795" and a height of 0.375" was selected; probably because of the availability at the time.

Unfortunately, the keyhole dimensions of Eash's cartridge (still used today) could accommodate the back swing of the roller only if the roller was positioned such that the tape path was off center; located about 0.032" from the top of the roller and 0.093" from the bottom.

The inherent roller position required to clear through the keyhole has locked

in the designs of the transports, making a larger roller in the transport design impossible.

On the other hand, it is desirable to maintain the running path in the center of the roller surface to improve tape guidance; especially in critical stereo operations. For this reason, some transport manufacturers now use a roller which has been retooled to 0.312" height.

It is obvious that cutting the roller off by 0.062" results in a tape path centered upon the roller. This improvement is important in original recording, as well as in all subsequent replays, if azimuth error and phase shifts are to be reduced.

Why do manufacturers use the 0.375" high pressure roller? The reason is to deliver the maximum tape pull (torque) capability.

Very basic physics will relate simply that the larger the surface area between the pressure roller and the capstan, the larger the pull. Several, more subtle factors are related to the amount of pull that is realized.

Among these, although not as significant to the end result, are shaft diameter, deflection, surface roughness, and the roller wear pattern.

Yet, typically, the pull realized from the extra 1/16" of roller is about 25% more than the centered roller for a given pressure applied.

### Motor-bearing load, life

Figure 1 reveals that the dead weight pull of the pressure roller to capstan surface is essentially linear for the pounds of force applied to the pressure roller when the roller and capstan shaft are in new condition.

But as the roller becomes worn out, the pull realized dramatically changes, even if considerable force could be added to the pressure roller. A further study relates that more pressure is required for the 0.312" height roller to produce equal pull, as explained earlier.

(continued on page 31)

## IN SEARCH OF EXCELLENCE.

Long before it was a popular management theory, broadcasters were searching for excellence. Excellence of Sound.

The search is still on, but the goal is now within the reach of every FM broadcaster.

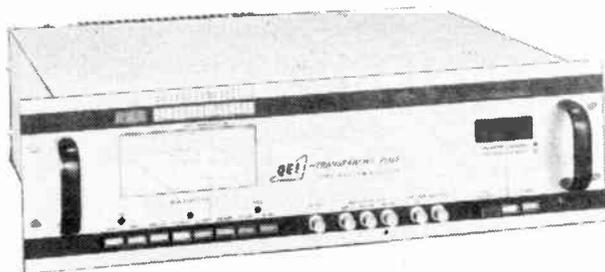
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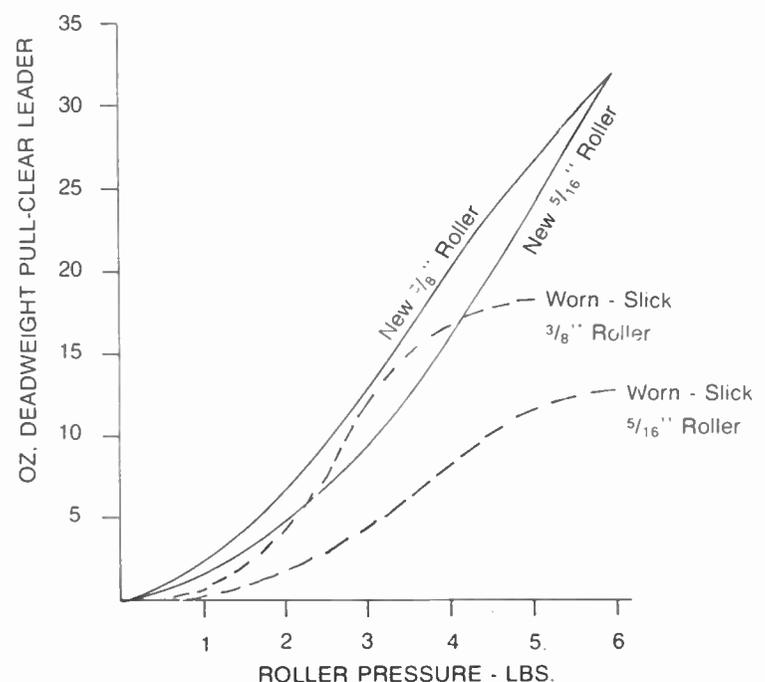
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Circle Reader Service 19 on Page 31

Figure 1.



## Buyers Guide

# Otari Expands Line With CTM-10

(continued from page 26)

recorder/reproducer combination.

The CTM-10 playback unit is unique in its combination of features and functions.

The user is provided with both mono and stereo heads in playback-only units, enabling upgrade to stereo without the need to invest in new stereo machines. AM-FM combos will appreciate a deck that allows the sharing of news carts.

The three speeds available (3.75, 7.5, 15 ips) are jumper selectable, and allow stations of differing requirements and formats to optimize the use of their cartridge machines to their operations.

The front-panel headphone jack allows carts to be previewed without the need to tie up a studio's console, power amp, or speakers.

The front-panel azimuth adjustment system allows the engineer to optimize the record azimuth while the deck is in the rack, and verify the results by using the front-panel phase comparator display provided.

The fast-forward mute function enables users to cue to a section of tape (or to the end) while muting the output of the cart machine. It also allows air talent to cue a cart without worrying that the signal might reach the air.

If the mute function is defeated in fast forward, the audio output is attenuated 6 dB and bandwidth limited to around 1 kHz. This is useful to those who prefer not to subject monitor speakers to high-level, high-frequency abuse.

Other features include a "repeat play lockout," an LED real time counter, two LED bar graph meters on the playback module, and front panel LED cue sense indicators for all three cues.

The CTM-10 comes equipped with long-life record heads. Developed with replaceable crowns, they allow the head surface alone to be replaced.

The capstan motor of the CTM-10 has a front-panel adjustable 6% varispeed range, and is externally controllable by SMPTE time code synchronizers and controllers, including the newest generation of audio/video transport controllers available from Adams-Smith, TimeLine, Audio Kinetics and others.

The crystal-referenced, brushless DC servo motor is mounted solidly to a 1/2"-thick milled alloy deckplate, and the motor bearings are permanently lubricated.

The transport does not use a solenoid to engage the pinch roller, effectively enabling the unit to be physically smaller, and yet run cool.

### Record module functions

The record module utilizes two large VU meters with additional LED peak indicators, as well as an LED bar graph meter for the cue track. The cue track may be erased or recorded independently of the audio channels.

Adjustable record phase compensation allows correction of group delays, providing better transient response regard-

less of tape formulation, bias level or HF equalization.

All recorders feature splice finders with a unique optical detector that enables the recorder to cue carts to the splice point.

Another standard feature is the sum-and-difference-matrix mode, which allows the stereo broadcaster to minimize

the effects of phase cancellation caused by the cartridge, and provides perfect mono compatibility.

The built-in oscillator generates a sine wave at frequencies of 150 Hz, 1 kHz, 8 kHz and 16 kHz, with an additional 1 kHz square wave included for record phase compensation adjustments, mak-

ing it easier to align the record circuits, head azimuth and phase response.

The CTM-10 demonstrates Otari's commitment to features of real benefit to the broadcast professional. Our goal is for broadcast engineers around the world to refer to the CTM-10 as "The 5050B of cart machines."

*Editor's note: For more information, contact the author at Otari: 415-592-8311.*

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## Buyers Guide

# Don't Ignore Cart Maintenance

by Bryant W. Ellis  
Broadcast Cartridge Service

Huntington Beach CA . . . For a temporary system that should not have worked, the continuous-loop cartridge has come a long way in three decades.

First used solely for commercial spots, jingles and news, many stations have complete music libraries on cart, and source material has been extended to include CDs.

### Choosing a cart system

Just about everyone has had varying experiences with tape carts. When selecting a system to convert to or install for the first time, it's best to do some research.

Check with other CEs. Call the cart manufacturers and ask for free samples. Request a demo of that new cart machine you've been eyeing. Select one cart that's best for your purpose and stick with it.

It's also a good idea to have an alignment tape made in the brand cart you will be using with that type of tape. Purchasing head height, tape guide and insertion gauges, and installing wow and flutter and stereo phase meters in your production studio is also advised. Be sure to follow the machine manufacturers' guide for regular maintenance.

Particular attention should be paid to the newer high-output, low-noise tapes. These tapes are very sensitive to heat caused by increased friction and some machine motors. The tape is highly polished and tends to shorten head life and smooth the capstan.

Air circulation in and around cabinets should be adequate. Ask operators not to leave carts in the machines with motors running for extended periods of time.

Eventually the carts will show some wear. Don't wait for an on-air crash or all of the oxide and backing to come off before removing them from service.

People are always asking me how long a cart should last. It depends; age, number of plays, environmental conditions and operator handling all affect life expectancy. Simple common sense and proper tape and machine maintenance will give you plenty of service.

### Reconditioning questions

When it is time to recondition carts, they should first be checked for breakage and warping, and any bad carts should be thrown away. The remaining ones should be cleaned inside and out.

To clean, strip out the tape, pressure pads, Teflon washers and turntable, if warped. On a winder load with the same type of lube tape as you set up as your standard, splice with the proper size loop and exercise in a player for at least two cycles. Check each cart for level, wow

and flutter, and phase. The finished product should be very close to new condition.

Who should do the work? You must weigh the pros and cons. It's easier for a station with a large library to send the carts out. In-house, you can load custom lengths in a timely manner.

Do you have properly trained personnel? How do the costs compare? If you decide to send the work out, ask the company for references. Remember, no matter how you do it—get the job done!

It looks like the cart tape system is going to be around for some time to come. With digital on the horizon, possibilities are endless. Remember to do your homework and select a system of machines and carts that will work best in your situation. Once in place, take care of it and it'll work hard for you.

*Editor's note: For more information, contact the author at Broadcast Cartridge: 714-898-7224.*

## Keycart Plays Like a Pro

(continued from page 23)

tridge is inserted, detected by a sensor near the front of the cartridge slot. This sensor placement helps get the motor up to speed for an almost immediate start, if necessary.

### Performs to specs

Radio Systems checks and aligns each machine before it is shipped, but I put the machine on the bench for a check prior to installation. Performance was within the specifications and no problems were encountered.

The frequency response at the high end was down somewhat, but listening tests proved that the machine sounded almost identical to a machine costing several times as much.

The Keycart version we have does not have a playback level control, and this was a concern because the machine is used to feed directly into the telephone line through a passive coupler.

The level was exactly right for our telephone system, however. It measured +4 dBm, unloaded. The output does drop some when terminated with 600 ohms, but this is not a problem with today's

consoles, almost all of which have bridging inputs.

I understand that Radio Systems is working with Keydial, Ltd., the British manufacturer, to produce an improved version of the Keycart machine. The new version will include all the standard alignment controls, secondary and tertiary cue tones and other refinements.

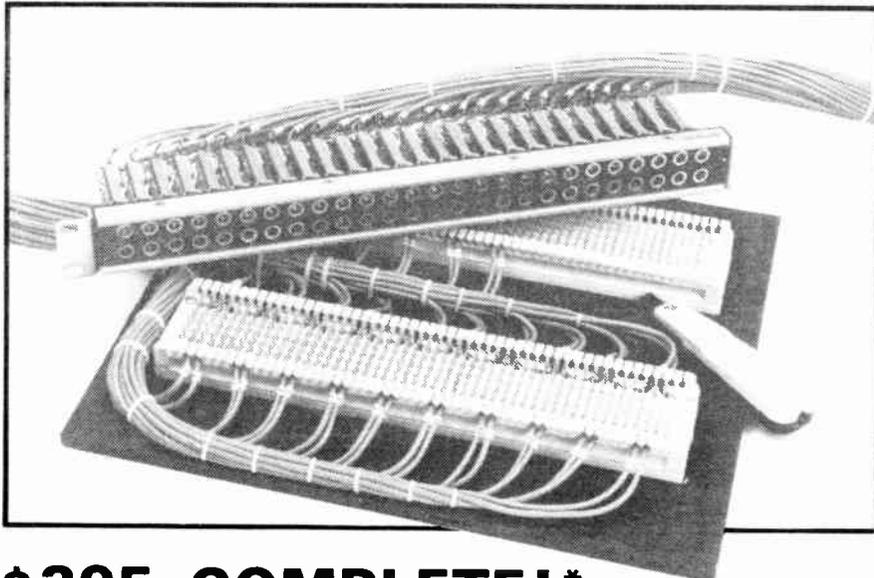
Cartridge insertion on our machine is a little stiff, though not a major inconvenience. The springs used to keep the cart in position seem to be quite positive.

Our mono machine showed very little high frequency level variation when the cartridge was twisted or pulled. The new version will have an improved cartridge hold-down system, which should make insertion easier.

We found that, for our application, the Keycart machine works perfectly. It may not be the ultimate cartridge machine, but at under \$600 it is a terrific bargain.

*Editor's note: For more information, contact Bill Wohl at Radio Systems: 800-523-2133 (or 800-423-2133 in PA). The author may be reached at 215-565-8900.*

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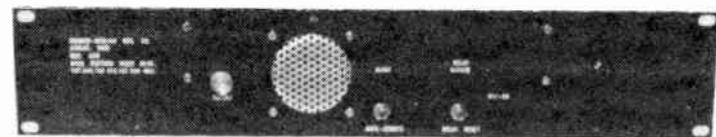
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# Buyers Briefs

Fidelipac recently introduced a new version of its CTR100 cart machine, incorporating Pacific Recorders and Engineering Corporation's Maxtrax™ tape track format.

The machine, according to Art Constantine, vice president of marketing for Fidelipac, "make(s) it possible for radio stations with cartridges recorded in the Maxtrax format to utilize the latest cartridge machine technology while still being able to play their old cartridges."

Fidelipac's first user of the new machine is WSB, Atlanta. Ron Wilson, WSB's chief engineer, said he is pleased with its performance and features, which include Cartscan, Vary Speed and replay lockouts.

"All of those features . . . would have some application if we decided to change manufacturers of carts . . . the Cartscan

would come in real handy for that," Wilson said.

"One feature that we really like, particularly in the news area, is the 1 kHz Stop Tone Defeat. It's really simple. The operator just presses the record button two times, and then he can lay as many cuts down [as he wants] without having a stop tone between them," he added.

WSB has had the units in operation for more than five months. "[They've been] very reliable," said Wilson. "As a matter of fact, perfect!"

For more information, contact Art Constantine at Fidelipac: 609-235-3900.

ITC/3M's new DCM-1 Dynamic Cartridge Monitor continuously verifies audio broadcast cartridge performance before and during on-air broadcast.

Used in conjunction with a station's cart machine system, it assists in identifying worn-out or problem carts before they fail on the air.

The DCM-1 evaluates small changes in cart tape speed by monitoring a special reference tone located on a previously unused portion of the cue track. When speed changes, displayed on an LED indicator, reach a limit predetermined by the

station, the operator can remove the cart from service.

The monitor is available in both an Encoder/Decoder model and a Decoder-only version. Both are fully automatic, contain their own power supply and require no user intervention once installed.

For more information, call Bill Parfitt at 800-447-0414.

## Cart System Still Evolving

(continued from page 28)

Why don't machine manufacturers just provide pressure roller drive systems that apply unlimited force to the roller and solve the problem? There are several reasons that this is not feasible, but one very important reason is bearing load and life factors.

Most modern capstan drives are by direct motor. These motors have to be very precise in nature to produce synchronous speed and low flutter, and they contain bearings of close tolerance. With the approximately 1.5 mechanical load amplification due to the extended length of the capstan, the bearings are very load critical if extended life is to be realized.

Industry finds itself in a vicious circle. If the tape tension increases significantly, slip is introduced at the capstan surface, resulting in wear and polish. Of course, when the shaft becomes polished, it loses its ability to properly pull the load which caused the polish and wear in the first place.

The cause and effect is inescapable and well defined. The only question remaining is, 'How soon does this destructive wear effect have to occur?'

Unfortunately, it can occur very rapidly, in a matter of a few hours' of service when the tension applied by the tape is allowed to become too high for any extended period.

*Editor's note: This is the first of a three-part series. Part two will appear in next month's Buyers Guide. For more information, contact the author at 309-452-9461.*

## Tomcat Shows Its Style at KNXR-FM

(continued from page 22)

minimum. Some very creative and thoughtful engineers obviously designed the Tomcat. It is completely microprocessor controlled. There are many features you'll take for granted once you own it.

There are a myriad of performance options you can select via dip switches and jumper plugs. For example, there is a fast-forward speed select of 15 ips or 30 ips; audio mute at the beginning or end of the secondary cue tone; replay inhibit to prevent accidental replay of a just-aired cart; discrete left/right or matrix sum/difference record format; infrared cart in-place sensing and switchable VU meters to measure all audio operating and alignment functions.

Cue signals are recorded on a narrow, 21-mil track near the lower edge of the tape. The cue track record function can be operated independently of the main audio channels.

You can record, erase or rerecord the cue track after you've recorded the left and right audio channels. There are even line level, balanced input and output connectors for the cue track!

The Tomcat is a ruggedly built workhorse. It is obviously a no-compromise cart machine. It is also not the least expensive cart unit you can buy. It was designed for progressive stations that know how to get a return on investment in top-of-the-line equipment.

### Reel-to-reel sound

The Tomcat's most impressive feature is its sound. When dubbing music from a high quality source like compact discs, you will notice punch and dynamics you're not used to hearing from carts! It truly sounds like a reel-to-reel recorder.

The next-most impressive feature is the very personal, attentive service you'll receive from PR&E. The company seems bent on catering to each customer and

intent on making sure you are absolutely pleased with their equipment.

Tomcats have been in use for six years at KNXR—used continuously, every day, for both commercials and music. There have been no failures or breakdowns. The only maintenance has been regular cleaning of heads, capstan and pinch roller.

The transition from the old narrow-track head format to the new Maxtrax format can be done quite painlessly if you do a little advance planning. Once it's done, you and your air-staff will say it was well worth it!

*Editor's note: For more information, contact Mike Uhl at Pacific Recorders: 619-438-3911. The author may be reached at 507-288-7700.*

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