

## Canada Approves C-QUAM

by David Hughes

**Ottawa Ontario** ... Canada's Department of Communications (DOC) has selected Motorola's C-QUAM system as its national AM stereo standard.

In a 21 March announcement published in the *Canada Gazette*, which is similar to the US *Federal Register*, the DOC indicated that AM stations operating with stereo systems other than C-QUAM have one year—until 31 March 1988—to convert to C-QUAM or cease broadcasting in stereo.

The DOC, which develops and defines Canada's technical broadcasting regulations, said in its *Gazette* statement: "The AM stereo broadcasting transmission standard to be used in Canada will be based on the Motorola C-QUAM system.

The department will issue an AM stereo broadcasting transmission standard shortly."

Canada joins Brazil and Australia as nations that have formally endorsed the Motorola system as a national standard. No nation has yet selected the rival Kahn/Hazeltine ISB system as a standard, however several, including Japan, are still studying the issue.

The US has refused to select a system, opting instead for a "marketplace" decision. To date, only about 10% of US AM stations have gone stereo, with the some 350 selecting C-QUAM and less than 100 using the Kahn system.

The DOC ruling officially ends an "experimental" period in which Canadian stations were free to test the C-QUAM, Kahn or other systems. The experimen-

tal period was initiated in September 1982.

According to figures compiled in 1986 by the Canadian Association of Broadcasters (CAB), about 50 (about 12%) of Canada's 435 AM stations had gone stereo—and the majority of those, 42, were using the C-QUAM system. Only eight had selected the Kahn system.

The influential CAB, which late last year recommended that the DOC select C-QUAM, stressed that its recommendation was based on "marketplace forces" and not on technical considerations.

"It was primarily a marketplace decision," said Mario Pittarelli, the DOC's director of broadcast engineering, planning and standards. "There was an overwhelming consensus to go to the Motorola system."

Apart from the CAB's support for C-QUAM, Pittarelli said the Radio Advisory Board of Canada, which represents a wide range of other broadcast associations, also supported the Motorola system.

He added that the CBC, while not saying whether it favored Motorola or Kahn, indicated that it favored the selection of a single AM stereo system.

In a prepared statement, Canada's Communications Minister Flora MacDonald maintained that the selection of C-QUAM as the nation's AM stereo standard is a "first step toward improved AM." She added that the AM band in Canada, like in the US, has "faced a gradual decline in popularity."

### Kahn refuses comment

Kahn Communications President Leonard Kahn refused to comment to RW on whether he thought the Canadian decision would affect the on-going battle between his system and C-QUAM in the US.

However, Motorola AM Stereo Manager Frank Hilbert said he was "absolutely pleased" with Canada's decision. "I give (the DOC) a tremendous amount of credit ... for sorting through a difficult decision."

While he was hesitant to speculate how the decision would impact the US market, Hilbert said that he believed it would increase the rate at which AM stations switch to stereo.

Another Motorola official added that he thought the decision would encourage some of the 90% non-stereo US AMers that are now "sitting on the fence" to select the C-QUAM system.

Hilbert also said that Motorola is involved in about 15 other countries in its efforts to develop a world AM stereo standard.

CAB Senior VP/Radio Pierre Nadeau, (continued on page 4)

## AM Issues Kick Off NAB Show

by Alex Zavistovich

**Dallas TX** ... Acceptance of a voluntary national preemphasis standard and selection of an AM stereo broadcast system were strongly encouraged by FCC Mass Media Bureau Chief Jim McKinney during opening remarks at the AM Improvement Session of the NAB's 41st annual broadcast engineering conference.

Before a near-capacity audience, McKinney spoke in favor of the NRSC preemphasis/deemphasis standard, maintaining, "The NRSC objective is to obtain technical comparability with FM ... You have a choice to join other AM broadcasters in your area to improve the whole band."

McKinney also urged the group to make a decision regarding AM stereo. "Every month that you postpone the installation of the system you believe has won the marketplace battle you suffer," he said.

"Those who counsel falsely that you should wait a little while longer—wait until more studies are made ... those broadcasters are doomed in this age of consumer interest in better quality," he continued.

McKinney's remarks were followed by a number of papers, including a presentation on the NRSC standard by Delco Engineer Bill Gilbert and NewCity VP/Engineering John Marino, both NRSC members.

Marino spoke about concerns over the proposed 10 kHz bandwidth recommendation of the committee, noting that "10 kHz audio will gain us a lot more listeners than 3 kHz audio."

The presentation was followed by an implementation panel, during which broadcasters questioned NRSC members about the standard.

Also during the session, Harrison Klein, PE with San Francisco-based consulting engineers Hammett & Edison, presented his paper on modulation,



overmodulation and occupied bandwidth.

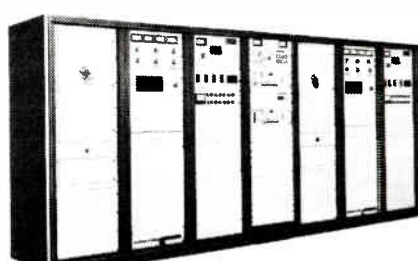
In it, Klein concluded that the primary

cause of splatter interference is "the presence of excessive high frequency content in the audio signal that modulates the carrier."

Splatter interference is minimized by filters before modulation, clippers in processors or transmitter inputs, and elimination of DC level shift in AM transmitters, he said.

Kahn Communications President Leonard Kahn, disagreeing with Klein's conclusions, spoke about AM modulation theory and measurements.

"There is no practice that can, under normal conditions, cause more adjacent channel interference than overmodulation" (continued on page 3)



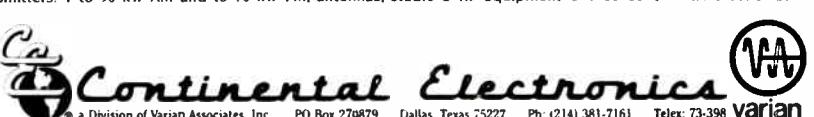
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## Regulatory News

# Reading Service Band Denied

by David Hughes

Washington DC ... Radio reading services, which provide an audio service for visually handicapped people, will not be getting a chunk of FM spectrum reserved for them.

Instead, the "talking book" services will have to continue relaying their programming via the subcarriers of non-commercial radio stations.

The FCC, in an order issued 20 February, rejected a request by the Association of Radio Reading Services (ARRS) that the 220-225 MHz band segment be allocated for use by radio reading services for the blind and print handicapped.

"We believe that the existing means for providing reading services are sufficient," the FCC said.

The ARRS had contended that the current practice of using FM subcarriers for reading services, especially with the need for special subcarrier receivers, makes it difficult for handicapped people, especially those on fixed incomes, to receive the services.

### Subcarriers faulted

The ARRS, which represents 152 radio reading service outlets, maintained that the existing subcarrier-based reading services reach only a small percentage of visually handicapped persons.

In a petition filed with the FCC last year, the ARRS said that only about 150,000 print handicapped persons now listen to subcarrier reading services, leaving as many as 2.4 million unserved.

It added that reading services also face problems with ever-tightening subcarrier capacity in many markets.

Talking book services have to pay high prices to lease the subcarriers and often have to deal with inferior transmission quality, the ARRS maintained.

In turning down the ARRS petition, the Commission maintained that the

existing means for providing reading services is "sufficient." It said that FM subcarrier usage has lagged in many markets.

The FCC added that the ARRS did not document its claims that there are areas where radio reading services cannot obtain a subcarrier.

Most major markets, the Commission said, have more than one non-commercial FM station each with related subcarriers. It also maintained that less expensive subcarrier receivers could be produced.

The Commission also said that it was "unconvinced that the cost (to the consumer) of service at 220 MHz would indeed be significantly less" than with the current use of subcarriers.

"We expect a growing number of (subcarrier) outlets to be available for radio reading services with the addition of new FM radio stations and growth in alternative media outlets," the FCC said in its February order.

It added that FM subcarriers are not the only medium for reaching print-handicapped people.

Bob Watson, who handles legislative and governmental affairs for the ARRS, told *RW* that the FCC's actions "were a bit misguided." He said the Commission divided the 220-225 MHz band between amateur and mobile paging services, and rejected, "without even a comment period," the ARRS request for the band.

He said his organization plans to file a petition for reconsideration.

### Lower SCA fees

In a related issue, the FCC has extended its comment and reply deadlines on a proposal, also filed by ARRS, to require noncommercial FM licensees to allow radio reading services to use their subcarrier capacity on an "incremental basis."

The FCC's inquiry, which was released

in February, originated from an ARRS petition filed in May 1986.

According to the FCC, the ARRS maintained that "allowing public radio stations to use subsidiary channels for remunerative purposes has had unanticipated negative effects on reading services for the visually impaired."

The ARRS contended that the FCC had not established guidelines regarding charges for subcarrier services thereby creating a great variance among fees charged.

Commenting on the petition, the Commission maintained that the ARRS has provided little evidence that the use of subcarriers for remunerative purposes by noncommercial stations was actually harming the reading services.

But the FCC did acknowledge that there was "a great disparity among stations in the amount of the charges imposed on the reading services."

In asking for an extension on the comment deadlines, the Corporation for Public Broadcasting (CPB) said that more time was needed to collect information about the prices that stations are charging.

(continued on page 4)

## FCC Clips

### Employment Figures

In March, the Commission released its 1982-1986 employment trends in the broadcast industry and they indicate that white males continue to dominate broadcast engineering.

The figures show that of the 32,472 "technicians" in both radio and TV, 28,107, or 86.6%, are males. Only 6,188, or 19.1%, are minorities, and only 4,365, or 13.4% are women.

The ranks of minorities and women in engineering are increasing—albeit slowly. In 1982, only 17.2% of technicians were minorities and 11.7% were females.

Minorities and women's numbers are greater in other radio/TV job categories.

In the "office/clerical" category, women make up 87.7%, with minorities comprising 26.2%. Women make up 46.9% of all sales workers, 30.3% of "professionals" and 30.1% of "officials and managers." Minorities make up 60.2% of "service" personnel, 40.7% of "laborers" and 18.6% of "craftsmen."

Of all jobs at broadcast stations, women make up 37.4%, while minorities include 16%. Both figures are up less than 3% since 1982.

Complete state-by-state reports can be inspected at the Mass Media Bureau's EEO Branch, Room 7218, 2025 M Street NW, Washington DC 20554. The employment reports can be purchased from International Transcription Services, call 202-857-3800.

### Synchronous Transmitters

The FCC has set 4 May and 3 June as the deadline for comments and reply comments, respectively, on the issue of allowing more widespread use of synchronous AM transmitters.

On 15 January, the Commission issued a Notice of Inquiry proposing that AM stations be able to use carefully synchronized transmitters on their original frequency to fill in gaps or to extend their coverage area.

Several AMers have already received experimental authorizations to conduct synchronous tests.

The FCC docket number is MM 87-6. For more information contact Bernard Gorden at 202-632-9660.

### Revised Form 301

The FCC has issued a revised version of Form 301, the application for a construction permit at a commercial station. The Commission maintained that it will continue to accept the old form until 30 April.

Starting 1 May, only the revised version will be accepted. Use of the new 301 will "help reduce application processing time," the FCC added.

Copies of the new form can be obtained from the FCC's Operations Support Division and Supply Branch, Room B-10, 1919 M St. NW, Washington DC 20554, or by calling 202-632-7272.

For more information contact the FCC's news media information office at 202-632-5050.

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# New Life for Carts at Exhibits

by Judith Gross

**Dallas TX** ... Breakthrough audio technologies breathed new life into the traditional cart machine on the NAB exhibit floor dispelling, at least for now, the belief that the old stand-by is on its way out of the radio station.

Two years ago digital store and playback units using hard and floppy disk technology were being touted as replacements for cart machines.

But these have failed to gain acceptance among radio users, and this year there were state-of-the-art improvements—analogue as well as digital—to cart machines.

## DAT arrives

ITC/3M broke new ground with the 3M HCDA 3000 Digital Audio System.

It's a 16-bit linear system one part of which resembles a traditional cart machine, and uses the same 3M data cassette used in computers—but with Digital Audio Tape inside.

Each cartridge has 200 feet of tape played at 52 ips in what the company calls a "serpentine" configuration.

The DAT head moves across all 32 tracks on the tape, one track at a time, each time the tape reverses direction.

The system accommodates either 48 or 44.1 kHz sampling rate, which is automatically detected during playback.

According to ITC/3M, worst case time for cueing to a specific cut is 15 seconds. A recorder/reproducer is priced at \$13,500, the reproducer alone is \$6,750, with delivery slated for the end of this year.

## CD Cart

Another digital offering designed to look and act like a cart machine was the Denon CD Cart Player shown in Allied Broadcast Equipment's booth.

The DN-950F is a playback unit for CDs, but instead of loading a CD directly into the machine, it uses hard plastic cartridge cases designed for CD-ROM.

The CD Cart Player cues to music, and marks the beginning and end of a cut.

Denon is pricing its CD cart player at \$1,200-1,500 with September availability.

## Analog not dead

One new application of emerging technology shown at the convention was not digital.

Pacific Recorders & Engineering showed the first use of Dolby SR as an outboard unit for a cart player in a dem-

onstration using the Tomcat.

Dolby SR is an encoding-decoding technology designed to increase the performance of analog tape recorders. It reduces distortion and tape saturation.

Pacific Recorders said the addition of Dolby SR to the Tomcat resulted in a dynamic range of 92 dB.

The Tomcat-SR demo was shown to

get feedback from radio engineers and is not yet available as a product.

Dolby would have to design an OEM SR card specifically for cart machines, according to PR&E, which could be either incorporated into the machines, or used as an add-on.

RW will have a complete review of the NAB convention in the 1 May issue.



ITC/3M demonstrates its new digital cart machine to NAB attendees.

## Show Highlights NRSC Standard, AM Concerns

(continued from page 1)

tion of a typical AM transmitter," Kahn said.

Kahn stressed in his paper that his main purpose was to "dispel the slightest doubt that sharp edges and overmodulation of AM transmitter signals have a tremendous effect on splatter."

Alan Parnau, an engineer with ABC/Cap Cities, presented a design for a broadband antenna-matching network

for a single tower, non-directional station.

Grant Bingeman discussed "economical" directional antenna systems.

Other topics presented in the AM Improvement session included digital AM modulation, diplexing antenna systems and alternative antenna sites and configurations.

RW will present full coverage of the NAB convention in the 1 May issue.

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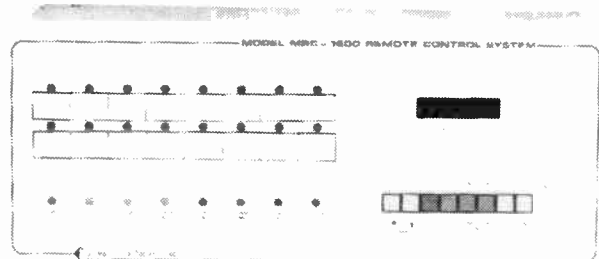
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# FCC Decision on Tap for DST

by Alex Zavistovich

Washington DC . . . At RW's press time in late March, an FCC decision was expected in early April on increased presunrise authorization (PSA) power levels for daytimers affected by the recent advancement of daylight savings time (DST).

However, comments filed with the Commission indicate that many broadcasters, especially owners of clear channel facilities, disapprove of the FCC's proposed remedy, which involves the grant of a minimum of 50 W PSA power to daytimers.

The Commission's decision to change AM daytimers' presunrise operations was prompted by the DST extension passed by Congress last year. Under the new law, clocks have been turned one hour ahead on the first Sunday in April, rather than the last. This year, DST began on 5 April.

For daytimers, the change means loss of an hour of full power morning drive time.

Louis Stephens of the FCC Mass Media Bureau International Branch predicted, however, that a decision on PSA will be made and action will be taken by the Commission in time to inform daytimers that would be affected.

According to the FCC's proposal, daytimers with presunrise authorization (PSA) of less than 50 W, or those which do not qualify for a PSA level, will be able to operate at 50 W beginning daily at 6 AM during the DST extension.

Daytimers already authorized to operate with more than 50 W PSA would continue to do so, the Commission maintained.

The 50 W PSA level applies only from the first Sunday in April to the last day of April, the FCC stressed.

But two alternative courses of action are possible by the FCC, Stephens said.

The Commission may either decide to adopt the proposal for this year and "give further thought to later years," or

an interim action may be chosen, allowing stations to use the 50 W limit even though it had not been officially approved.

Regardless of the Commission's decision, Stephens said stations must notify the FCC of their intent to broadcast using PSA operating power. The FCC said it "intends to perform the necessary calculations and to issue authorizations to all affected stations in time for use next April."

Broadcasters were generally critical about the higher PSAs; however, there was some support. Of the comments filed, only the Maryland-DC-Delaware Broadcasters Association (MDCD), a trade association of radio and television stations in the Mid-Atlantic region, wholeheartedly urged adoption of the Commission's proposed rule change.

"By amending its rules," MDCD said, "the Commission balances the goal of providing relief to AM daytime-only stations with the objective of minimizing interference to other broadcast stations."

The FCC's proposal was also supported in part by the NAB, which expected that the change would generally "provide useful benefits for daytime-only stations and their listeners without causing significant interference to other stations."

However, the NAB called particular attention to situations for which the 50 W grant to some daytimers might "significantly impair the normally protected 0.5 mV/m groundwave contour of other AM stations."

In those cases, the NAB urged the Commission "to weigh carefully whether the special circumstances involved in this proceeding . . . would afford daytimers currently not entitled to PSA operation a range of PSA power during extended DST, based on their actual interference potential."

Price Communications, owner of five clear channel stations, opposed extending the PSA "on Class I channels where a minimum power is proposed."

sunrise "would cause mammoth interference to the nighttime skywave and groundwave service of the US Class I stations."

According to the firm's study, "Class I stations can lose thousands of square miles of groundwave service while each daytime station will pick up only a small amount."

Further, Ring held, "any service lost by the Class I station is now existing service which will not be replaced and may well result in the creation of 'white' (unserved) areas."

In its filings, the Clear Channel Broadcasting Service (CCBS) maintained that "the proposal to alter the hours of operation of daytime stations . . . fails to protect the public's interest in receiving interference-free service . . ."

As a compromise measure, CCBS urged the FCC to "balance the public's interest in receiving interference-free service by at least preserving the 0.5 mV/m groundwave service offered by Class I stations while permitting daytimers to operate with a minimum of 10 W."

Noting that the Commission's 50 W proposal "was tried once before and resulted in massive interference," CCBS suggested that its own compromise would "preserve irreplaceable wide area groundwave service."

FCC docket number is MM 87-3. For additional information, contact Louis Stephens at the FCC: 202-254-3394.

According to Price, "any increases in presently authorized power will result in additional interference to service rendered by the clear channel stations, clearly above and beyond that which would result from only a change in operating time impacted by the earlier effectiveness of DST during the month of April."

A "potentially highly destructive" effect on clear channel stations would result from increasing power to a 50 W minimum, "even for the limited time proposed," Price contended.

The Association for Broadcast Engineering Standards (ABES) also held that the Commission's proposal would result in added interference.

"The need for a minimum is based on the recognition that presunrise protection to the protected primary groundwave and secondary skywave contours of Class I stations cannot be provided at the stated minimum," ABES maintained.

"The result," the association said, "will be interference of a nature that cannot be offset by the new services provided at the minimum power."

In a technical report filed in response to the docket, A. D. Ring & Associates, a Washington DC-based consulting engineering group, stressed that allowing 50 W for each daytimer from 6:00 AM to

## Canada To Go C-QUAM

(continued from page 1)

who monitors the AM stereo issue for his association, said he "did not know" if the DOC ruling would encourage the US to select a single standard.

### Receiver standards

The DOC ruling only applies to the stereo transmission standard and has no bearing on receivers, Nadeau added.

However, the CAB last year also recommended to the DOC that by 1990 all AM receivers sold in Canada should be stereo capable. The DOC has yet to rule on this proposal.

According to Nadeau and Pittarelli, the DOC has also opened a formal comment period on a preemphasis standard and band-limiting criteria, which have already been adopted in a voluntary standard by the NRSC in the US.

"Such standards," the DOC said in the *Gazette*, "would result in uniform AM broadcasting audio processing and would encourage receiver manufacturers to adopt complementary circuitry leading to improved audio quality."

For more information, contact Mario Pittarelli at 613-990-4950, or Pierre Nadeau at 613-233-4035.

## Services Denied FM Band

(continued from page 2)

ing reading services to lease their subcarriers.

According to Watson, the CPB is doing an investigation on "the non-uniformity of the (SCA) cost structure" for radio reading services.

The original comment deadlines on the matter had been set for March. The new deadlines are 15 June for comments and 29 June for reply comments.

The issue involving the reallocation of the 220 MHz band is contained in Rulemaking 5434. For more information contact Raymond LaForge at the FCC: 202-653-8155.

The issue of the SCA cost study is contained in FCC docket MM 87-9 and Rulemaking 5509. Contact Barbara Kreisman at 202-632-7792. For more information on the ARRS, contact Bob Watson at 612-642-0848.

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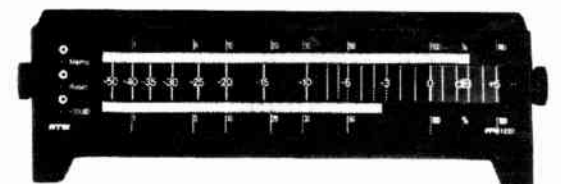
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## On-the-job training

Dear RW,

I have read with great interest the many fine articles in your paper since I began my current position at this non-commercial Christian radio station in the central part of the state.

I have finally been motivated to write after reading Tim McCartney's article about the general lack of interest in broadcast engineering as a career choice for electronics students (and others). I found it quite interesting and would like to relate a little of my situation.

KTIG is part of a two-station group that used to have a network technical director in a full-time capacity serving both stations.

When he left us in June of 1986 the network board elected not to replace him. That left us to fend for ourselves in the technical area.

The management secured some local help for emergencies, and I had the opportunity I wondered if I would get without leaving here for a job somewhere else.

I enrolled in the Associate Degree program with CIE and began my education in electronics, with emphasis in broadcast (not offered in the degree program at school!). This emphasis is OJT. I love it!

The challenges offered me in the technical area keep my interest sparked constantly. I don't love breakdowns, and yet I love the challenge of trying to track down those problems that are keeping equipment from functioning properly.

Of particular interest I noted that Tim mentioned the willingness of guys in the field to help each other. This has certainly been true in my own situation also.

Obviously if CIE isn't giving me some of the specific broadcast help that I need,

I have to get it from somebody. Those somebodies are Mark Persons (I'm sure many RW readers will remember his articles), Al Stewart from the Denver area (who happens to be the engineer who left us), and a local engineer from our telco who has a lot of helpful insights for me.

I feel a little sorry for my college friends who went into electronics and went the computer route because there was more of a "future" there.

I love my work (I also do a six-hour air-shift here M-F), and I cannot imagine that those poor guys are as fulfilled in their work as I am. I'm looking forward to a future of more technical emphasis and less on-air work. I can hardly wait!

I appreciate the help I get from RW, especially articles which help me as a beginner to understand more of what's going on with my broadcast equipment.

Mark W. Croom

KTIG-FM

Pequot Lakes, MN

## AM Stereo garbage

Dear RW:

I've heard all the garbage I can stand about the AM stereo "issue." The problem?

1. Motorola and Kahn each want a monopoly.
2. The stations don't want to waste \$6,000 on the wrong system.
3. The FCC is afraid it will be sued by the "sore loser" in a standard decision.
4. The receiver makers are afraid of wasting millions on the wrong system.
5. The listeners don't know anything about AM stereo.

So what are the facts involved?

1. Motorola and Kahn aren't going to give in because there is money and bragging rights to be collected.
2. \$6,000 is a lot of money to a 500 W daytimer, even though it is a small portion of the cost of converting.

With the DOC's approval of C-QUAM as an AM stereo transmission standard, Canada joins the growing list of countries that have resolved the AM stereo question.

As in Brazil and Australia, broadcasters and receiver manufacturers in Canada now know what to expect and can proceed to improve the quality of their AM service without further delay.

Presumably the same will be true of Japan, once the BTA finishes its study and recommends an AM stereo system.

Each country's choice of a particular system is not as important as the fact that the matter was resolved in a unified way. A process was undertaken and it worked.

It's clear from those countries that have resolved the AM stereo standard question that it takes the efforts of broadcasters, receiver manufacturers and, if feasible, the government as well, to move the AM stereo question along.

Clearly, in the US such a cooperative effort has been lacking.

While our government's inability to enter the fray is understandable given its deregulatory posture, the same cannot be said of the other factions involved.

Why haven't AM broadcasters and receiver manufacturers, and the two organizations that represent them, the NAB and the EIA, been willing to join forces to resolve the AM stereo question?

It's particularly difficult to understand the reluctance on the part of AM broadcasters, when many of them are fighting for their survival.

While the NAB has yet to respond to this need, there has been some interest from AM stations in the formation of an ad hoc committee to meet with receiver manufacturers.

But NAB, which purports to represent the interest of AMers, is failing to respond to an issue of critical importance to a major part of its membership.

NAB should openly and clearly give its reasons for its unwillingness to help resolve the AM stereo situation. Only then can NAB's membership determine if the organization is pursuing the proper course.

—RW

# Your Move, NAB

3. The FCC's "raison d'être" is its own continued existence.

4. The receiver makers are doing a terrible job of promoting the few sets they have made.

5. The folks who know anything about AM stereo are not telling the listeners what they know.

Personal suggestions about what to do.

1. Forget Motorola, Kahn and the FCC, since they don't operate in the public interest.

2. Forget the listeners since they don't have any way to decide the issue. It isn't their fault or responsibility.

3. The station owners should convince

the receiver manufacturers to donate or sell at cost a bunch of multimode sets. Give them away at drive time every day for a month. Sell them dirt cheap on MTV. Include them with newspaper subscriptions. "Call now—1-800" on late night cable stations. Tell me that AM people aren't the masters of low cost promotion.

If this letter gets printed, the sequel will contain the names of the real culprits of the AM stereo situation. The story has a surprise ending.

Robert Koch  
Repair Shop  
Greensboro, NC

## Radio World

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## AM STATIONS . . . NON-STEREO ONLY.

RW would like your help in determining what effect the NTIA's study of multisystem AM stereo receivers will have on the AM stereo "stalemate."

Please check only one response below and mail this form to: RW NTIA Survey, PO Box 1214, Falls Church VA 22041.

- 1. If the NTIA study finds that multisystem receivers are the right alternative and asks the FCC to protect both Kahn and C-QUAM pilot tones *we will go stereo.*
- 2. If the NTIA finds that a single system would be preferred over multisystem AM stereo, *we will go stereo.*
- 3. No matter what the NTIA study concludes, *we will not go stereo.*

### OPTIONAL:

Name \_\_\_\_\_ Title \_\_\_\_\_  
Station \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_  
Telephone ( ) \_\_\_\_\_



# AMs To Get Interference Dollars

by David Hughes

Washington DC ... Florida AM stations that had filed for federal funds to compensate them for improvements they made to battle Cuban interference may finally see some cash as early as this spring.

Although the FCC had approved nine compensation requests during the past two years, it did not handle the actual cash disbursements.

That is provided by the US Information Agency (USIA). However, a dispute over how to pay the approved claims has, until now, blocked the release of any funds.

As of mid-March, no station had seen any compensation funds. "To my knowledge, nobody has received any funds," said Leonore Cunningham of the FCC Audio Services Division.

However, USIA Counsel John Lindberg told RW that at least some stations could receive their compensation checks by spring or summer.

The Radio Broadcasting to Cuba Act, which was approved in October 1983, made the compensation program law. The FCC completed the mechanics of a compensation program the following year.

Stations which made approved transmission system improvements to combat increasing AM band interference from Cuba could apply for federal funds.

## Disbursement delays

According to the USIA's Lindberg, Congress last summer appropriated \$500,000 for the compensation program. How-

ever, because of legal questions involving how those funds should be paid, the disbursement has been delayed.

Lindberg said the USIA had originally decided to pay the compensation claims on a first come, first served basis.

That would have meant that the first six claims, which total just about \$500,000, would be paid in their entirety. The USIA requested the \$500,000 after the first six compensation claims were approved.

However, since then, three more claims had been approved by the FCC—raising the total to about \$1.5 million. Lindberg said the USIA then examined whether to use the \$500,000 to pay all nine claims on a pro-rated basis.

If that plan were approved, each of the nine claimants would receive only a portion of their compensation and would have to wait longer for the remainder of the funds.

Eventually, the USIA decided on the first come, first serve plan. Lindberg said the first six claims will be processed and paid by "spring." He added that short staffing at the USIA and its heavy caseload was also partly to blame for the delay.

Those claims include \$31,461 for WINZ, Miami, \$245,751 for WVCG, Coral Gables, \$84,027 for WIOD, Miami, \$113,271 for WNWS, South Miami, \$14,397 for WEAT, West Palm Beach, and \$12,165 for WSUN, St. Petersburg.

However, the three remaining claims, approved by the FCC since the USIA's original request for \$500,000, will not be paid until late 1987, at the earliest.

Lindberg said that a supplemental re-

quest for about \$1 million was submitted by the USIA to Congress in January. "If Congress approves it, we could see the funds sent out in late 1987," he added.

Those claims include \$714,833 for WQBA, Miami, \$257,631 for WKAT, Miami Beach, and the latest approved claim, a second recommendation for WSUN of \$18,980.

The second recommendation for WSUN, technically the ninth claim approved by the FCC, brings the Commission up to date on the claims. "There are no more claims on file," according to Cunningham.

## Latest recommendation

In the latest compensation recommendation, the Commission on 25 February recommended that Taft Television and Radio Company, former owner of WSUN, St. Petersburg, receive \$18,980 for its transmission system upgrades to battle Cuban interference. CBS has since

purchased the station.

In March 1985, the FCC recommended that Plough Broadcasting, which owned WSUN before Taft, receive a compensation recommendation for \$12,265.

Plough had filed for a special temporary authority (STA) in April 1983 to make changes in the station's daytime and nighttime operations.

The FCC approved the daytime changes in June 1983 and Plough made those improvements. However, the authority for the nighttime changes was not granted until after Plough sold the station to Taft in June 1984.

When the approval for the nighttime changes was made by the FCC in December 1984, Taft subsequently made the upgrade.

Since both Plough and Taft had made improvements to battle Cuban interference, the Commission determined that each was eligible for compensation, thus the two separate recommendations.

For more information on the compensation program, contact Leonore Cunningham at the FCC, 202-632-6485, or John Lindberg at the USIA, 202-485-7976.

# NAB Titles Changed

Washington DC ... In an attempt to make their roles within the organization more clear, the NAB has given new titles to four of its Science and Technology Department employees, formerly referred to as simply "staff engineers."

Ralph Justus is now Director of Engineering, Regulatory and International Affairs, while the Director of Spectrum Engineering and Regulatory Affairs title has gone to Mike Rau.

Ben Crutchfield now holds the title of

Director of Special Engineering Projects. Ed Williams is the Director of Broadcast Systems Engineering.

The new titles were conferred 9 March, an NAB spokesperson said.

Rau maintained that the titles were created because they are more appropriate job descriptions. The new position descriptions do not imply any change in responsibility, he stressed.

For additional information, contact Mike Rau at 202-429-5340.

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# Denver RF Levels Meet Limits

by Alex Zavistovich

Washington DC ... Results of a joint FCC/Environmental Protection Agency (EPA) survey of RF radiation emissions in Denver generally show levels considerably below the 1,000  $\mu\text{W}/\text{cm}^2$  standard set by the American National Standards Institute (ANSI).

However, the antenna of Denver's KYGO-FM, one of the stations tested, indicated radiation values as high as 10,000  $\mu\text{W}/\text{cm}^2$ , and station management has begun work to correct the problem.

The RF level findings were summarized in a EPA-prepared report released in March on the joint survey, which took place last September at the Lookout Mountain broadcast antenna farm. The survey was prompted by requests from Denver area residents and city officials.

Measurements were taken both on Lookout Mountain and in the nearby development of Genessee, approximately five miles from the antenna farm, according to the FCC.

The main sources of RF radiation on the mountain came from FM radio broadcast antennas, the report concluded. The FCC noted that "typical power densities near several residences did not exceed 100  $\mu\text{W}/\text{cm}^2$ ," and that the highest value found near the broadcast towers along a public road was 580  $\mu\text{W}/\text{cm}^2$ .

The ANSI RF protection guide recommends a limit of 1,000  $\mu\text{W}/\text{cm}^2$ . This guideline is used by the FCC in "evaluating" environmental impact with respect to RF radiation," the Commission said.

Results of the joint survey were well-received by Chris Odell, chairman of the Lookout Mountain Civic Association, a residential group which had pushed for the measurements of the antenna site.

"It (the survey) has given us some peace of mind," Odell said about the moderate RF emissions. "With a few exceptions, the radiation levels fall below even the most stringent requirements set

for the area," he said.

Odell also addressed the issue of the excessive emissions recorded at the KYGO antenna, noting that station management had unsuccessfully tried to move its antenna for several years, but had been met with "homeowner opposition" in the proposed new location.

Still, the station is working to resolve the problem. The FCC commented that KYGO management is working with the FCC to "ensure that the public will not be exposed to RF levels in excess of the ANSI guidelines."

According to KYGO GM Wayne Phillips, the station is negotiating with a tower lessor on Lookout Mountain to have its antenna moved to another tow-

er, at a higher location. Negotiations are "moving quickly," he said, and at press time the station was expected to reach an agreement by late March.

Phillips pointed out that the highest reading of 10,000  $\mu\text{W}/\text{cm}^2$  was recorded at the base of the antenna, directly below the antenna bay. The furthest point from the tower at which KYGO still exceeds recommended standards is approximately 40 feet southeast of the tower base, he said.

As a temporary measure, the EPA suggested a fence be erected at the 40' line, to limit public access to the area, Phillips said. He maintained that such a fence will be used until the antenna is moved.

According to the FCC, studies similar

to the one held in Denver were also conducted in Honolulu, Cougar Mountain near Seattle, and Portland, Oregon.

The results of the Portland survey, released late in February, showed that the highest power density anywhere in the area was less than 700  $\mu\text{W}/\text{cm}^2$ . An area open to the public near the base of the broadcast tower showed a contour of 500  $\mu\text{W}/\text{cm}^2$ , the survey said.

Residents and health officials in the Portland vicinity were concerned over the findings, which in homes near the site measured up to 200  $\mu\text{W}/\text{cm}^2$ . The RF radiation limit set by Multnomah County, in which Portland is located, is 200  $\mu\text{W}/\text{cm}^2$ .

For additional information, contact Robert Cleveland at the FCC: 202-653-8169, Chris Odell at 303-861-2223, or Wayne Phillips at KYGO-FM: 303-321-0950.

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# FCC Denies 225 MHz FM2 Band

by David Hughes

Washington DC ... The FCC has rejected a proposal to create a second FM band that could be used by daytimers and other AMers that suffer from poor coverage. However, the plan's backers say the issue is not dead.

In mid-March, FCC Office of Engineering and Technology (OET) Chief Thomas Stanley turned down Radio New Jersey's (RNJ) proposal to create a 225-230 MHz "FM2" band. He indicated that the frequency band was already reserved for military uses and could not be

reallocated for broadcasters.

According to RNJ Counsel Larry Roberts, Stanley maintained that the frequencies were vital to national security.

## FM2 plan

RNJ, which owns WRNJ, a 2.5 kW daytimer in Hackettstown, NJ, had asked the FCC last November to allow daytimers and fulltime AMers with poor nighttime signals to move to the 225-230 MHz band, which was dubbed FM2. Eventually, according to the plan, the AM operations would be discontinued—and not replaced.

RNJ contended that the former AMers would benefit by having fulltime operations on FM2, while the remaining AM stations would face less clutter and therefore be able to upgrade.

However, Stanley indicated in a 17 March letter to Roberts that the 225-230 MHz band is currently allocated "on a primary basis only for government use for fixed and mobile services," primarily "to operations by the military services."

"More specific information on systems operating in this band is not available to the public," the OET chief maintained.

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Receiver manufacturers have stated their willingness to replace their current AM receiver designs (with their telephone-quality fidelity) with AM receivers having full 10kHz frequency response—but *only* if and when the NRSC standard is fully adopted by broadcasters. For the NRSC standards to be successful, broadcasters must change over *quickly*. If the new high-fidelity receivers generate complaints of interference caused by stations not complying with the new standard, the receiver manufacturers will revert back to the present low fidelity 3kHz designs! *Everyone* will lose.

Orban was the first to propose and implement AM pre-emphasis and low-pass filtering, and we were heavily involved in the Committee work and research. We strongly endorse the new NRSC standard. It's good engineering *and* good business, and we are making it easy for all OPTIMOD-AM owners to comply.

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To find out more about the NRSC standard, and about Orban's new 9100B OPTIMOD-AM, or the Upgrade Kits for the 9100A and 9000A, please call or write.

Why not copy this ad for others at your station who would like to know what's in store for AM radio.

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Stanley said that the RNJ proposal would "displace government operations ... Since those operations are vital to national security interests, your proposal cannot be accepted and does not warrant consideration by the Commission."

He added that the FCC's finding "has been coordinated" with the National Telecommunications and Information Administration (NTIA), which sets communications policy for the Executive Branch of government. The NTIA "agrees with the action," Stanley maintained.

RNJ President Larry Tighe said he was aware there might be problems with the band. "We were apprehensive to start. We realized that the government may have regarded those frequencies as untouchable."

However, Tighe, who has monitored the 225-230 MHz band, said he has never heard any use of it. "We still don't know what the government uses it for," he added.

## Plan not dead

Despite the rejection, Roberts stressed that the FM2 plan is not dead. In addition to filing for reconsideration of the OET's decision and asking for a public comment period on the proposal, Roberts said RNJ will look for a new frequency band.

*"We realized that the government may have regarded those frequencies as untouchable."*

Roberts told RW that RNJ will ask the FCC to look, instead, at the adjacent 220-225 MHz band, located just above TV channel 13.

Recently the Commission rejected a plan to let radio reading services, which produce audio programs for the visually handicapped, have access to that band. (See the related article in this issue.) Those services currently use FM subcarriers.

Still, Roberts and Tighe say that they are more optimistic about their chances with the 220-225 MHz band than they were with 225-230 MHz. They point to the FCC's recent decision to delay a controversial decision to allow additional land mobile use of the UHF TV spectrum.

## Land mobile questions

The Commission was expected to allow increased land mobile use of the UHF TV band this spring. However, the commissioners have since questioned the validity of the data that indicated there was a pressing need for additional land mobile spectrum.

That issue is related to the FM2 proposal in that the FCC had also planned to give portions of the 220-225 MHz band to land mobile, as well as to the amateur service, according to Tighe.

If there is a dispute about the need for more land mobile spectrum, Tighe maintained, the Commission may be willing to open the band to broadcasters. "Millions of people would be served by the new (FM2) frequencies," he said.

"This is the first step in a long journey," Roberts added. "The idea is not dead."

For more information on the FM2 plan, contact Larry Roberts at 202-659-4700, or Larry Tighe at 201-850-1000.



# How To Fill Your Own Shoes

by John M. Cummuta

**Downers Grove IL ...** When John Wayne and Robert Ryan starred in the "Flying Leathernecks" there was a scene where the Duke's being transferred back to the states.

Ryan, who has been the Exec of the squadron, should be the natural to take over, but he doesn't get the nod. The Duke didn't recommend him.

There's a tense moment when Wayne tries to explain that it was probably his fault that Ryan wasn't ready to take over. "After all," he said, "it's the commanding officer's job to prepare his officers for command."

Ryan wasn't too receptive in the movie, but the Duke's point is well taken; and it's missed by a majority of upper-level managers in almost every industry—especially broadcasting.

It's the responsibility of top management to prepare those on the next rung down to take the reins. Not only for that future day when the present management will step aside, but for all those times before then when the boss is out of town or otherwise unavailable.

If there's a leadership void during those periods, the performance of the station will suffer—and the top manager has therefore failed.

If developing managers is a prime responsibility of top management, why are so few actively doing it?

It takes a high level of maturity to be a good boss, because only the mature can admit that they don't have all the answers.

Many times immature people are raised to levels of top management, either because they were very good at their midlevel job, because they're the owner's son-in-law, or because there just wasn't anyone else available.

Whatever the reason, they are insecure about their own abilities and worthiness for the job.

This insecurity causes them to act as if they do have all answers, and as if they are all-powerful and omniscient.

But, if they attempt to train anyone to be their second-in-command, they fear that their inadequacies would become obvious. So they remain the Lone Ranger manager.

What I'm getting at is that if you feel a strong internal resistance to allowing someone to take a bead on your job, you're feeling insecure.

That insecurity may stem from a self-esteem problem. You're probably not feeling confident about yourself in your position, and there are only two possibilities in that

event. You're either right or you're wrong.

Let's say you're right. The mature thing to do is not to keep holding a worthy candidate away from accepting more responsibility, but rather to further challenge yourself to improve your knowledge and skills.

The idea is that if you're not really worthy of your job, study and work on yourself until you are. Then you can feel free to give an up-and-comer a chance

to develop to his or her full potential.

Even harder than finding the right person inside yourself is finding the right person on your staff.

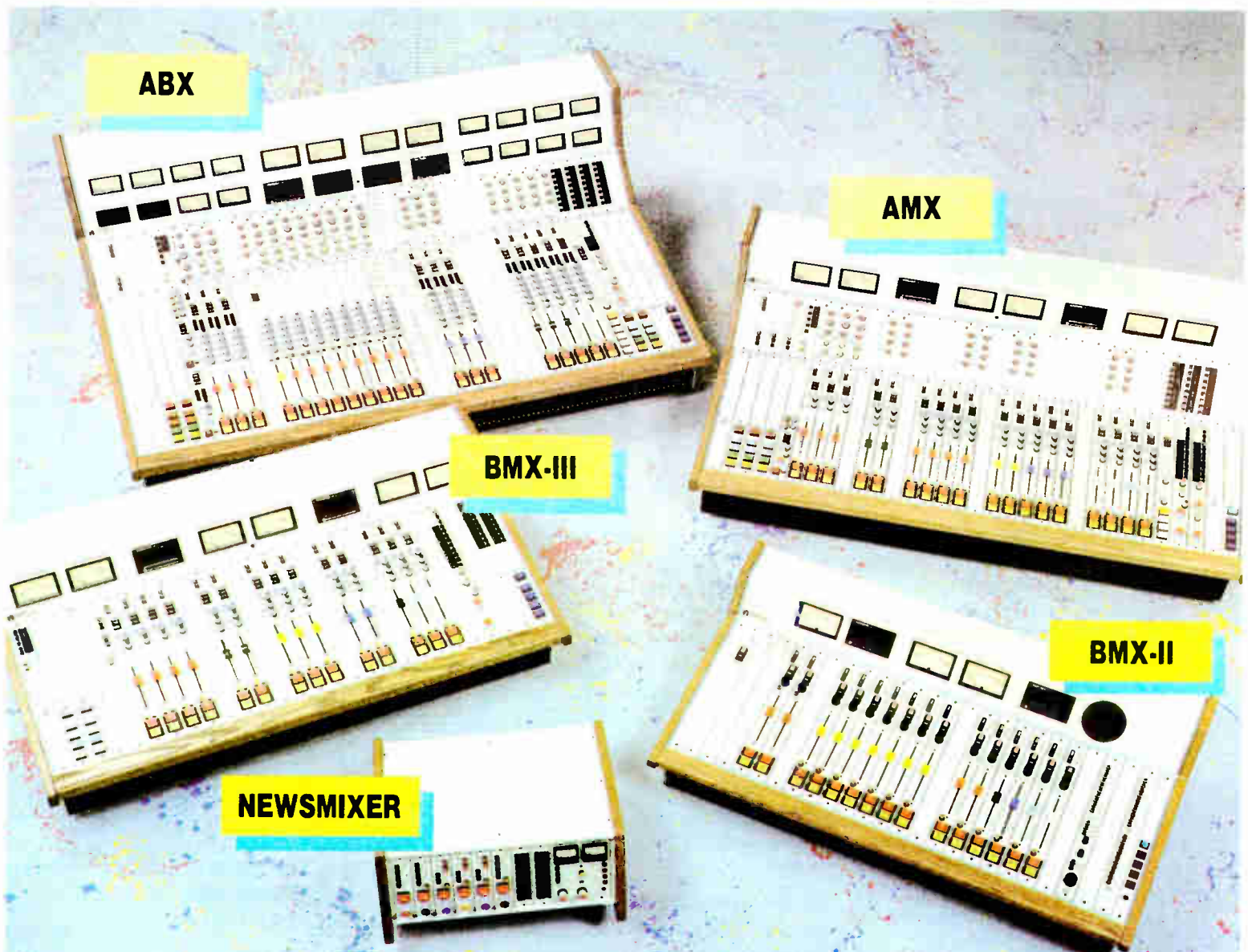
The more you study management principles and observe good and bad management in action, the more you'll realize that good managers are rare indeed.

In fact, you become painfully aware that good potential managers are even more rare.

When you (assuming you are an upper-level manager) begin looking for someone in your ranks whom you can groom for a promotion, you'll need to understand two truths: any potentially good managers will be diamonds in the rough at best; and you'll never find the perfect candidate.

Every one of them will have one or more flaws. But so do you. But you've learned to capitalize on your strengths and minimize the liabilities of your weaknesses. That's a sign of maturity, which the candidates have not yet necessarily developed.

*(continued on page 13)*



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



# Production: From Rat to Pro

by Tyree Ford

Baltimore MD . . . OK! So you started out working weekends on the air at the local station.

Because you are driven to achieve, you start hanging out in the production studio, working on your delivery and timing, waiting for that chance. Someone could get sick, or even better, be hired away to a larger market.

Until that time you remain hungry. You remain constantly alert for oppor-

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

tunities to prove your worth, to others as well as yourself.

One day, while you're in the production studio putzing around with tape echo, the door opens and a somewhat anxious A/E pokes his/her head in. It's the famous last minute copy change, and it's your big chance.

Grabbing the copy and donut, you try to metamorphasize your eagerness into something resembling professional assurance.

Forty minutes later you emerge from the studio with your finished master production (five years later you could have done the job in ten minutes).

The A/E checks it out, plays it for the client, gets an OK, and you head for the

traffic department to find out when the spot hits the air.

For the next two weeks you listen every time the spot runs. Each time you pick the spot apart and put it back together again. Your friends start to think you're a little strange because you begin turning the radio up during spot breaks, instead of during music.

Before you know it, you've bought your own splicing block, razor blades, splice tabs, cue tips and head cleaner. You keep them in a small box inside a turntable base cabinet. You have become a Production Rat.

When other members of the airstaff are disappearing immediately after their airshifts, you're still in the studio dis-

covering new ways to splice your segments together to increase the impact of your spots.

You are overflowing with new ideas. You now measure distance and time in 30 and 60 second segments and 7½ and 15 inch increments. The aroma of head cleaner and freshly unpacked pancakes of tape are aphrodisiacal.

Because you are "one" with the studio, your production clearly stands out as better than anyone's.

## Up against the wall of reality

One day the boss calls you into his office. He tells you that the station's pitching a really big client, and he wants you to come up with three or four spots.

You need no encouragement! Within two days you concoct four masterpieces, fully extending your talent and ability.

On the day of the big pitch you wait until the sales team returns. You see the car pull up. The faces of the boss and sales manager are long, *not* happy.

They struck out, which means *you* struck out. You can't believe it. Large chunks of your self-esteem crumble.

You have just experienced the results of ignoring the first rule of selling, which demands that you know what the client wants.

If you had been at the first meeting and had a chance to listen to the client's ideas, you could have created spots that incorporated those ideas.

This approach requires that you put your creative juices on hold and listen. Write down all of the client's ideas. Sure, some of them are going to be off-target, so are some of yours.

As you listen, try viewing the problem from your client's perspective *and* from the customer's perspective.

## Producer's File

Be careful to note the copy points and whether or not the client can really deliver the product or service as promised.

If he can't, and your copy says he can, you're asking for trouble. The customer's dissatisfaction will carry back through your client and right to you.

## Making the team

Maybe you wanted to be included in that first meeting, but the boss said it wasn't necessary. There are usually underlying reasons for this.

Your boss may believe that his/her ability to sell him/herself was all that was required. While establishing and maintaining good rapport with the client is essential, so is getting the job done.

Maybe you really do come off as a dirt-ball studio rat, and the boss doesn't see any benefit in exposing you to the client. (Don't ask the boss about this, look in a mirror.)

There may be a good reason why you look like you just crawled out from under an equipment rack.

The point is, if the boss perceives you this way, you're not likely to be asked to be part of the team. If that is the perception, you'll have to make some major changes to alter it.

As an airperson/production director at my last station, I wore a tie almost every day for three years. When I was made operations manager, I began wearing a jacket and tie, or a suit.

Within the first week of my change, one of the A/Es complimented me on my clothes and added, "Now you're one  
(continued on next page)

## Comtech's 3.8 Meter has the Extra Performance Margin Needed for Crystal-Clear Audio Reception.

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3.8 Meter Antenna Installation



## Equipment Buying Firm Started

by Alex Zavistovich

New York NY . . . For smaller broadcasters looking at new studio and transmission gear, Buygroup Ltd., a recently established broadcast-related purchasing company, is offering contract buying services.

Buygroup Ltd. was established in October 1986, according to President Bill Kovari. Kovari, who has worked in the purchasing departments of NBC and CBS, formed Buygroup after seven years as ABC's purchasing director.

According to Kovari, Buygroup will act as a company's "off-premises purchasing department," and hopes to eliminate payroll problems, unproductive time and fixed budget expenses.

### Business News

The company's clients also benefit by receiving more favorable prices on merchandise, reducing their overhead, and cutting paperwork, he maintained.

Buygroup maintains a staff of three full-time professional buyers who specialize in contract buying for the broadcasting industry, Kovari said.

The purchasing strategy behind Buygroup involves locating a number of clients looking for a similar piece of equipment from the same manufacturer, he explained. The clients then give Buygroup authorization to act as their agent.

By bringing enough smaller companies together, Buygroup will have increased buying power and can commit to a large order, he said. As a major buyer, the company can take advantage of lower per unit costs.

After the deal has been negotiated, the vendors deliver the merchandise to Buygroup's clients directly, Kovari said. The vendors also invoice the clients for direct payments.

Buygroup does not work on a percentage basis, he stressed. Rather, the company charges a fee, generally under \$50, for each document it processes.

Requisitions are sent by the clients to Buygroup's mid-town New York City offices, where prices are negotiated and an auditable record is maintained for each customer.

Kovari also pointed out that Buygroup deals only in new equipment obtained directly through a manufacturer or dealer, if necessary. The company does not involve the customer in auction bidding or other similar transactions.

Any order will be taken on by Buygroup, Kovari said, from single items such as pieces of test equipment to full start-up packages, including control rooms and studios.

For additional information on Buygroup Ltd., contact Bill Kovari at 212-544-6611. Or, write to BuyGroup, Ltd. at Central Park Plaza, 1775 Broadway, New York, NY 10019.

# How to Be a Production Pro

(continued from previous page) of us."

Although I was still on the airstaff, I had been accepted by the sales staff because of my clothing. From that point on, I made it one of my missions to break down the "wall" between "talent" and "sales."

In reality, both "talent" and "sales" sell; one in the studio, one on the street. The more these teams work as one, the stronger the station will be.

This doesn't mean you should start looking like Herb Tarlick. For you it may mean a haircut, getting out of paint splattered jeans, shelving your T-shirt collec-

tion, and leaving the sandals at home.

If you have no sense of what looks good, pick up one of those books about dressing for success. Eliminate polyester.

#### The new you

Don't expect people's perceptions to change overnight. Once you've been pigeonholed, it's difficult to change other's impressions of you.

After working at the same station for eight years, I decided to shave my beard, leaving my mustache.

While it took my wife a week to get used to the difference, people I worked with every day hardly noticed. After be-

ing beardless at work almost all day, someone finally asked how I had managed to grow such a full mustache over the weekend!

Bear in mind, the first time you show up dressed more professionally, someone will ask you if you have a job interview or a court appearance.

My comeback was always to smile knowingly and tell them it was definitely not the latter.


If you feel uncomfortable with upscaling your image, remember, you're still the same person underneath. If you still can't accept the facts, don't blame others for holding you back.

Q

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# Phasor Components

by Tom Osenkowsky

Brookfield CT ... In our continuing discussion on phasor design, we have examined the effect of L/C ratios and the function of most of the components which make up the matching and phasing networks.

If we are designing or redesigning a phasing system, we might want to consider how to accomplish our goal without using unnecessary components.

Let's look at a typical non-D 90° tower

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

and its matching network as shown in Figure 1.

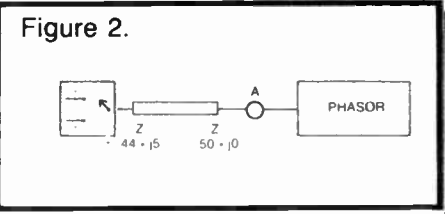
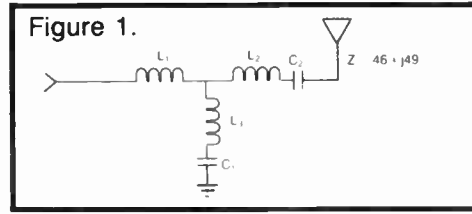
Things couldn't be much simpler, could they? Well, we could substitute a variable capacitor for C<sub>1</sub> and eliminate L<sub>3</sub>.

But there are two more unnecessary components, namely L<sub>2</sub> and C<sub>2</sub>. Remember, the equation for a 90° network is:

$$X_1 = X_2 = X_3 = \text{SQRT}(R_1 + R_A)$$

where R<sub>1</sub> = Line resistance and R<sub>A</sub> = Antenna resistance.

Keep in mind that the model for our tower consists of the antenna radiation resistance, the antenna reactive component, loss resistance and a distributed



capacitance, usually configured, lump summed at the tower base.

We find that our X<sub>2</sub> arm can actually be the inherent reactance of the antenna. We have actually eliminated two components from the design.

Let's divert briefly from the Tee design and look at another form of matching. Figure 2 shows an actual situation at a New York City station,

The phasor is located 50' from the RF Relay Antenna/Dummy Load selector. The common point is set to 50 ohms DA-D and DA-N.

At the other end of the line, the effect of the relays, etc. shows each transmitter 44+j5.

We could alter the common point network to allow the transmitters to see 50 ohms, but we'd like to standardize the actual common point to 50 ohms.

We could use an "L" or "T" network to match to 50 ohms, but could we do it with less?

### Matching the impedance

Let's try adding a 0.0004 μF capacitor from Point B to ground. We find the impedance at Point B to now be 50±j0.

I used a single shunt component here to raise the impedance to the desired value. This idea may be useful in circumstances where a minimal change is required.

The equation is:

$$X_{\text{required}} = X_{\text{load}} + (R_{\text{load}}^2 / X_{\text{load}})$$

Let's look at another situation. Consider the a non-D antenna whose impedance is 48+j25, and is located right next to the transmitter shack.

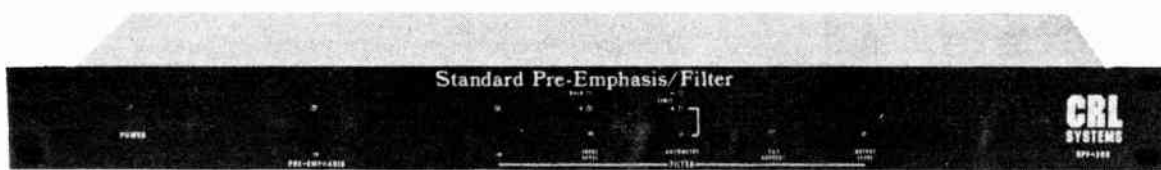
We simply use a capacitor to cancel the *(continued on page 19)*

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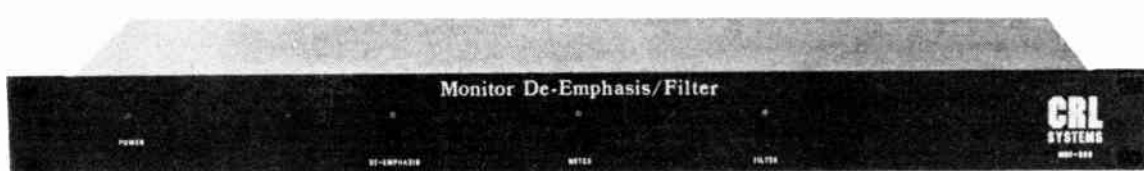
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The price of AM improvement is nice too! The SPF-300 list price is only \$495.00, the MDF-400 (Mono) \$295.00, and the MDF-800 (Stereo) \$395.00. These units are available for purchase now. If you need more information on these units, or want to talk about the improvements that the new NRSC standard offers, please call us at (800) 535-7648, or write to us at the address below.

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# Filling Your Own Job

(continued from page 9)

When you're looking for those diamonds in the rough, however, keep one thing firmly in mind. You are far better off picking someone with the right qualities, character and skills than someone with just experience.

Experience, in and of itself, is not an indicator of a potentially good manager. A candidate could have had years of rotten experiences, mostly self-induced.

I suppose the best way to bring it home is to say that, as a top manager, you are no longer judged by your own performance, but rather the overall performance of the group of people you manage.

So, when you're looking for someone you can clone, to occasionally assume your responsibilities of leadership, you need to be looking for the *type* of person with whom you would entrust your reputation.

Always easier said than done, leadership by example is a must. There's a saying in child rearing that goes, "Your children more attention pay, to what you do than what you say."

Nothing could be more precise in explaining the way employees watch the correlation between their boss's words and actions.

If you can ever get to the point where you notice someone in your ranks at-

tempting to subtly employ a concept they picked up from you, you've made it.

Because it is the highest compliment a manager can be paid.

The converse is also true, though. If your department is performing poorly, and no one in it is making any noble attempts at excellence, the first place to look is in the mirror.

Because that, to a great extent, is what your employees are: a mirror of your leadership by example.

Once you've designated one or more candidates for development, you must be willing to delegate real responsi-

bilities to them.

This is one of the toughest things for a really competent manager to do, because he (probably rightfully) feels that he can do the things he does better than anyone there.

I can promise you that several good things will happen as you begin to implement this new "development" mindset into your management.

You will find a new enthusiasm in the work of those you begin to challenge. They will grow. They will usually rise to accept their new level of responsibility and blossom before your eyes.

But you'll also see a change in yourself. Firstly you'll feel better about there being a backup to yourself in the leadership department.

You'll also lose that nagging feeling,

when you're away doing other tasks, that things are out of control back at the ranch.

You'll also feel a surge in your self-esteem. Why? Because you will realize that you are mature enough to let go and let grow.

You are not threatened by the appearance of another employee who may also be good at the job you have.

If you truly deserved to get your job, you probably deserve to keep it, and all your new protege can be is your heir-apparent until you decide to vacate the slot.

Until then, however, you've probably developed a good backstop, an able assistant and likely a strong friend. Rent a video of "Flying Leathernecks." You'll find that that's what the Duke did.



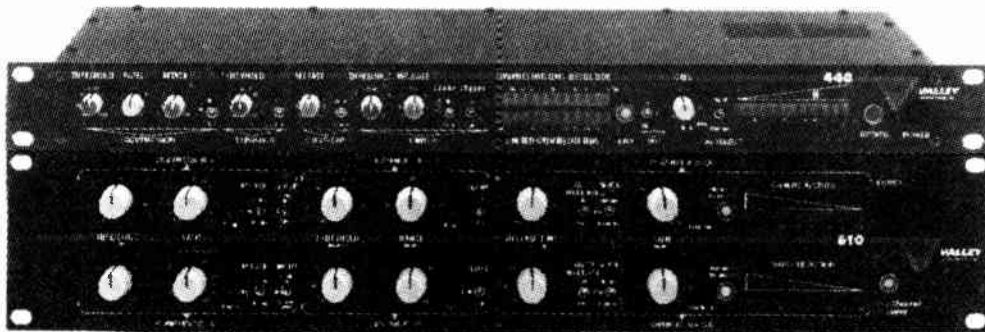
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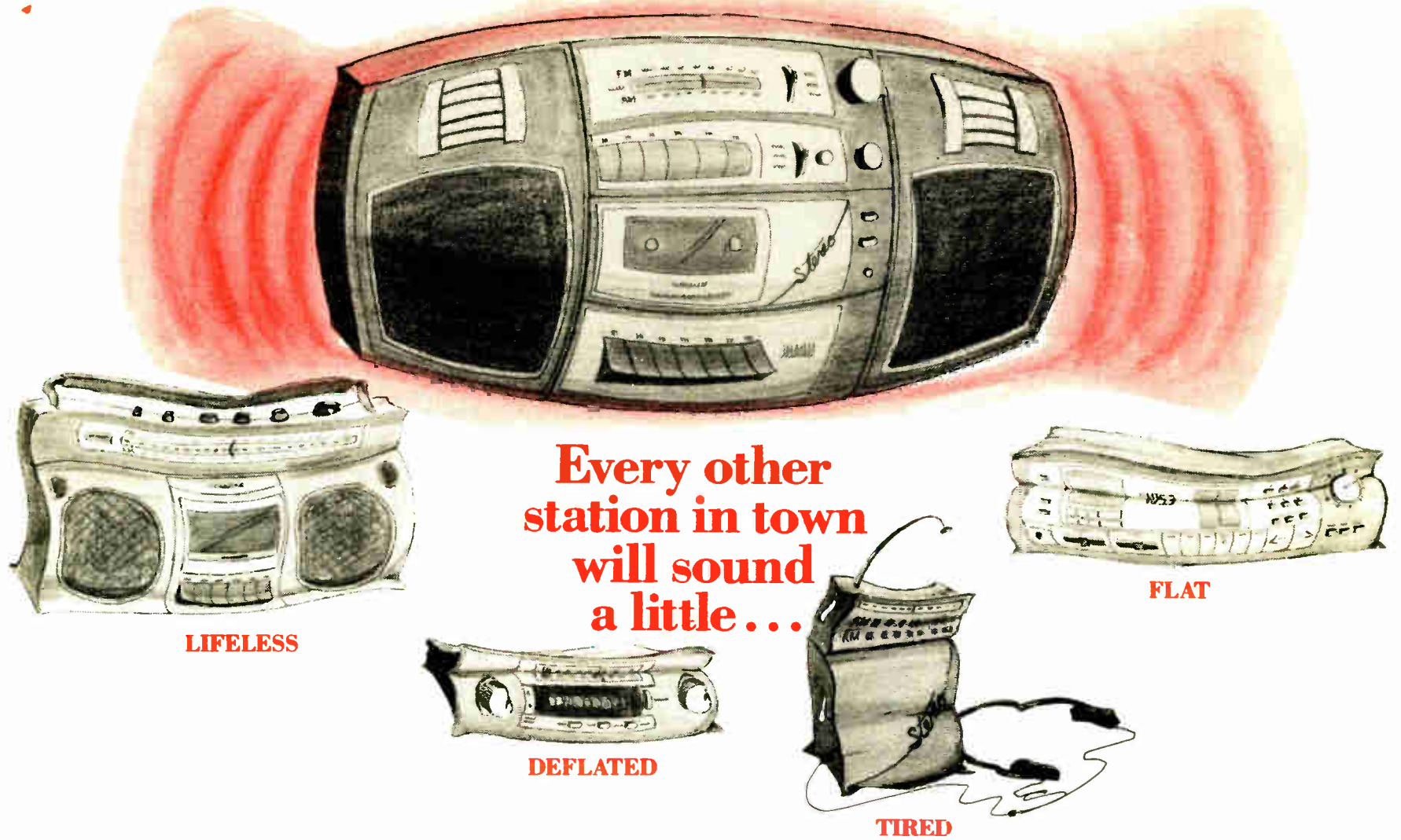
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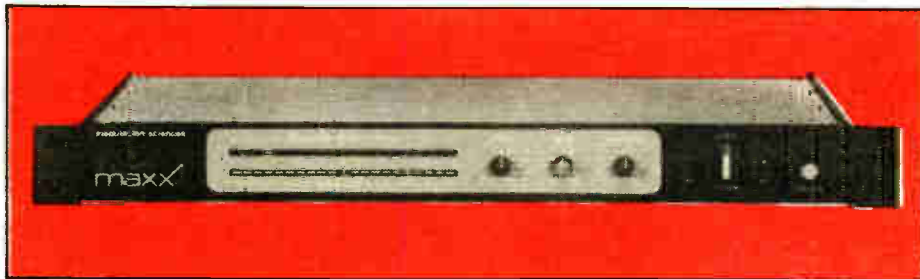
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Circle Reader Service 52 on Page 20



## 56 Years Ago in RW

Editor's note: The RW of today and the RW of old fortuitously share the same name. The RW of old was printed for a period of time in the 1920s and 1930s, when radio was first becoming popular.

The current version of RW that you hold in your hands has been around (in various forms and names) for nearly ten years.

## MARCONI TALK FROM ENGLAND IS HEARD HERE

Coincident with the opening of the public show in New York City, Senator Guglielmo Marconi spoke before a microphone of the British Broadcasting Company, in London, and his talk was carried by the WABC and WJZ chains. The Senator, an Italian, spoke with an English accent, for he has lived much of his life in England. He said in part:

"I am supposed to confine myself to an account of point-to-point wireless telegraphy, but broadcasting has become such an important factor in the daily life of nations that the practice of it depends on principles which are common to wireless telegraphy.

"The thing from which it may be truly said that wireless has sprung was the discovery made by Michael Faraday 100 years ago, that it was not necessary for two electrical circuits to be in actual physical contact in order that electrical energy might pass through the small space between them.

"The great need of the present day is for a better understanding between men and nations," said Senator Marconi. "This understanding can be fostered and helped by improvements in our communications. A most direct and satisfactory means of communication between men is the spoken word. In this respect broadcast telephony occupies a unique position as being the most potent means for the dissemination of instruction and entertainment that the world has ever known. I am happy if by any effort of mine I have been able to make some contribution toward international sympathy and understanding."

Reprinted from Radio World, October, 1931.

# Tracking Tower Wiring Puzzles

by Floyd Hall

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

The discovery of magnetism was probably the beginning, and the basis, of all electrical and electronic development as we know it today?

Well, it began with the invention of the magnetic compass, somewhere around the 12th century.

A black iron oxide,  $Fe_3O_4$ , an important iron ore was discovered, some of which was heavily magnetized and called lodestone.

Now, some sharp character—no one seems to know who—maybe some smart Portuguese sailor I would guess—found that he could rub a needle with a piece of this lodestone, float it on water with a sliver of wood, and it would point to the North!

It was Michael Faraday who discovered that if he passed a wire through the magnetic lines of force—from any kind of a magnet—a current would be induced in the wire.

I love the story about this—which I may have told you before, but like Red Skelton used to say, don't stop me if you have heard this before—I want to hear it again!

Well, Faraday wrote a paper about his discovery, which Sir Humphrey Davy submitted to the Great Royal Society.

### No practical future

In a few days, they handed down a learned verdict—they admitted that Faraday's discovery was an interesting phenomenon, for which they could see no practical application!

Of course, you know that practically everything we know and do electrically and electronically today, from super computers to the ignition on our auto-

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

mobiles, is based on Faraday's discovery.

Now, what I am trying to get at is, how often do we think of, or understand the principle of operation of the multitude of electrical, electronic, or electro-mechanical devices we utilize every day?

Look around you: digital multimeters; your electric shaver; VHF counters; of course your PC; your TV; and your electronic watch.

## Old Timer

We are living in a fabulous and amazing time, but the next few years will make us all look like rank amateurs.

Tell me now, what was the D'Arsonval movement?

### The days of tower lights

Early in the use of vertical radiators for AM, tower lighting was required.

In all of these early installations, the tower light wiring was installed by a good electrician, and was run up the tower in a steel conduit, which was straplocked, or clamped to the tower about every 15 or 20 feet.

Somewhere back in the forties, some character decided it was a lot easier, and cheaper, to wire with just insulated wire, such as a kind of house wire known as Romex, or something similar.

Now this stuff was two wire, with a ground, and when the steeplejack connected it up to the beacon, he hooked the ground wire to the tower.

The first time I ran into trouble with this stuff was at a station with a four

tower array, that called me in and said the DA had suddenly gone out of adjustment.

Before I made any change in the tuning, I wanted to look around to try and see what might have caused this sudden sharp change in operating parameters. I walked around the array, and noticed a coil of wire hanging about ten feet up on one of the towers.

When I asked what that was, I was told it was the light wiring, which had arced over and fouled the lighting, and they were having a tower man out to fix it.

### Free-form wiring

Up to this time I had never seen tower light wiring not in conduit, but I checked and found all four towers were wired with this "house wire."

That night, at midnight, I pulled this coil of wire down and connected it back to the lighting choke (with its bypass condensers). With the power turned off the tower lights, I found that the operating parameters had returned substantially to normal.

I of course recommended they replace all that junk with wire in conduit, which they eventually did; and we had to re-tune the array.

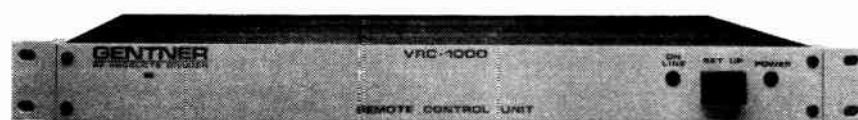
The next time I ran into this situation was at a station where they had seven—count 'em, seven—towers: a four tower parallelogram daytime, and four towers in-line nighttime.

The chief engineer was an old friend, and one night he called me and said, "Hey, the tower light wiring is arcing" *(continued on page 19)*

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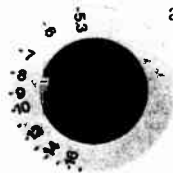
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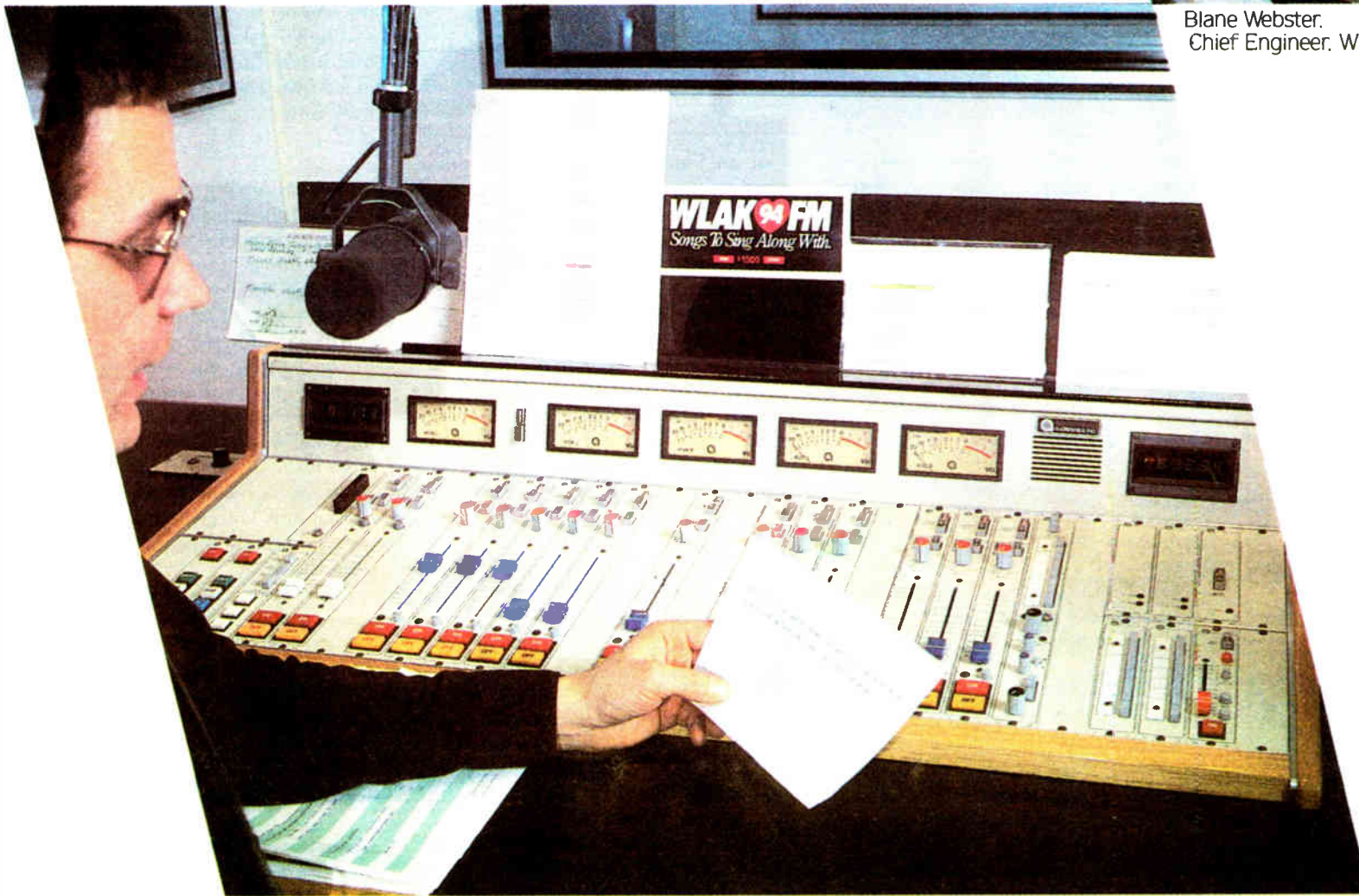
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Blane Webster,  
Chief Engineer, WLAK-FM



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

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

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

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

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

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# ABC Tests Satellite Data Feed

by Alex Zavistovich

New York NY ... Newsroom operations at ABC affiliate radio stations may soon gain faster access to news bulletins and special reports, if the network's recently announced digital satellite-delivered data system proves successful.

ABC Radio VP/Engineering and Program Operations, Kent Coughlin said the system, unveiled in February, will allow the network to address each affiliate individually. "We will also be able to feed information simultaneously to our lineup," he added.

The satellite system is essentially an extension of the Digital Audio Transmission Service (DATS), a three-transponder service on Satcom I-R which RCA leases to networks, according to ABC's Satellite Systems Director Bob Donnelly.

The DATS service is channeled with a certain number of time slots for program audio, in either 15 kHz or 7.5 kHz, Donnelly said. It can also be broken into 32

kilobit time slots for data, using a range of baud channels, he said.

ABC is currently operating at a 9600 baud rate, he said.

### Testing

Testing of the satellite delivery system began in February at the network's New York station WABC-AM. The project is expected to be completed, including testing and implementation, no later than 7 September 1987, he added.

Prototype data carts for the tests have been developed by Scientific Atlanta, which is also the principal supplier for ABC's uplink facilities in New York and Los Angeles, as well as for its terminal receivers.

At press time, ABC had also just signed a letter of intent with McCurdy Radio of Toronto for contract production of two different data carts, compatible with the Scientific Atlanta DAT 32 and Fairchild DART 384 terminals, Donnelly said.

WABC has started receiving regular

satellite feeds, Donnelly noted. "The data goes up on satellite, comes back off the network's receiver, and is handed off through an analog modem to the newsroom."

The analog modem, an output to a standard modem, is used because some analog detection is needed between the receiver and the data cart, he explained.

In addition to testing the effectiveness and reliability of the satellite system, Donnelly said ABC will also examine "worst cases"—situations in which a station's satellite receiver is remotely located from the studio.

### Significant enhancement

Testing of the satellite system is also under way at WMAL-AM and WRQX-FM in Washington, DC, and KGO-AM in San Francisco, Donnelly noted. Other stations due to go on line include WBAP-AM, Ft. Worth, WJR-AM, Detroit, WHAS-AM, Louisville, and KOMO-AM, Seattle.

The advent of satellite delivery is a "significant enhancement" to radio operations, Donnelly said. "It provides text information to users of our audio product," he explained.

According to Donnelly, radio stations taking news cuts from the network will, with this new system, "be provided with scripted information for the cuts, rather than having to hear an oral rundown of what will follow."

ABC Radio Network President Aaron Daniels said that the new radio system **(continued on page 19)**

# Springtime Dish Maintenance

by John P. Bisset

Washington DC ... With spring weather upon us, now is a good time to check your satellite system. The ravages of winter can take a heavy toll on downlinks, and now that most of the snow has melted, a visual inspection is in order.

To begin with, check the dish mount. Dishes mounted on concrete slabs are particularly vulnerable to settling into soft muddy earth as the ground thaws.

Even a fractional amount of tilting can degrade the signal, and necessitate adjustment. Check the bolts and the feedhorn mount. All should be tight.

### Problems with pests

While you are inspecting the feedhorn, check for insect nests. Unfortunately, the protected recesses of the feedhorn provide an ideal habitat for bees and other insects.

Suspect a wasp or hornet nest if you lose your signal around evening and regain it at dawn. In many cases, enough signal will pass through the nest while

the bees are away during the day, but when they arrive home for the night, the signal strength drops off dramatically.

The most difficult problem is when insects nest inside the waveguide. This problem can be avoided by covering the feedhorn with a plastic or styrofoam lid.

Check with your dish manufacturer as to their recommendations. The object is to select something that will not retain moisture, yet cover the opening to the waveguide or feedhorn to keep the insects out.

### Dealing with vandalism

Check the bolts holding the LNA to the feedhorn waveguide—they too

should be tight.

If your dish is located in a populated area, and subject to vandalism, you may want to mark the position of the LNA to the feedhorn.

The same goes for the feedhorn mount to the dish and the azimuth and polar mounts. These marks can be invaluable should someone decide to "take your dish for a spin."

In addition to marks, a can of spray-paint—a color different from the one the factory used—can be used to mark the piston of a polar mount. If someone cranks the dish, the change in color is instantly recognizable.

**(continued on page 18)**

John Bisset is CE at WCPT-AM and is also RW's technical advisor. He may be reached at 703-683-3000.

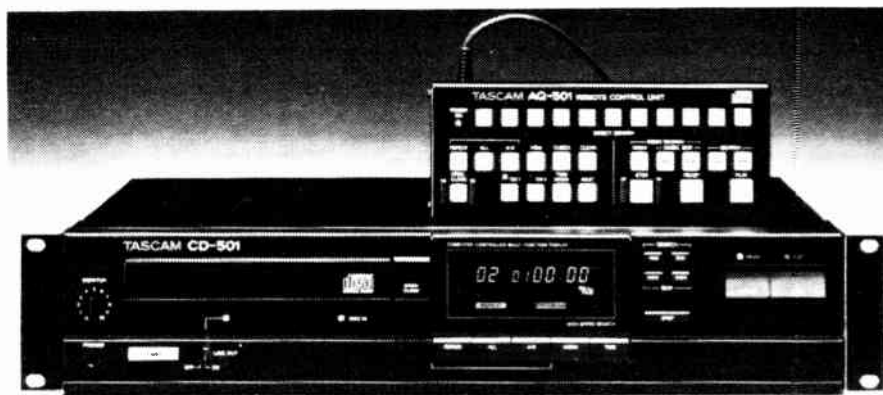
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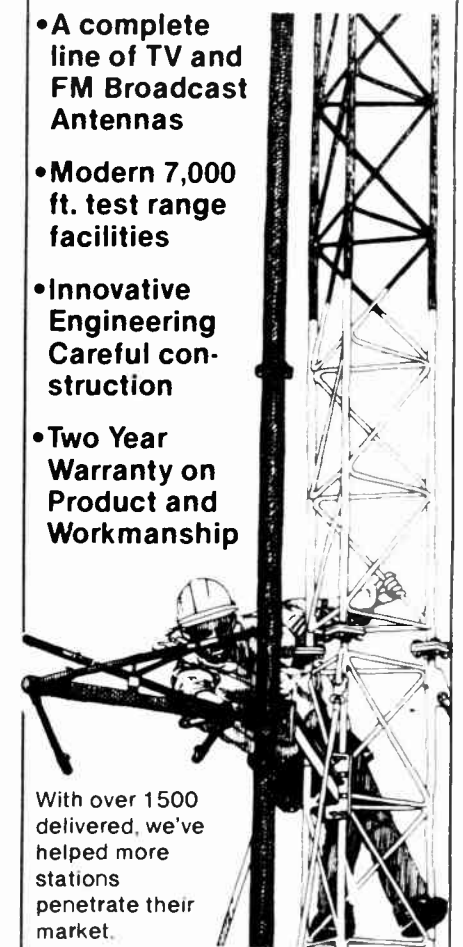
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## Satellite Times

# Teleport Purchased

by Judith Gross

Springfield VA ... The Washington International Teleport (WIT), which had been providing mainly video satellite services, is entering the world of radio uplinking with its purchase of a neighboring teleport from MultiComm Telecommunications.

MultiComm is a subsidiary of Amway Corp., and had been a part of Mutual Radio. However, the teleport was not included as part of Amway's sale of Mutual Radio to Westwood One in 1985.

The WIT currently owns ten uplinks and downlinks on just over an acre of land, and has been serving broadcast and cable video companies and an increasing amount of videoconferencing, according to Bruce Kirschenbaum, president of WIT and of Carley Teleport Communications. WIT is a wholly-owned subsidiary of Carley.

Kirschenbaum would not disclose the price for the MultiComm purchase, but said that it was "more than \$2 million."

### Real estate and equipment

By purchasing the MultiComm Teleport, WIT adds 4.7 acres of adjacent suburban Virginia property, plus a 3000

square foot operations center, an 11-meter earth station, two 4.6 meter C-band stations, and 3.7 and 1.8 meter stations.

But WIT also adds MultiComm's customers, which include Mutual Radio, Westwood One, AP, UPI and McDonnell Douglas, Kirschenbaum said.

Kirschenbaum said that he didn't anticipate the move into radio would be a problem for WIT's 24-hour a day crew.

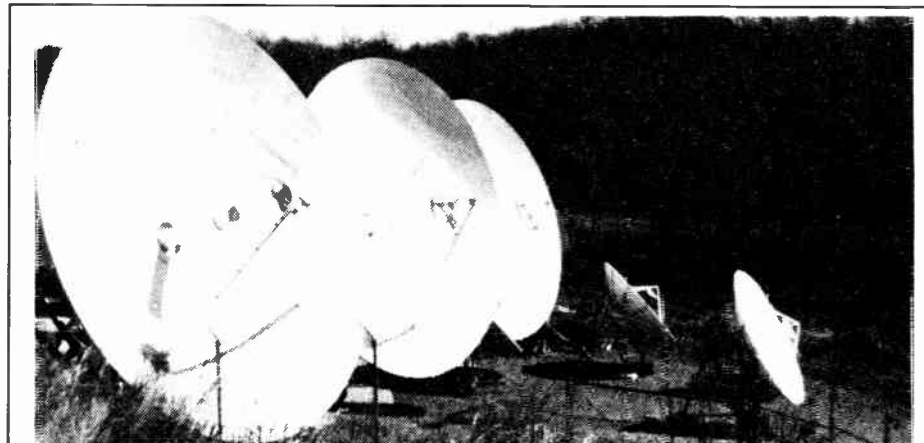
"Radio is a little different, but it's not a major difference," Kirschenbaum noted. "Our staff is experienced in digital uplinking, we know the broadcast business."

### Fiber for the future

In addition to the MultiComm purchase, Kirschenbaum said WIT intends to expand in other ways.

"We're negotiating to link that entire site to a national fiber optic network, for voice, data and radio, and replace the phone lines for radio services," said Kirschenbaum. He declined to name the specific fiber network involved in the negotiations.

Kirschenbaum added that the fiber link would be used primarily for the newly-added radio services because TV's



The Washington International Teleport will expand into radio with its acquisition of the adjacent MultiComm Teleport from Amway Corp.

bandwidth takes up too much room for fiber to be economical.

He pointed out that use of fiber would also mean converting TV signals to digital, which he maintains is difficult, while "a lot of radio is digital already."

Kirschenbaum said that WIT intends to try to attract more radio customers in addition to the ones acquired by buying the MultiComm facility.

He also said that WIT will install two international earth stations this summer (a standard A and a standard B), which will allow the teleport to be the first in the Washington DC-Virginia area to take TV and radio signals from overseas without having to go through Comsat.

For more information, contact the Washington International Teleport at 703-734-2724.

## Spring Checks for Dish

(continued from page 17)

If the coaxial connector was not wrapped in some kind of weatherized rubber tape or compound, now is a good time to weatherproof this connection.

Suitable weatherizing compound can be obtained from an electrical supply or TV repair shop.

If your coax is attached along one of the feedhorn guy lines with white or

clear wire ties, replace the ties.

Only black wireties are resistant to the ultraviolet rays from the sun. The white or clear ties will eventually crack when exposed to the elements.

An hour or so of preventive maintenance now will save you lots of headaches later, as well as provide some good references for troubleshooting should problems develop.



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# Solving Tower Wire Mysteries

(continued from page 15)

over to the towers!"  
 "What?" I said, "Do you mean to tell me that guy didn't put the light wiring in conduit?"

I didn't install this array, a midwestern consultant had, and they had lights on all seven towers.

Now, I told the CE friend he had to remove that open wire and wire the towers

## Phasor Nets

(continued from page 12)

inductive reactance of the antenna. Combining the above two methods, one could conceive an "elegant phasor" using only two capacitors as an ATU.

Back to economic issues, the general use of "L" networks is avoided in DA's because of the fact that independent phase shift is not available with such designs.

### Modern methods more precise

There are two sides to the issue of component quantity, economics not withstanding. Back in the "old days," numerous networks with generally higher L/C ratios were employed to afford adjustability ... being able to tune into anything.

This was done because the prediction of base impedances was usually accomplished by the sinusoidal method and the experience algorithm.

By employing modern techniques, such as the PC computer program MASTER, we can very accurately predict impedances and eliminate the need for a wide matching range.

In many older phasor designs, it is not uncommon to see, for example, two Tee phase shifters for each of the two towers.

Such designs can reduce overall RMS by introducing additional losses in the system and can impair bandwidth as well.

Simpler designs narrow the tuning range and allow or improved bandwidth due to the lower Q of the circuits. In some cases, a matching network may not be necessary at all.

Until next time ...

## Data Feeds

(continued from page 17)

"has to rank as one of the most significant advances in network radio."

"Instantaneous data communications to our affiliates will permit much easier access to the full range of audio services delivered across our nineteen 15 kHz audio channels."

"(The network) will also be able to develop whole new products using data that will help our affiliates to program their stations."

Rich Robertson, VP and GM of KOMO-AM, was enthusiastic about the new service. "The ABC Radio Network will now be able to make available to affiliate stations ... complete written information on news bulletins and special reports, as well as provide hourly billboards for news and sports," Robertson said.

"What it means to our listeners is more news, even faster," he added.

For additional information, contact Bob Donnelly at 212-887-2515. Contact Rich Robertson at 206-441-6666.

in conduit, but I asked him why they had lights on all seven towers?

Subsequently, the FAA allowed them to light only three towers, and so they removed the wiring from the other four. Then the array went out of adjustment, and nobody could get it back!

### Perplexing problem

Some time later, they rather casually asked me to go there and correct the adjustment, get the monitoring points down to what they had been in the original proof, and accomplish all this without delay!

Well, I worked on it for a couple of days, but was getting nowhere. The thing baffled me.

That evening after dinner, I sat around the motel mulling over the crazy situation, when I suddenly jumped up and said to my wife, "Quick, get your clothes on, I want to go out to the transmitter."

It was about 9 PM, and when I got out there, I drove around the field to all seven towers, and discovered they had removed the light wiring from four towers, but left the same open wire on the three the FAA had designated.

Two of these were on the daytime array, and one the nighttime! The next morning I told the client he had to remove the open wire and replace it with wire in conduit.

They argued, but I was adamant and insisted it was the only way this complex

system could be made to work.

To make a long story short—they finally did—and it did.

### Accidental antenna

Now, think about this a minute. This open wire, connected at the top to the tower and isolated at the base, is a kind of folded antenna.

The standing waves of voltage on this wiring change the base impedance of the tower as well as the phase of the current.

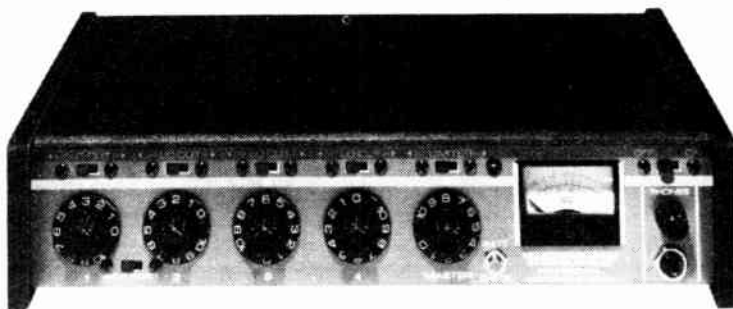
Any change in this wiring is a change in the characteristics of the tower, and hence the operating parameters of the array. In addition, it is unstable, and changes with humidity and temperature.

If you have a tower, or towers, wired with this stuff, when you say your prayers at night, plead for no change in it, especially if you have a DA.



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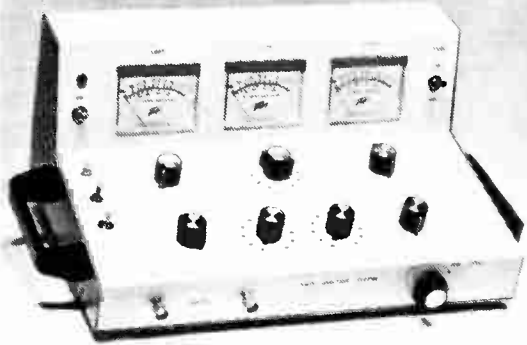
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### Audio tape analyzer

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For more information, call **Dan Peluso** at 702-384-0081, or circle Reader Service 63.



### Microphone preamp

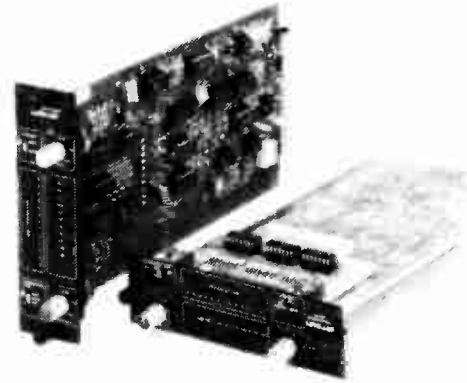
Studio Technologies, Inc. recently introduced a new self-powered dual microphone preamplifier, the Mic-PreEminence, of low noise, low distortion, high speed design.

The Mic-PreEminence is useful in any application where complex analog signals tax the capabilities of current microphone preamplifiers. Application examples include minimizing signal flow through a console and digital sampling.

Designed to be an interface between analog microphones and digital recorders, the Mic-Pre-Eminence operates as an in and out transformerless, balanced preamp. Phantom power, a signal indicator and a trim control are provided.

Suggested retail price is \$795.00.

For more information, call **Jennifer Shore** at 312-676-9177, or circle Reader Service 61.



### Audio level controller

Valley People, Inc.'s "Levellers," audio level controllers, are available in two models: one is a two channel, rack mount model and the other is a single channel, modular version. The on-board audio processing computers automatically adjust processing parameters dynamically, thus allowing the operator one-knob control.

For more information, call **Norman Baker** at 615-383-4737, or circle Reader Service 77.



### Tower strobe alarm

Broadcast Communications' Tower Strobe Alarm Model AL-1001 is designed for use with Models SH-2001, SB-2001 and RTF-2001 tower strobes.

The AL-1001 is designed to mount in a standard 19" rack panel, using 3 1/2" of vertical rack space. The alarm panel contains an audible alarm as well as normally open/normally closed dry contacts to send an alarm to a remote control point, such as a broadcast studio.

Should the strobe beacon fail to flash, the beacon alarm senses the lack of flashes and sounds an alarm. Once it again begins to flash, the alarm automatically resets, ready to sound an alarm in case the beacon should fail again.

For more information, call **James Crooks** at 608-833-3977, or circle Reader Service 51.



### Shotgun mics

Beyer's MC 736 PV and MC 737 PV are short and long shotgun microphones designed for such broadcast applications as ENG/EFP and sports events.

Both mics feature new reamp designs which accept any 12-48 V phantom power supply. The MC 736 is a short shotgun with a lobed polar pattern above 2 kHz and a cardioid pickup pattern below 2 kHz for sensitive voice reproduction.

The MC 737's long shotgun design produces a tightly focused lobed pattern for immediate off-axis rejection and accurate voice pickup.

For more information, call **Mike Solomon** at 516-935-8000, or circle Reader Service 65.



### Audio processor

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For more information, call **Jim Wood** at 408-458-0552, or circle Reader Service 54.

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# Buyers Guide

AM Transmitters & Exciters

## Solid State Making Inroads

by Marlene Petska Lane

Falls Church VA ... Solid state medium wave transmitters appear to be making real inroads with broadcasters. The continued improvement in design, as well as the marked savings for a station's bottom line are the reasons for the growing attraction.

When the first generation of solid state transmitters emerged nearly ten years ago, manufacturers were pushing the state of the art. Harris introduced its MW-1 and Westinghouse showed a 5 kW transmitter (which was never marketed). Elcom Bauer (then Sparta Bauer) also introduced a 1 kW transmitter.

Multiple sources for good equipment were not available at that time, so manufacturers had to take a gamble on the devices they chose. Needless to say, it was not always smooth sailing.

"We went down what turned out to be a very narrow path," says Paul Gregg, President of Elcom Bauer. The then Sparta Bauer used switching devices which later were manufactured using an automated process. That process negated their use for RF application.

The production change meant the devices had to be produced by hand for the transmitter. Spare parts were unheard of.

Today's solid state transmitters use MOSFET power amplifiers, power transistors and power semiconductors, which were developed for the power supply industry. Long term availability of these devices is a given—there are now more than ten manufacturers.

"With the widespread use of switching supplies and the MOSFET power amps being developed for switching power supplies, the MOSFET devices are getting more powerful and their costs are dropping significantly," says Joe DeAngelo, manager, broadcast product marketing for Harris Corporation.

### Overview

And, these newer devices are a radical improvement over those used in the first generation of solid state transmitters. They operate well throughout the entire medium band and are easily paralleled for higher power operation.

"MOSFET amps are a discrete power amp unto themselves. You can team up the number of MOSFET amps and utilize their circuit contribution in unique ways. A tube amplifier doesn't yield as much flexibility," according to DeAngelo.

Also improved from the first generation is the solid state transmitter's reaction to transients.

"Most of the horror stories you hear about solid state transmitters relate to some early experiments, particularly with the bipolar device transmitters rather than the field effect transistors," says Jorgen Jensen, broadcast sales manager for Nautel in Canada and the US.

Gregg agrees, and adds that the effect of lightning on solid state transmitters has been overdramatized.

"Theoretically," he says, "lightning can do much more damage to a tube type

transmitter." Gregg explains that the transients create "problems" only because of the protective circuits within the transmitters.

"If the tower is momentarily shorted out because of arcing, the solid state transmitter reacts to the sudden load change by engaging its protective circuits and turning the transmitter off very quickly," says Gregg.

Admittedly, the tube, because of its greater thermal mass, is still more forgiving of a short duration transient than a solid state device. And if certain precautions are not taken with solid state transmitters, a broadcaster could have a problem on his hands.

"In other words," observes Skip Marsden, senior engineer at Continental, "if the MOSFET glows red it's all over. The top comes off and poof ... a spray of molten steel and that's the end of the MOSFET."

But the likelihood of this happening is rarer than the stories you've heard might make you think. Solid state transmitters can be protected against the type of load problems that may create downtime.

Simply giving more thought to proper grounding and taking some reasonable precautions against lightning are key in preventing catastrophic situations.

"You probably ought to be taking pre-

cautions anyway for the protection of the personnel—you hate to burn up engineers," Jensen says.

Another necessary precaution is to avoid some of the more questionable power configurations. One of these is the open Delta configuration, which tries to generate three phases from two.

"The Delta configuration is intrinsically unbalanced and highly susceptible to induced transients, both from man-made sources and from lightning," warns Jensen.

Of course, the protective circuits of the transmitters themselves are constantly being improved. Continental's new solid state transmitter, according to Marsden, "has some interesting circuits that are pretty effective protection."

The company believes the new transmitter will have a reliability similar to the tube "when bad things happen" at the transmitter site.

The continued improvements in solid state design, coupled with the low cost of manufacturing the units and their reputation for being stingy power consumers, points to a strong solid state future in the eyes of many manufacturers.

"I believe the future is going to be all solid state," says Marsden. "It will replace the tube, at least in power applications of up to 50 or 100 kW. It's the direction things are going."

## BE Improves WCZN

by Douglas W. Fearn, CE  
WCZN

Media PA ... WCZN in Chester, PA, has had a 40-year history of service to the area known as the Philadelphia-Wilmington corridor. When the 1 kW AM station was bought by Lloyd Roach in 1985, he intended to continue this tradition.

One of his first improvements was a completely new audio chain from turntable to transmitter input, including a new Broadcast Electronics AX-10 AM stereo exciter. This made WCZN the first C-QUAM AM stereo station in the Philadelphia area.

In the simplest terms, the C-QUAM system works by phase modulating the main carrier frequency with the L-R (stereo difference) information, while the main modulation is the sum (L+R).

A 25 Hz pilot tone is inserted to turn on the stereo light on a C-QUAM AM stereo receiver. The AX-10 was installed in December of 1985 and has worked flawlessly ever since.

### Converting to stereo

The first step in the AM stereo conversion was optimizing the performance of the 10-year-old Gates BC-1H transmitter, particularly in regard to incidental phase modulation (IPM).

In some transmitters, the carrier fre-

quency shifts slightly with modulation. This can be from power supply regulation or because of changing load impedances on the PA as the transmitter is modulated.

IPM can be a problem in transmitters designed before the development of AM stereo, because back then it was not considered all that important. Since the stereo

### User Report

Information is phase modulated, IPM can be the limiting factor in the amount of stereo separation obtainable.

The BC-1H uses conventional high level plate modulation. Before anything else, we replaced all the tubes in the transmitter and made some measurements.

Performance was quite good, with reasonably flat response to 10 kHz. After careful modulator bias adjustments and optimum tuning and loading of the driver and PA, distortion at any frequency was under 2% at 85% modulation.

We were then ready to connect the AX-10 to the BC-1H. The AX-10 has left and right audio inputs and two outputs.

One output is a conventional audio output for the main transmitter in-

(continued on page 31)



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## Buyers Guide

# Continental Scores High Marks

by Thomas R. McGinley, Dir. Eng.  
First Media Corp.

**Greenbelt MD** ... Since its introduction in 1982, Continental's 317-C2 50 kW AM transmitter has earned an impressive track record and reputation.

Much has already been written about the performance of this thoroughbred of transmitters. The improvements and refinements which Joe Santone and his staff engineered into the C-2 version made it a clear winner for us in its power class.

About one and a half years ago, WPGC-AM commenced construction of its new 50 kW, four tower facility on the edge of Washington, DC.

### Clear choice

Before we decided on a transmitter, we launched a careful research effort to find out as much as we could about actual operational experiences of engineers who had already been running the various 50 kW rigs available on the market.

User lists of the several units under consideration were obtained from the manufacturers.

We developed a check list of 35 questions which covered virtually every operational aspect and performance characteristic, in addition to general comments.

These questionnaires were then filled out during telephone conversations with all the user engineers involved.

The 317-C2 scored high marks in all categories. While other transmitters may have had a slight performance edge in

## User Report

a few areas, the Continental was the consensus choice among 21 out of 24 engineers we interviewed.

### Classic design

The transmitter's basic design is now legendary in the industry. The modified Dougherty screen grid modulation scheme eliminates all the high power iron of conventional plate modulation.

The C-2 updates enabled frequency response, THD and IMD performance, and transient response to rival that of a solid-state audio power amp.

The characteristics which impressed us the most about the C-2 were reliability, superb sonic performance, ease of tuning and maintenance, excellent factory and parts support, and the two year warranty.

WPGC operates a remote-controlled site in a marginal environment. As a

daytimer, we placed a high premium on reliability and having full confidence that the rig would come up each morning from a cold start without overloads, downtime and call-outs.

### No need for factory help

When our transmitter arrived about a year ago, two station engineers had the rig completely installed and wired to the R/C in less than a week.

It fired A-OK into the dummy load on the first try. As part of the package purchase, Continental normally sends out a factory engineer for up to four days without charge to help get the rig set up and running to spec.

Our maiden voyage went so smoothly, we chose not to have the factory send a man out. Instead, we put the free trip in the bank to use later when and if we really needed it.

After more than a year of operation, the only component failure has been a gassy vacuum variable capacitor in the PA inter-grid tuning section. It was a bit of a surprise when we finally found it since vacuum caps rarely fail.

The only other problem encountered was when we tried to reduce power to 5 kW for non-directional testing. At this level, a zener regulator in the screen power supply stops conducting and the rig starts oscillating. We got lucky and

were able to do the N-DA proof at 10 kW.

Maintenance-wise, our C-2 runs almost like a 5 kW rig. Intake air is merely filtered with the usual furnace type fiberglass filter panels.

### An energy saver

No air conditioning has been necessary, even with outside temperatures reaching over 100° F in summer. This has meant a significant savings on power bills.

We move about 5000 cfm of outside air through the transmitter via a large ducted hood with a 30" blower at the exhaust port on the outside wall of the building.

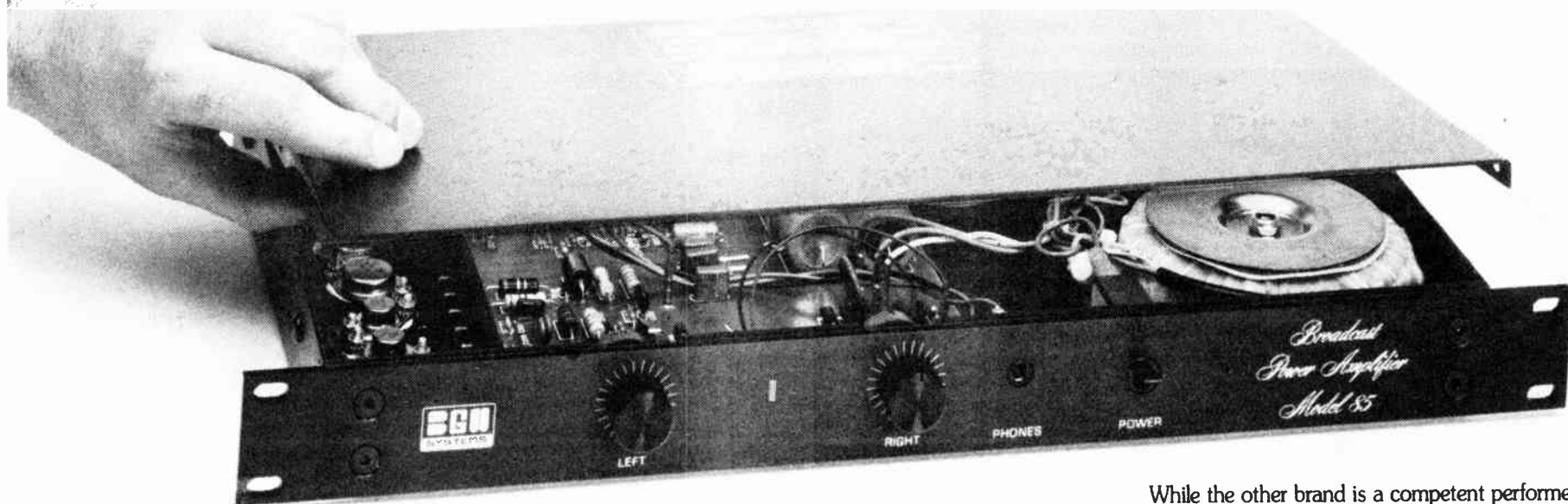
Changing the filters and vacuuming out each cabinet once every four to six weeks has proven quite adequate. During lightning storms, the Magniphase protection circuit has worked like a dream.

The C-2 can also be brutalized with audio testing. It takes any waveform and is very forgiving.

Continental is continuing to make improvements in the 317-C2 design to get distortion figures even lower (really Joe, it's awfully good the way it is), and to incorporate a solid-state PA driver to replace the 4-400A tube driver. That update should be available soon.

*Editor's note: For more information, contact Vern Collins at Continental: 214-381-7161. The author may be reached at 301-441-3500.*

## To Find The Best-Built Broadcast Audio Amplifier... You've Got To Look "Under The Hood."



From the outside, most broadcast power amplifiers look pretty much alike. (After all, audio power amps are designed to be heard, not seen.) And this might lead you to suspect that the major brands are pretty much alike on the inside as well.

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Full complementary discrete circuitry for optimum performance	YES	NO Quasi-complementary circuit design
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While the other brand is a competent performer, as a broadcast engineer you can readily appreciate the extra care in engineering we put into the model 85. And every BGW amplifier is built with the same total commitment to engineering excellence.

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## Buyers Guide

# Nautels Prove Reliable for Lotus

by Lindy Williams, VP  
Lotus Communications Corp.

Los Angeles CA ... Rarely do transmitter purchase decisions filter up to the non-technical executives of the company. But my suggestion that we purchase a transmitter with no tubes, designed and built by a company that no other executive in this company had even heard of, was a bit more than my colleagues were willing to take.

Lotus Communications has a large number of other transmitters, all bearing the same label, and all giving us good service. Why gamble?

## Researching the unknown

It was in the fall of 1984 when I picked up my phone and proceeded to call all 12 of the US stations on the Nautel users list.

I asked for the owner or manager of each station; I wanted the opinion of the person who footed the bill for the device. What I heard was a revelation: "best purchase I ever made," "we haven't lost a moment's air time," "it sounds better than anything I've ever heard."

If you are planning to do the same research now, be prepared to spend a few days on the phone.

The list now looks like a who's who in broadcasting.

Our first Nautel went to WTAQ in Chicago, a newly purchased Lotus station.

The motivation for the purchase was to be as competitive and aggressive as possible without dirtying the sound.

## Not Star Wars inspired

The Nautel was an exceptionally good choice in both areas. We found it able to hold the high intensity of a CRL AM4 with the clarity and freedom from overshoot unheard of in an AM transmitter.

The IM distortion levels were a magnitude lower than any other PDM transmitter we have in the company.

The major attraction for purchasing the Nautel was the straightforward design. The design concepts are not Star Wars technology, and they do not get into what I refer to as the "microprocessor controlled bulk erasure syndrome."

The Nautel has a fairly conventional pulse duration modulation scheme with a conservative, V-FET RF section. There is a great deal of redundancy built right into the 5 kW. There are backup cards for the modulation driver as well as the oscillator.

The transmitter is capable of operating with a loss of several RF output cards as well as modulator cards and can still function at reduced power.

## Precautions eliminate worry

The package is small by today's standards. The modules pull out directly from the front for easy maintenance and repair.

It is readily field repairable, although after more than 18 months of operation, the unit has failed only once. That failure was caused by a lightning surge through the power line.

As most of you would guess, the transmitter is not quite as forgiving as a tube type when it comes to line spikes. Nor will it sit for days and look at a highly reactive load.

The installation of MOVs ahead of your service breakers will prevent damage from the first, and I would recommend that the input network to your phasor or ATU be given a quick check with an OIB before connecting the transmitter.

## User Report

Both of these precautions should be taken regardless of what type of transmitter you are installing.

When we first took delivery, the transmitter had sustained damage from shipping. I suspect that the transmitter was dropped off of a loading dock.

The heavy metal bars which support the RF output tuning network were bent badly and all of the large meters across the top of the transmitter were shattered.

We placed a call to the factory and Nautel had a service technician on a plane to Chicago that evening to repair it.

## One suggestion

When I asked Andy Wise, our chief engineer at WTAQ, for input about the transmitter, his first words were about the exceptional factory support, coupled with the fact that he simply does not think about his transmitter because it rarely fails.

The only aspect of design which he

would have changed was the placement of the remote control and metering connections. They are behind the whisper fans on the back of the transmitter.

Since the "plate" voltage is only 70 V, one would have little hesitation working inside the transmitter while it is on.

Andy pointed out that the fans can be removed for access to the terminals while the transmitter is still in operation, but they can be left off for only a few minutes before the heat build-up becomes excessive. Try that with a 4CX-15,000.

## Solid state won't drift

One of the pleasures of a solid state transmitter is its stability. The three Nautel stations mentioned in this review are all C-QUAM stereo.

The ability to install and align a C-QUAM exciter and come back three months later to find that it hasn't drifted is quite refreshing.

In theory, any device using tubes will perform optimally for only a short period of time. There will be deterioration almost from the moment the tube is installed until the deterioration becomes apparent, even to the listener.

A system which eliminates this deterioration is like finding the transmitter fountain-of-youth. The Nautel is a classic example of that discovery.

At this writing, Lotus Communications has two more Nautels on order. Ironically, none of the three transmitters were purchased for the same reasons.

## Operates under hostile conditions

We have a 5 kW Nautel ordered for KOXR in Oxnard. The principal reason for this selection is because the transmitter will have to operate in a hostile environment.

The transmitter building is located in  
(continued on page 24)

# CSI Pleases WENO

by Erwin O'Conner, Owner  
WENO

Chattahoochee FL ... I'd like to share with RW readers my experiences with my station's CSI T-5-A transmitter and the performance of the equipment for the last eight years.

As the station's owner, there were several factors I had to use in selecting a transmitter for our power increase to 5 kW in 1978.

First of all, and most obviously, I was looking for a new unit with increased power consumption. Another factor was ease of maintenance.

## User Report

But I think the deciding factor was the people at CSI. I discovered some people who were not only interested in selling me a transmitter, but who wanted to make sure it would be in my best interest.

They helped me get a lease plan, and later helped me with a Phasemaster unit when I was unable to get commercial power, three phase. Even now, years later, I get calls from people who want to know how my transmitter is doing.

## Never a failure

I can honestly say that in eight years I have not lost a single minute due to transmitter failure.

Sure, I have been off the air. The hurricane last year took my power lines, and several times we have had power out-

ages. But the T-5-A has never failed me.

Most of the time I sign on, and it is a pleasure to turn the transmitter on and watch it reach the power level purring like a kitten.

I suppose power bills vary according to where your station is located. But my bill for January this year was \$375. Not bad for 5 kW.

## Still going strong

And what about maintenance costs? Here again my CSI has been very economical. The expensive 10 kW tube in the final has not even begun to weaken ... I still have the modulator tubes.

My engineer makes his regular checks each week, and each time he makes the same report: the transmitter is running fine; no problems.

Meters are easy to read, and the transmitter is easy to get to for maintenance checks.

We are impressed with the quality of our signal, as well as the range. WENO reaches out very well for a Florida station.

Of course looks are not especially important, but I think my CSI looks sharp even after eight years. It is just an all around good piece of equipment.

If I were increasing again, putting in a new station, or just in need of a broadcast transmitter, CSI would be my first choice—in fact my *only* choice.

Editor's note: For more information contact Bernie Gelman at CSI Marketing: 813-647-1904. The author may be reached at 904-663-2323.

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## Buyers Guide

# DE Selects Kahn Stereo for Katz

by David Solinske, CE  
WSYR

Syracuse NY ... In 1980 when John Marino, DE of Katz Broadcasting was selecting an AM stereo system for the Katz stations, he defined certain standards to avoid detrimental technical results that could interfere with the chain's success.

He felt that the quality of the mono transmission must never be sacrificed. This meant all sidebands of the signal in mono and stereo must be passed. Restriction of sidebands would add to the muddiness on a typical low fidelity, high distortion AM receiver.

### Setting standards

The system was required to operate with the oft times heavy co-channel interference WSYR receives from WMCA in our mutually protective nulls: interference that can be measured at over 1 mV 1.5 miles from our transmitter at night at the monitor point towards WMCA.

John insisted no new, never-before-heard sound effects of any type should be generated by the stereo system, in either mono or stereo receiving modes.

He wanted to avoid any FM multipath effects (since FM has proven to be somewhat of a competitor to AM), and declared our chosen system must meet all FCC Rules and Regulations and be im-

plemented only as a tool to increase the "listenability" of the AM stations.

### Stereo sidebands

John chose the Kahn Independent Sideband AM Stereo system. What that name means to most people is that if you tune from WSYR at 570 kHz to the left, towards 560, you will receive the left audio channel. Upwards towards 580, you get the right channel.

## User Report

The sidebands are the stereo, independent of locking on a pilot tone with phasing considerations which contribute to the picket fencing and multipath sound effects experienced on FM in stereo.

The Kahn STR-77 stereo generator consists of a couple of rack units which, for the layman, take the left and right audio channels through a card cage which contains enough circuitry to encode a L-R channel.

The circuitry then phase modulates it so it cancels out the mono in the upper and lower sidebands when it mixes in the main transmitter with the mono audio derived from the left and right audio inputs.

It's like throwing a curve ball or angling a bat before hitting. It steers the left and right channels into their very

own sidebands. Any two radios then, may be tuned above and below the station frequency to hear stereo.

The STR-77 and the newer STR-84 both have redundant power supplies, each built like a battleship. The main advantages of the STR-84 are a cleaner card cage and a different filter on the L-R channel to permit stereo separation up to 7500 Hz.

The unit features simple left and right audio inputs, and mono audio and RF outputs. A complete set of test BNC jacks reside on the front panel for inter-stage sampling. There are provisions for day and night adjustments for optimizing two antenna modes.

### Easy installation, adjustment

Installation is done by any station engineer in just a few hours. It involves connecting the mono audio output to the transmitter audio input.

The RF output from the Kahn unit is inserted into the transmitter where the normal oscillator output (carrier frequency) connects to the IPA or other advanced stage at the oscillator output. That completes installation.

The transmitter, now in stereo, operates more like FM where the exciter generates the carrier frequency. Adjustment for operation involves use of a spectrum analyzer (usually borrowed from a local TV station or instrument rental agency), or a Kahn RF-01 stereo monitor.

I prefer using the RF-01 first, to take advantage of the neutralization "Neut Meter" feature. Improper neutralization usually generates hum in stereo.

Use either to set the AM and PM time delays for maximum separation. I must admit I prefer the spectrum analyzer to watch the separation of L and R at the same time after neut metering the rig.

The Kahn system is totally independent of antenna system bandwidth or transmitter loading. This proves useful as we chase seasonal variations in tuning on our three tower DA-2 array here in the cold north country.

When you hit it big down the road, you can broadband the antenna system or perfect the array in any way you choose with the thousands of dollars it

takes to do it right ... but you can sound good in stereo now, and it doesn't take all night or constant adjusting.

### Outstanding performance

On air performance and reliability has been exemplary. I must admit, working with an unknown or unfamiliar piece of gear I did put a "patch around" set of jacks on the transmitter front panel three years ago when I arrived in case of stereo generator failure.

The transmitter has kicked a few buckets since then, but the stereo generator never sputtered or failed.

Dave Doughty at WTLB, Utica, with his 5 kW Continental gets 30 dB separation to over 4 kHz, falling then as a result of an interference-preventing filter; we get 26-28 at WSYR.

Dom Bordonaro of WFTG, the only person I contacted with the newer STR-84, gets just over 30 dB up to 7500 Hz. This is a result of a less stringent filter, the only purpose of which is to meet the stringent FCC tone tests as they exist "on the book."

Newer FCC statements could lead to modification of the type of tone tests done, and the filters could be removed from any new or old exciter, giving separation up to 15 kHz. The Kahn system easily passes the tests in mono, above those filter frequencies (in both stereo and mono reception modes).

Keep in mind that those filters limit separation, *not* frequency response. Distortion and S/N all depend on your transmitter maintenance, not the Kahn system.

### Not susceptible to outside interference

My experience shows that going under a bridge or power lines, the station fades out in stereo, and fades up in stereo. Being phase independent and not locked to a pilot tone as is FM, it cannot be influenced, unlocked or otherwise unduly influenced by outside factors.

Co-channel stations don't bother us, and our ratings show that our mono listeners have not been hurt in the least.

Since Leonard Kahn has insisted that receiver manufacturers to whom he licenses his technology provide high fidelity reception so the public does not just get two channels of AM garbage, we feel he is looking out for AM licensees and owners in the areas of quality and  
(continued on next page)

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## Nautels Perform Reliably

(continued from page 23)

a river bottom area adjacent to a rock quarry. Huge earth-moving trucks constantly pass the building on a dirt road.

Under the towers are grazing sheep, which probably will mutate from intense radiation (are you listening ANSI?). That means no vegetation anywhere. The dust problem is unbelievable. With only 70 V rails, the Nautel could be buried in the stuff and still not experience a flash-over.

This unattended remote transmitter site needs all the help it can get. It's getting a Nautel.

### Efficiency important

The third Nautel will be a 10 kW for KTKT in Tucson, AZ. The existing transmitter is of late vintage and uses a Dougherty modulation scheme.

The device is competitive and reliable but very inefficient. The port-to-port efficiency is in the low 30% range, while its Nautel replacement specs are at 73%.

It doesn't take much arithmetic to calculate the difference. With \$3,000 a year in tube savings, and a considerable reduction in air conditioning, a Nautel will pay for itself from the savings it generates.

It is impossible for me to hide my enthusiasm for this transmitter. Every engineer I have spoken with would love to own one, and every engineer who does seems to share my feelings.

I give this device a 9.95. Everyone knows there are no 10s.

Editor's note: For more information, contact Jorgen Jensen at Nautel: 207-947-8200. The author may be reached at 213-461-8225.



# WITL Opts for C-QUAM System

by Geary S. Morrill, DE  
Mid-West Family Stations

**Lansing MI ...** When WITL-AM decided to commence stereo broadcasting in 1983, there were precious few AM stereo stations on air anywhere in the country. And, unlike FM, the FCC had created a monster by its failure to adopt a single transmission standard.

In our search for which system to choose, we sought the benefits of receiver availability, improved fidelity (low distortion and high separation figures) and manufacturer support.

All three were needed to give WITL-AM a fighting chance in a market that has been FM dominated since the early 1970s. Without receivers, what difference would it make?

Once receivers were available, our signal would have to stand the scrutiny of being compared to FM. And without substantial support from the manufacturer, we wouldn't stand a chance.

### Deciding on a system

After speaking with folks who had the various systems, and a friend in Indianapolis who was able to hear the Delco tests being conducted, one point became obvious—Motorola was committing the manpower and expertise needed to get things going forward.

All of their installations were being made by factory-trained personnel to ensure optimal system performance.

Since we were not talking about FM transmitters and antennas with relatively wide passbands, there was a real need for factory-trained expertise. My 1970 Collins 820D1 and 81M3 tower phasing gear had never been designed to pass stereo modulation.

After further examination, I decided to go with the Motorola C-QUAM Model 1300 exciter and 1310 monitor.

During initial installation with Pete Boyce of Midamerica Broadcast Service (a Motorola installation subcontractor) it was determined that our performance figures were being limited by the capacitive modulation sample provided on the 820D1. Pete ordered in a Delta toroidal

transformer (at Motorola expense).

After this we turned some numbers that were respectable and well within FCC requirements (L+R 2% distortion or less, 100 Hz to 7500 Hz at 95% modulation; L or R only, less than 1% distortion, 50 Hz to 7500 Hz at 60% modulation; separation 27 dB at 1 kHz.)

I was impressed with the amount of delay and equalization available in the exciter to compensate for the various combinations required for different

transmitter designs and vintages.

Since the phase and envelope information take entirely different paths through the transmitter, this is necessary to get both to arrive at the antenna in time coincidence.

### Improving performance

I saw Pete off and figured that would be the end of it. Within days, Verne Buland, Motorola's field service coordinator was on the phone.

Based on the common point sweep I had sent him prior to installation and a debriefing with Pete, he was convinced that my plant was capable of better performance.

I had invited Verne up to Lansing to speak at an upcoming SBE chapter meeting. When he arrived, he brought Don Wilson and a spectrum analyzer in tow, and we spent another Experimental Period taking a closer look at the setup.

(continued on page 29)

**Q.** What's the radio industry's best kept secret?

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**Harrison** Interested? Give us a call.

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## DE Chooses to Go Kahn

(continued from previous page) interference.

It is generally accepted that the public misunderstands the difference between high fidelity and stereo. The Kahn system provides hi-fi transmission to 15 khz if desired in stereo and mono, and avoids splatter while doing it.

Should you buy Kahn? That's not for me to say. Get a Sony or Kenwood multisystem radio and then visit New York or LA. Drive around. Listen. Talk to stations that have used one or all systems. Multisystem radios keep everyone honest.

Editor's note: For more information, contact Leonard Kahn at Kahn Communications: 516-222-2221. The author may be reached at 315-472-9797.



Circle Reader Service 3 on Page 20



## Buyers Guide

# Delta Exciter Called Stereo "Mack Truck"

by Craig V. Kingcaid, Tech Dir  
WHAM/WVOR

Rochester NY . . . In spite of it all, you and your staff decide to go AM stereo.

If you've looked at several of the exciters on the market and are still undecided, then you haven't looked at the Delta exciter. Here is an exciter that could be called the "Mack truck" of AM stereo exciters.

I don't know why some manufacturers seem compelled to make everything smaller and smaller. Does anyone really believe that the transmitter site is the place to practice micro-surgery?

### User Report

Enter the Delta AM stereo exciter. Here is a piece of gear that is truly built to survive at the transmitter site.

Physically the exciter and the companion monitor are the same size—the standard rack width of 19", 5 1/4" high and a little over 14 1/2" deep. The front of the exciter is commanding, with its two black and red on white VU meters.

There is a rocker switch in the center of the face panel to switch the meters from reading left and right audio to L+R and L-R audio.

This is very handy for making sure the exciter is being driven properly. It allows you to see both functions in either position of the switch at the same time.

Centered above the rocker switch are three red LED indicators. They are labelled Pilot, Stereo and Night. They show status of the exciter's inner workings.

Pilot indicates whether the 25 Hz tone is being injected if the system is in the stereo mode. (Note: You don't need the pilot on to be in stereo as with FM signals.)

Night indicates if the optimization circuits for day or night are selected. The Day/Night circuits could also be called "Main" transmitter and "Auxiliary" transmitter for those of you non-DA types.

WHAM used this to be able to optimize the exciter for its MW-50 main transmitter and the MW-10 auxiliary transmitter. When transmitters are switched, the exciter is made to track the transfer, ensuring optimum AM stereo.

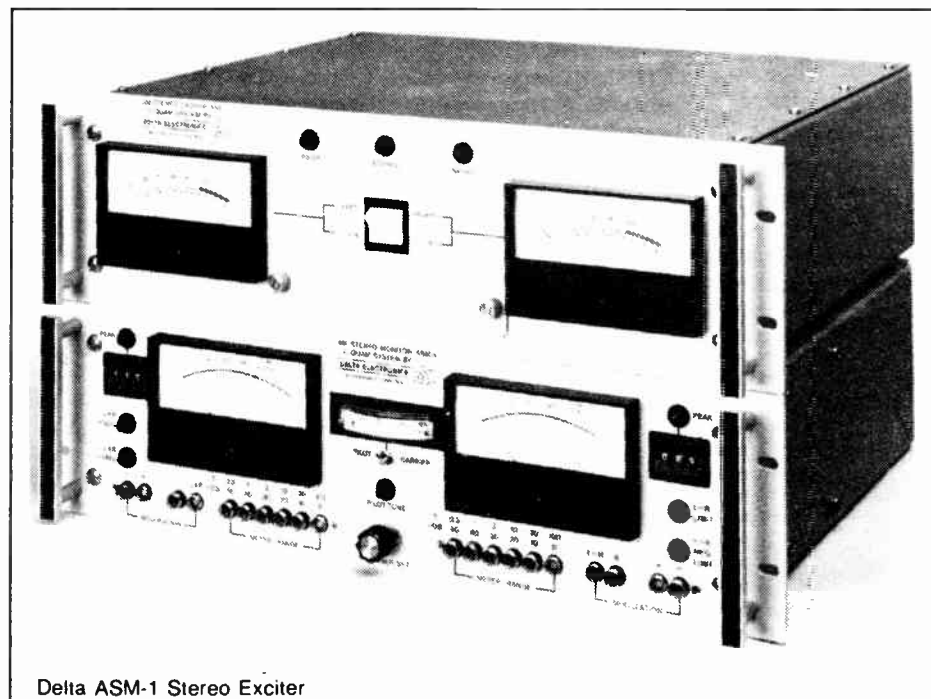
Below the rocker switch is a removable panel. Behind that is what Delta refers to as the front subpanel. This panel has the most-used controls.

I thought it was nice of Delta to do this rather than mix them in with all the other controls, of which there are many. It eliminates the " . . . , I got my little greenie on the wrong adjustment." I know we've all been there—a simple adjustment turns out to be a real breather.

The pot adjustments are of the multi-turn variety: +Limit, -Limit, Day L+R, Night L+R and Balance. Push-button switches control the Off/On of the Pilot.

The Day/Night switch controls the Day/Night optimization circuits and the L+R envelope. The L+R envelope switch is more of a meter function switch than an operation switch.

The + and -Limit adjustments are just that. Delta has built into its exciter a positive and negative modulation limiter. It works with your processor to ensure the carrier is not pinched off (good-



Delta ASM-1 Stereo Exciter

bye AM stereo detection) or over-negatively modulated.

The +Limiter is usually not set. That one is left up to your AM processor. The L+R Day and Night settings are used to set the mono or the usual modulation of the carrier.

The audio for the driving amplifier in this section is getting its audio from the left and right inputs to the exciter.

The rear panel of the exciter contains the input and output connections. In addition to the usual left and right inputs, there are a few others.

Day and Night L+R outputs go to the conventional audio inputs on the transmitter.

These outputs are not switched with any of the switching functions in the exciter. They may be used as separate outputs to two transmitters. Or only one of the outputs may be used to the main transmitter.

Another option is to use an external relay to track your DA system and use it to set modulation levels on two antenna modes.

In addition to these, you will find six BNC connectors. They are labelled Day Variable RF, Night Variable RF, Day TTL and Night TTL, SMPX (sample transmitter) and Sync.

As you know, the L-R signal of the AM stereo is generated in quadrature on the station carrier. Delta gives you the option of using either an RF-type signal to drive the low level stage of the transmitter or a pure TTL-type signal.

Surprisingly, different types of transmitters of the same manufacture "like" different types of drive. The Day and Night Variable RF drives are switched, while the TTLs are not.

The variable RF drives do not share a common level control. Therefore their adjustments can be independently set. Again this gives you a lot of options when you are planning your system.

The two remaining outputs are Sample transmitter and Sync. The Sample transmitter output is used to "close circuit" test the exciter and the modulation monitor.

It is a good test to be sure the system is performing properly. And the problems, if any, are brought into focus.

Sync output is a direct feed from the carrier generation circuits. It's a good place to check carrier frequency.

The final items on the rear of the exciter are dry contacts to interlock or lock-

out transmitters so operators don't try to bring them up without drive. Another nice feature is the mono night remote switching capability, which is sometimes overlooked.

Removing the top cover of either the exciter or the monitor, one can see the Delta attention to detail. Here are some mighty fine touches to first classness.

The cards are made of the finest PC material available. Edge connectors are of the zero insertion type.

The cards are slid into the edge connector and a key is turned to either open or close the "jaw-like" connectors. There is plenty of room and space for air to circulate around the components—a big plus for my money.

The power supply, the lifeblood of any electronic system, is big and beefy. I like a lot of brute force in this area; this is the last place a CE needs problems.

Audio into the exciters passes not through a transformer, but through an opamp circuit. No steel cores to bounce the audio around in this unit—another big plus in my book.

It will pass highly processed audio very nicely. Components on the cards are of the highest quality, passing through Delta's rigid test requirements.

Failures, if any, are few and far between.

I suppose I could go into great detail about the circuits' operations, but suffice to say that they perform well beyond the required specifications of most receivers on the market, and indeed the requirements of the AM stereo rules.

Another major consideration when going the AM stereo route is installation and service. Here again Delta gets very high marks. I have gone through this at two stations, KEEL in Shreveport, LA, and here at WHAM in Rochester, NY.

I can truthfully say that Delta's attention to detail and interest in being sure the installation was perfect left a lasting impression in my mind.

Mike Hotchkiss, the Delta engineer who did both stations, is very well versed in the ASM-1 stereo exciter and "marrying" it to a transmitter. His professionalism also left a lasting impression.

Like the car dealers say: "It's the service after the sale that counts."

Editor's note: For more information, contact Bob Bousman at Delta: 703-354-3350. The author may be reached at 716-454-3942.

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Buyers Guide

# Shortwave Aided by Elcom Bauer

by John McCloy, CE  
CFRB-CFRX

**Toronto Ontario** . . . Some might think our 50 kW medium wave transmitter is putting out a horrendous sixth harmonic. However, such is not the case here at CFRB-CFRX in Toronto.

What we're doing is using an Elcom Bauer 701B modified for shortwave. CFRX broadcasts 24 hours a day on 6070 kHz. CFRB broadcasts on 1010 kHz with 50 kW full-time using three towers for daytime operation and four towers at night.

**C-QUAM shortwave**

Located near Mississauga, Ontario, CFRX utilizes a 1/4 wavelength omnidirectional antenna. CFRB broadcasts in C-QUAM stereo with the mono output of the CRL audio processing chain being fed to the shortwave transmitter for fully duplicated programming.

Canadians settled in the sparsely populated areas of Northern Canada as well as those vacationing in the Caribbean listen regularly to the nighttime signal of CFRX.

Daytime reception throughout the up-

per Midwest is regularly reported. DX reports come in from the United Kingdom and Scandinavia and we respond to each one with a verification card.

**Solid state design**

The CFRX transmitter is the classic high level plate modulated type, all solid state except for the 4-400 tubes used in the power amplifier and modulator.

## User Report

Elcom Bauer designates their shortwave band 1000 W transmitter as the 701B-HF. This series has a dual winding filament supply allowing use of either the 5 V 4-400 or the 10 V 4-500.

We chose to use the 4-400 since the same tube is used in the low level stage of our 50 kW medium wave transmitter. Most of the modifications needed for continuous HF duty are in the RF section.

The solid state oscillator operates on carrier frequency using a stable, ovenless crystal. A buffer and a two stage amplifier provide sufficient signal to current

drive a class "D" output stage.

Though a bipolar transistor is used in our transmitter, I understand later models use a power MOSFET type. A pi network matches the RF driver into the final grid circuit. Neutralization has been added to the final amplifier, making it quite stable over the 49 meter band.

The output network is a pi-L type using a variable vacuum capacitor for plate tuning. In our application the output impedance is the standard unbalanced 50 ohms.

Our transmission line and antenna matching network are identical, in theory, to those we would use in the medium wave band.

The audio frequency portion of the 701B-HF consists of a pair of 4-400 tetrodes operated push-pull class AB-1. Since this configuration does not require any driving power, two 2N3739 voltage amplifiers are used to provide approximately 300 V<sub>rms</sub> of audio frequency voltage to the grids.

**Simple to operate**

The Elcom Bauer 701B-HF is well metered and simple in its operation. All components are quite accessible and

there is an abundance of space, particularly in the RF area where the smaller components required for HF operation are considerably smaller than their low frequency equivalent.

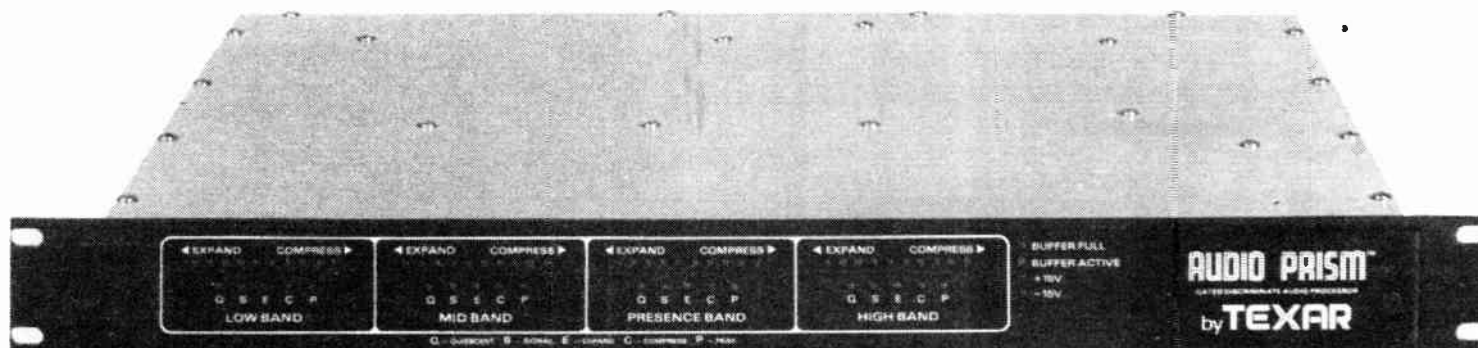
It can handle high positive modulation and has excellent specifications. The "toaster" type dummy load built into the 701B is missing from my HF version—it is probably too reactive at shortwave frequencies to be useful.

CFRX serves an appreciative audience and has been in operation since 1937. The Elcom Bauer 701B-HF installed in late 1983 has helped us serve that audience with a reliable, high quality signal.

*Editor's note: Shortwave broadcasting at power levels less than 50 kW is not permissible in the United States. Elcom Bauer reports that single frequency shortwave transmitters at power levels of 10 kW and below are quite popular throughout Latin and South America.*

*Some of the technical information above was provided by Paul Gregg at Elcom Bauer; he may be contacted at 916-381-3750. The author may be reached at 416-924-5711.*

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## Buyers Guide

# Carrier Current Compared to AM

by William Wallace, Fac. Adv.  
WMCR

**Monmouth IL** ... Last October, Monmouth College's carrier current station celebrated 25 years of (mostly) uninterrupted service to our campus.

As we collectively admired the plaque which marked this achievement, we found ourselves reminiscing about highlights and lowlights, successes and failures.

### Carrier current advantages

In the beginning, carrier current was both a conscious choice and a practical necessity. We had a small number of dormitories to serve, little or no chance to operate as an educational FMer and very limited resources.

While we still occasionally talk about broadcasting to the "real world," we have recognized that carrier current operation offers us some real advantages. Since we are not under the licensing authority of the FCC, our broadcast schedule can vary to suit our needs.

Currently, we are on the air about 14 hours a day Sunday through Thursday. We sign off at 3 PM on Friday and do not broadcast on Saturday. It may seem kind of odd, but it works for us.

Another plus is that we have the opportunity to sell commercial time. While our rate card won't make anyone run for cover, we think it is useful that our students have the chance to be involved in

sales, advertising and billing.

Finally, carrier current lets us define how we can best serve our listeners.

### Taking the good with the bad

While we've been quite satisfied with our carrier current operation, to quote a colleague, "It ain't perfect by a long shot."

Initial setup requires the assistance of trained professionals, and acceptable coverage and clarity is still a mixture of art and science.

## User Report

Since we're not a "real" radio station, some record companies tend to ignore us. And carrier current really suffers without a regularly scheduled program of preventive maintenance.

Over the years, our experience has allowed us to discover a number of "Radio Truisms." For example:

- Broadcast equipment doesn't seem to work well under four feet of water;
- The path of lightning's least resistance usually includes your distribution amps;
- No matter how well your transmitter/coupler units work, building coverage will be spotty at best if your incoming audio line is dead.

Generally speaking, though, we've been pretty fortunate.

This past summer, we were able to build and equip new studios (on the 3rd floor this time, to prevent flooding). At the same time we attempted to improve our coverage and distribution.

### The setup

Our air studio setup includes a BE console, two BE turntables, three Tape-caster cart machines, a TEAC reel to reel and a Sharp dual cassette deck. The program output is fed (through 1½" PVC) to an Orban compressor/limiter.

We run 16 gauge Belden wire from our building through an amazing array of steam tunnels to our existing telephone hookups. (We were pleasantly surprised to find that our cable run of some 600' does not significantly diminish our signal strength.)

At our telephone line hookups, we use a TEAC equalizer to improve sound quality, and run from the equalizer to an ATI distribution amp in order to feed the air signal to the various dormitories.

Each of our dorms is served by its own Radio Systems transmitter and coupler, which are installed near the main electrical panels in each building.

The air signal enters the building via the telephone line, and is then fed throughout the building by the transmitter coupler.

As several different installation and coverage combinations are possible, we relied on Radio Systems for advice concerning placement, loading and the like.

### Comparable to AM

Determining the "quality" of any signal is a subjective evaluation at best, and so it is difficult to offer comparisons between our carrier current reception and that of other radio stations.

Our perception is that our signal, when properly adjusted, is comparable to competing AM stations, although we seem to fall short of "FM stereo" sound. In order to maintain optimum reception, our transmitters and couplers require adjustment about once a month.

When I came to Monmouth in 1979, we had just installed new transmitters and couplers manufactured by Radio

Systems. After eight years, we're beginning to upgrade and replace these units with new Radio Systems equipment.

Given that we've done everything from running dead shorts through the equipment to installing it in rooms not fit for man nor beast, we think we've gotten our money's worth. (We've also had a pretty supportive administration which has recognized that certain minimum equipment and budget levels must be met.)

### Maintaining peak performance

As part of our system improvements, Monmouth has brought a Radio Systems technician back onto campus to send test signals into our buildings and to consult with us on ways to keep our equipment "healthy and happy."

Conducting such a survey is a wise

“ “  
*Our perception is that our signal, when properly adjusted, is comparable to competing AM stations.*  
 ” ”

complement to the regular maintenance we perform on the transmitters. And the report we received afterward is helping us to get the best performance from a difficult medium.

Currently, WMCR has about 35 students on the staff who are in charge of the day-to-day workings of the station. Any student on our campus may participate, although some effort is made to assure our "product" is worth listening to.

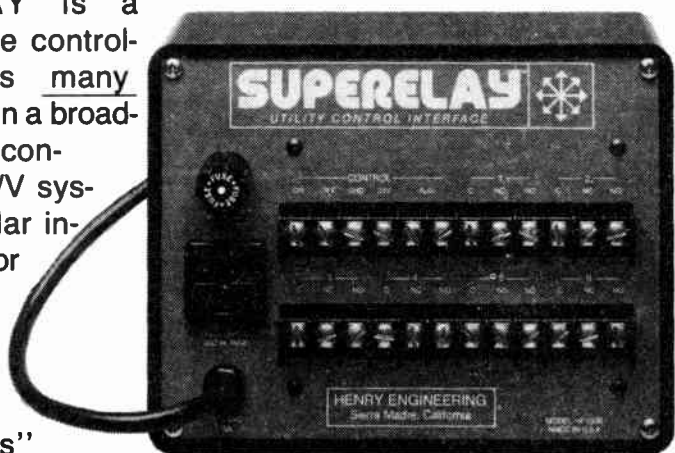
In general, we've been pleased with our carrier current operation. Carrier current has been a cost effective way to transmit an acceptable broadcast signal.

It has given our students experience in advertising and sales, and has offered us a good deal of flexibility. The system isn't foolproof, but on balance it does offer an alternative worth considering.

*Editor's note: For more information, call Bill Wohl at Radio Systems: 215-356-4700. The author may be reached at 309-457-2311.*

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# Buyers Guide

## WITL Opts for C-QUAM System

(continued from page 25)

Finally, we determined that the fixed neutralization in the PA was the culprit limiting our IPM floor, and consequently, the separation we could attain.

A few weeks later, Greg Buchwald arrived with a full assortment of doorknob caps and we proceeded to "walk" the neutralization in.

Then we obtained separation figures of 35 dB at 1 kHz (25 dB at 50 Hz and 29 dB at 10 kHz). This was roughly twice as good as the FCC performance specs, without major modifications to our plate-modulated transmitter.

### Good with old or new transmitters

All of these visits were at Motorola's expense, indicating once again their commitment to making AM stereo work, and satisfying their customers.

I've spoken with some stations that have installed Motorola C-QUAM with the newer solid state transmitters, and their specs are another order of magnitude beyond mine.

These transmitters, specifically designed to limit IPM of the carrier are truly impressive.

On the other hand, I also know of stations that are running C-QUAM with AmpliPhase transmitters. If you know how these beasts "tick," you've got to be impressed with how they could ever get them to play C-QUAM.

Since installation, we've experienced no major outages of our stereo operation. Checking system performance is quite straightforward, with the exciter providing a "sample transmitter" output for closed loop operation to isolate transmitter problems from exciter problems.

L+R and L-R detector outputs are available on the back of the monitor, and it's equipped to support remote modulation metering and peak flashers.

Over the years I've had the pleasure

of staying in touch with the C-QUAM crew. I've had some interesting experiences.

One involved the development of the Pioneer KEA433A receiver, during which time we hosted a group of Pioneer engineers for an evening of "fun during the Experimental Period."

### Hearing AM stereo

I'm still impressed with the performance of that unit, and the Pioneer SX-6 that was modified for C-QUAM reception by Motorola for demonstration

purposes.

If all you've heard of AM stereo is a Sony table radio, you haven't heard AM stereo! Late last year, Don Wilson stopped in with the new Motorola exciter and we ran some "real world" measurements.

This "second generation" exciter responded to many of the features station engineers had asked for, and improvements have been made in performance specs.

During the course of events, we found some problems that were traced back to

the feedback ladders in the transmitter. This might have gone undetected until the next proof, but it's resolved now.

I find all the Motorola folks extremely responsive to the real life needs of AM broadcasters. I'm aware of more than one transmitter or receiver manufacturer that has directly benefitted from information and/or design changes that have come back from C-QUAM field installers and Motorola's tech staff.

WITL-AM made the commitment nearly four years ago, and I haven't regretted the choice of Motorola C-QUAM.

*Editor's note: For more information, contact Chris Payne at Motorola: 202-862-1549. The author may be reached at 517-393-1010.*



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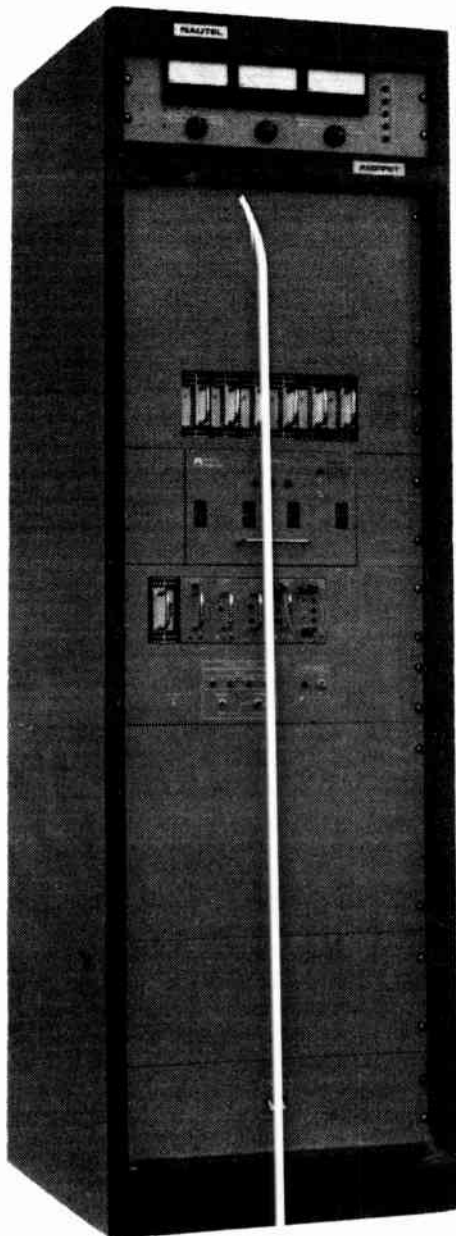


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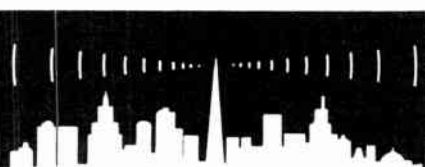
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## Buyers Guide

# MW-50 Mod Has Audible Effect

by Jon Frank, CE  
WHDH/WZOU

Boston MA ... When WHDH purchased one of the first Harris MW-50 50 kW AM transmitters in 1974, it made a long term commitment to both the product and the manufacturer.

Obviously the expense of a 50 kW transmitter and the associated installation makes this kind of commitment a necessity.

Thirteen years later, I am happy to report that our commitment to the

MW-50 has been well rewarded by the people at Harris.

When the MW-50A emerged with its solid state damper diode and improved overload panel, Harris made these improvements available to those stations, like WHDH, who had purchased an original MW-50.

Then, when the MW-50B, with its new audio board came on the scene, Harris again made the modification available.

### User Report

Both the MW-50A and B improvements were certainly worthwhile. But for the most part these upgrades were by their nature destined to be more appreciated by station engineers than by the station's listeners.

This is not the case with Harris's MW-50C3 modifications.

I remember first hearing about the MW-50C3 on the day the exhibits opened at the 1985 NAB convention in Las Vegas.

When I made it to the Harris booth I recognized several people I knew from Harris already being cornered by other MW-50 users.

#### Lower intermodulation distortion

Eventually I was treated to a tour of the new MW-50C3. The major improvement being offered was a solid state modulator driver, which replaced the original 4CX1500A tube.

What this improvement promised to deliver—significantly lower intermodulation distortion—was the reason for all the excitement.

For WHDH, this was the answer to a problem that had plagued us for some time. On any number of occasions I had tried various transmitter retunings and modifications to lower the IM distortion in our MW-50.

The THD numbers were quite good, running 1 to 1.5% percent in the mid-band (400-5000 Hz) area, but the IM was atrocious. The best I could do was 5.5% at 70% modulation using SMPTE IM tones. (Harris used to recommend IM measurements be taken between 60 and 80% modulation.)

As good as the rest of the transmitter was, the high IM distortion was standing in the way of the "transparency" neces-

sary to do justice to the rest of the equipment in our audio chain.

I kept hearing rumors of legendary transmitter engineers who were getting IM numbers below 3% but no one could tell me how to do it. Until, that is, the 1985 NAB show.

Just as I was asking the Harris factory engineer if our transmitter could be modified, up walked Bob Hallenbeck, the New England Harris representative, with what appeared to be a hastily printed sheet of paper detailing the MW-50C3 modifications available to all the current MW-50 users.

#### Modification was top priority

Needless to say, making the necessary capital budget requests for this transmitter modification was on the top of my list when I returned to Boston.

Several months elapsed before Harris called to say they were ready to come to Boston. As it turned out, three of the four MW-50 users in Boston had signed up for the latest MW-50 modifications.

It appeared I was not alone in my desire to make a vast improvement in transmitter performance.

The changeover to a solid state audio driver went quite smoothly. Mike Lawrence, the Harris field service engineer, was well versed in what needed to be done.

With my help and that of Al Carp, our transmitter technician, we were able to complete the modification in one ten-hour day.

#### Noticeable changes

The modification consisted of: 1) The removal of the old 4CX1500A tube and socket, and its replacement with a single high power FET, 2) the installation of a new PDM oscillator board, and 3) the addition of a new feedback network designed to overcome intermodulation distortion.

At the end of the day we switched on the high voltage and the transmitter came up to full power with no problems. The first thing I noticed was a lower supply current reading than I had been used to seeing.

This was due to the fact that the newly installed FET was far superior to the old tube when it came to amplifying PDM square waves.

The faster switching time between full on and full off, added to the low on-

resistance of this FET, allowed the 4CX1500A modulator tube, which it drives, to operate more efficiently. Therefore, less supply current was necessary to operate the transmitter.

We were also lighting up one less 4CX1500A filament at 200 W per hour. The people at Harris have told me that on average, the solid state replacement of the modulator driver saves 5 KVA of input power.

With today's energy costs, this represents a saving of several hundred dollars a month.

#### Transparency achieved

The next day we went about running the transmitter through its paces with our test equipment. Although there was a decrease in IM distortion, it was not as low as we had hoped for.

In all fairness to Harris, we had been made aware that we were among the first to have this modification done on

...making the necessary capital budget requests for this transmitter modification was on the top of my list.

an MW-50 of our vintage, and that some snags might develop.

Undaunted, we spent several days conducting various tests and collecting as much data as possible for the people at the factory to analyze.

It took several months, a number of phone calls, and another visit from Mike Lawrence, but we were well rewarded for our efforts.

With a few minor changes the transmitter began to perform as advertised. The improvement was, to say the least, outstanding. IM distortion at 70% modulation had dropped to 1.5%. The worst case IM was 2.9% at 80% modulation. THD was down also.

The improvement in "on air" performance was dramatic. The transmitter had finally achieved the degree of transparency we had been looking for.

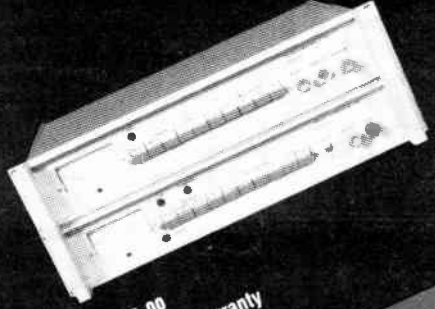
Both voices and music took on a new clarity that was noticeable on both narrow and wideband receivers. One of our competitors called to ask if we had changed our audio processing. Obviously, I was very pleased.

As of this writing our MW-50C3 modification has been in operation for more than a year. No problems of any kind have developed. More importantly, the transmitter continues to sound great.

Editor's note: For more information, contact Joe DeAngelo at Harris: 217-222-8200. The author may be reached at 617-267-1313.


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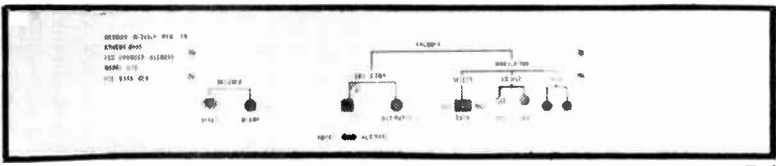
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## Buyers Guide

# BE Enhances Station's Sound

(continued from page 21)

put, and the other is a L-R modulated 10 W (adjustable) RF output that substitutes for the transmitter carrier oscillator.

The AX-10 RF output is 50 ohms, while the grids of the 807 drivers were of much higher impedance. Because of its broadbanded characteristics, we decided to try a 9:1 toroidal transformer trifilar wound on a 2" core.

The transmitter crystal oscillator was unplugged and the AX-10 transformer inserted. To our amazement, it worked perfectly! The driver grid current was exactly the same as when driven from the crystal oscillator.

Then we tackled the IPM. Most of the distortion minimizing adjustments had a similar, but more critical, effect on IPM.

We tried different LC ratios in the driver and PA tank circuits, but with little improvement.

The best we could achieve was about -34 dB IPM, which is not as good as might be obtained with a more recently designed transmitter. But it is still capable of providing quite good stereo performance.

### Adjusting for optimum performance

With audio routed through the exciter, we were ready to make it work in stereo. Broadcast Electronics' Gil Housewright spent two long nights adjusting the AX-10 for peak performance.

Actually, the system worked acceptably after only about a half hour of ad-

justment, but Gil wasn't satisfied until the last decibel of separation and the final kilohertz of flat response was achieved.

WCZN is directional at night with a three tower array. The antenna system is of fairly recent design and is quite broadbanded.

Nevertheless, the change in the system between day and night (which also involves a 40% power change) did alter the frequency response and separation somewhat.

The AX-10 is designed to be automatically switched between two different settings for "Day" and "Night" operation. There are numerous adjustments for proper equalization, phase and delay for both day and night.

After careful adjustment, there is virtually no change in audio quality between N-DA and DA operation at most points in the station's coverage area.

The worst case stereo separation was 25 dB, with about 29 dB being typical.

Frequency response was  $\pm 2$  dB from 50 Hz to 15 kHz, and THD is below 2% from 50 Hz to 15 kHz at 85% modulation, with no reason to believe there is a significant increase at higher modulation.

### Lightning strike

The AM stereo package was purchased from and installed by Radio Systems in Edgemont, PA. Included was an AM Stereo Modulation Monitor manu-

factured by Motorola (as their model 1310) and sold as the BE MA-1.

It worked fine for months and then, after a severe lightning strike, it indicated low RF level.

The input fuses weren't blown, but upon digging deeper we found that the circuit was not as indicated by the schematics in the instruction book. The monitor was still under warranty and Motorola promptly repaired the damage.

The Gates transmitter suffered extensive power supply damage in this storm and the main primary fuses were vaporized.

The only problem with the AX-10 was confusion of its logic, which was cured by removing and then restoring AC power.

Also installed at the same time was a CRL AM stereo processing package, which WCZN has found to provide competitive audio without sounding overprocessed.

### Frequency adjustment

Maintenance at an AM stereo station is similar to that for FM stereo. Of particular importance is mono compatibility, since most listeners still hear the station on older, mono receivers.

Tape cartridge equipment in particular must be kept accurately aligned to minimize phase errors.

There is some leeway because most listeners still use narrowband radios which

severely roll off the higher audio frequencies where phase cancellation in tape cartridges is first audible. But this has not been used as an excuse in the WCZN maintenance program.

The measurable improvement in frequency response is certainly evident when listening on a wideband AM stereo receiver.

But since few of these radios are used by listeners yet, we have boosted the upper mid-range and high frequencies with the CRL processing. This makes the station a little harsh on a good radio, but it sounds much better that way on an average radio.

But why go to AM stereo in the first place, with so few listeners in stereo? Owner Lloyd Roach had several reasons.

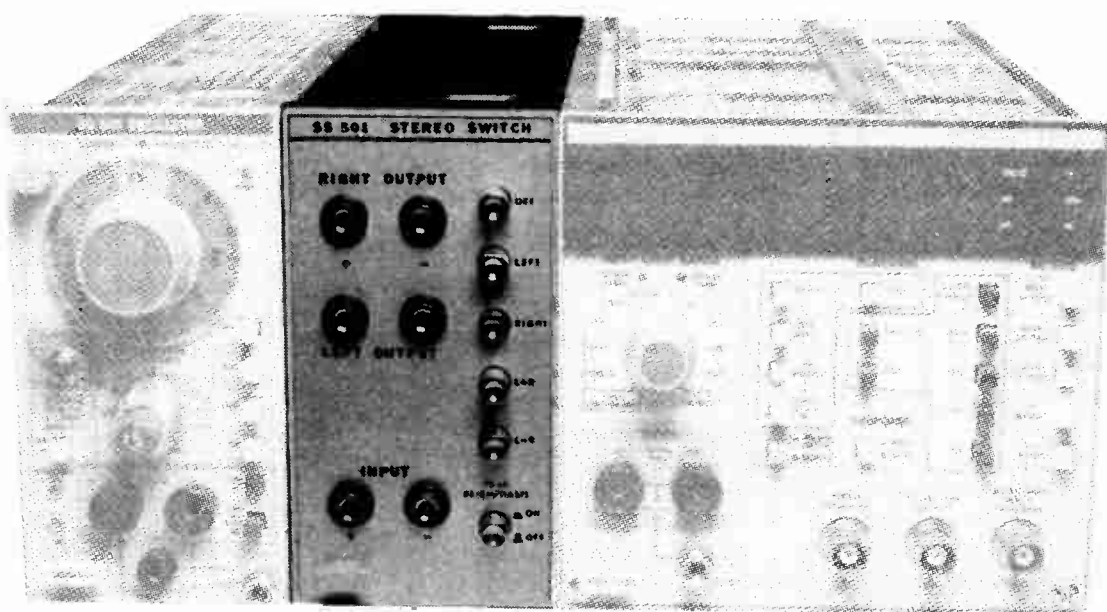
"Being smaller we needed a promotional edge over other AM stations," Roach said. "We are perceived as being closer to an FM station. And a new station would not appear to be new unless we did something new."

Interestingly, WCZN has received numerous comments to the effect that, "ever since you've been stereo you've sounded better," and, "why aren't other stations stereo if you are?"

Roach says he chose C-QUAM because Chrysler and GM decided on C-QUAM for their AM stereo car radios. And why the Broadcast Electronics system? "Mainly because of the good reputation of their transmitters," said Roach.

*Editor's note: For more information, contact Steve Ford at Broadcast Electronics: 217-224-9600. The author may be reached at 215-565-8900.*

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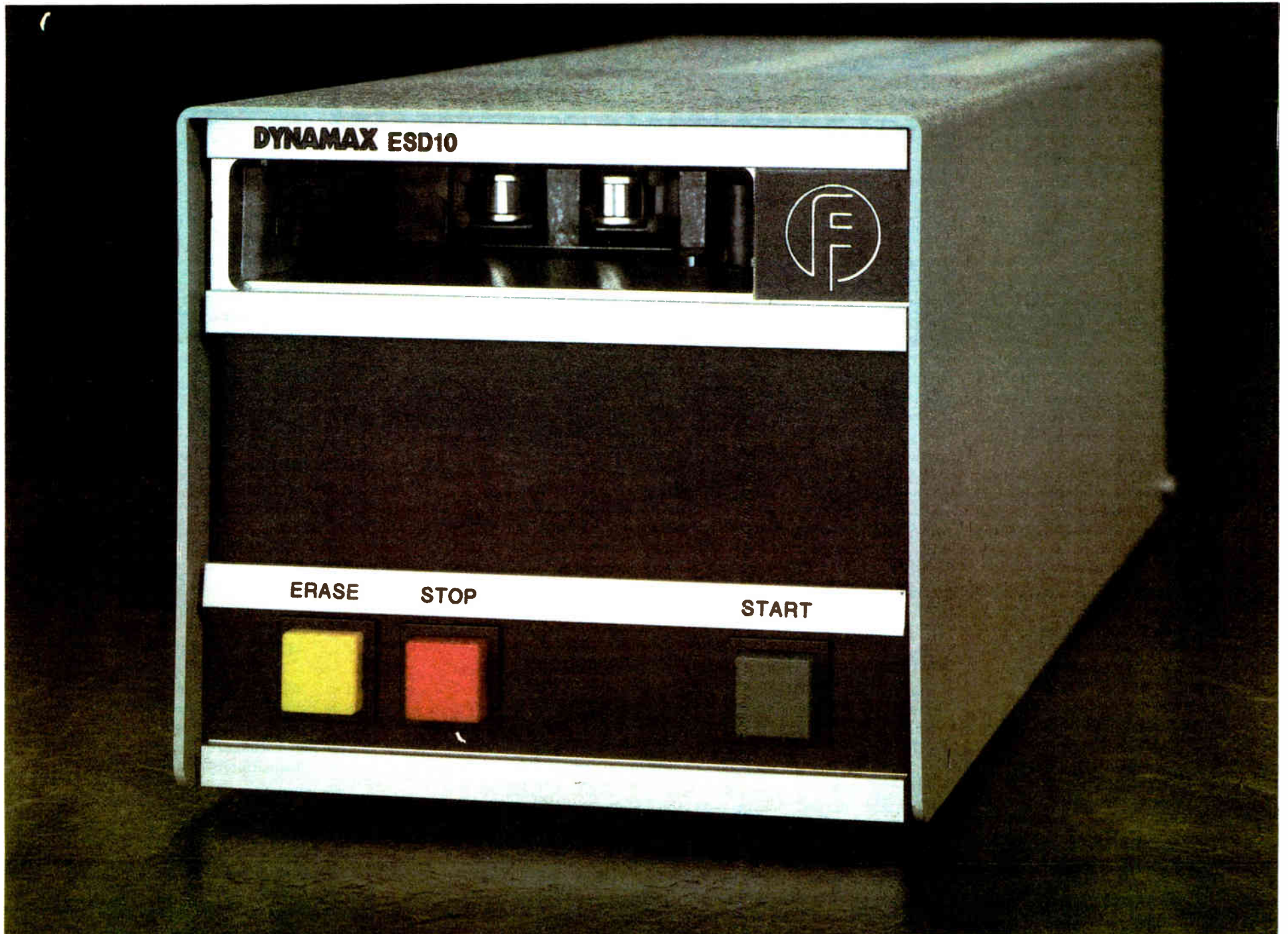
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