

REGULATORY NEWS

FCC Files

To file a petition or comments with the FCC, send an original and five copies of your filing to the Office of the Secretary, Federal Communications Commission, Washington DC 20554. When filing comments in support of another party's petition or comments, send a copy of your filing to the original petitioner and provide the Commission with a signed statement verifying that this has been done. For more information about a particular proceeding, call the contact person listed.

AM Technical Deregulation

In July the FCC began a formal review of its AM assignment criteria. The Notice of Inquiry will examine whether to overhaul the rules which prescribe the degree of interference protection for AM stations, as well as those that establish service areas.

The FCC said it is looking at field strength values of station contours protected from interference, in addition to the levels of interference permitted at those contours. It will also examine radiated emissions, skywave propagation curves, ground propagation and interference calculation methodologies.

The wide ranging inquiry will also examine antenna systems, man-made noise levels and receiver specifications. In addition, the FCC said it would look into the possibility of allowing stations to enter into private agreements to resolve interference conflicts.

While comment dates had not been assigned at RW's press time, the FCC indicated that its comment period on the inquiry will extend into the fall. The full text on the plan was due to be released in mid-August.

The docket number is MM 87-267. Contact Wilson LaFollette at 202-632-5414.

AM Stereo

In early August, the National Telecommunications and Information Administration (NTIA) released a study of multimode AM stereo receivers.

The 18-page document determined that, although it was possible to build receivers which decoded two incompatible stereo systems without degrading either, multisystem receivers would not be

a practical way to spread the growth of AM stereo technology.

The FCC had said it would wait for the NTIA decision before responding to a September 1986 request filed by Texar Inc. The firm had asked the FCC to abandon its marketplace approach and choose an AM stereo standard.

At press time, an FCC spokesperson said the study was still being evaluated.

Laboratory and field tests of multisystem receivers was completed in late July by NTIA's research facility, the Institute for Telecommunications Sciences (ITS). ITS had been charged with performing the tests following an initial report by the NTIA, issued in February. (For more information, see the update in this issue.)

Despite the FCC's reluctance to abandon its marketplace approach, former Mass Media Bureau Chief James McKinney said at the March NAB show that he personally believes a defacto AM stereo standard—C-QUAM—has been reached. He also advised broadcasters not to wait for any more studies before going stereo.

In other news, a petition calling for the FCC to require that all AM stereo receivers to be equipped with a multimode chip was filed by Press Broadcasting in November 1986. No action on that petition has yet been taken by the FCC.

The FCC's AM stereo contact is William Hassinger at 202-632-6460.

AM Daytimers

The FCC issued a proposal in early May that could allow daytimers on regional, and even clear channel frequencies, to add nighttime operations. If implemented, the plan would permit

night powers similar to those now being used by US daytimers on Canadian and Mexican clear channels.

Comments on the proposal, which were due in mid-July, were mixed. Several parties indicated that the FCC should complete its inquiry into AM assignment procedures, unveiled 16 July, before moving to allow more daytimers to operate at night. (See the article in this issue for more details about the comments.)

In addition to more hours for daytimers, the FCC's proposal also would make permanent a freeze on new daytimers. The FCC indicated in December 1986 that it would implement a freeze on the filing of applications for new daytimers. At the time, the FCC said this was a "temporary" measure.

In other news, the FCC has set 28 August as the comment deadline, and 14 September as the reply comment deadline, for a plan to set a minimum 10 W pre-sunrise authority (PSA) power level that daytimers can use during April, in line with a recent shift in the annual start date for daylight savings time from the last weekend in that month to the first weekend.

Earlier this year the FCC said it was considering a 50 W minimum PSA level instead. However, many fulltime AMers commented that the plan would cause interference.

The docket number of the 10 W PSA minimum plan is MM 87-3. The docket number of the fulltime plan for daytimers is MM 87-131. The contact on either issue is Louis Stephens at 202-254-3394.

RF Radiation

Results are expected to be reported by the end of September on a joint FCC-Environmental Protection Agency (EPA) study of RF radiation levels emitted by broadcast towers in Spokane, WA.

According to FCC Office of Engineering and Technology's Robert Cleveland, the Spokane study—conducted 28 June through 3 July—concentrated more on AM towers than did preceding joint studies in Honolulu, Seattle, Portland and Denver.

In addition to measuring emitted radiation from the towers, Cleveland said readings were also made of body current induced in tower climbers. Preliminary results of the study indicated that the highest current induced in tower climbers occurred at the tops of towers. Other findings were not disclosed, pending review of the data by the EPA.

Contact Robert Cleveland at 202-653-8169.

FM Regulations

At press time, comments were due in late August on an FCC plan to allow wider use of FM directional antennas in short spacing cases. The FCC inquiry, issued in April, considers the authorization of FM directional antenna systems to reduce the distance separations between an FM station's transmitter site and adjacent and co-channel stations and allotments.

The issue is contained in docket MM 87-121. Contact Bernard Gorden at 202-632-9660.

In another FM issue, several parties have indicated that they plan to file requests with the FCC to permit a blanket power increase for Class A FMs. Tentatively, the plan calls for a 6 kW limit, up from the existing 3 kW limit.

The FCC had previously said it would allow Class A's to upgrade to Class B and C status—interference conditions permitting—without having to move off their reserved Class A frequencies.

However, some broadcasters who had been campaigning for an across the board power hike for all Class A's to 4 or 6 kW levels said the FCC's action will have little effect in many areas because of existing congestion on the FM band.

The docket number for Class A upgrades is MM 86-144. Contact Joel Rosenberg at 202-634-6530.

In another FM matter, the FCC in March turned down a plan submitted by Radio New Jersey for the creation of an "FM2" band between 225 and 230 MHz. The band would have been utilized by daytimers and interference-plagued fulltime AMers, according to the plan.

The FCC said that the band was reserved for governmental use and could not be reallocated. However, Radio New Jersey indicated that it would refile its plan using a different band, possibly the adjacent 220-225 MHz band. Contact Radio New Jersey counsel Larry Roberts at 202-659-4700.

Duopoly Rules

Comments recently filed with the FCC by various broadcast concerns indicated general support for a proposal to relax radio duopoly and one-to-a-market rules. Recommendations from broadcasters ranged from case-by-case evaluation of station combinations to lifting of restrictions entirely.

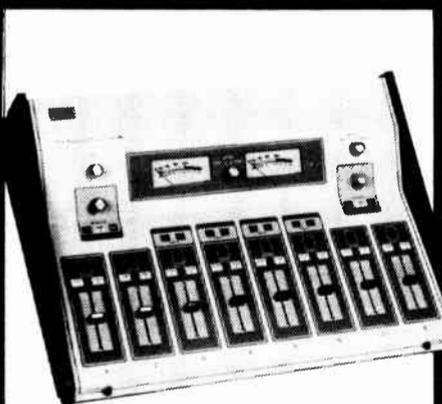
The FCC proposed in January to allow ownership of UHF stations with AM and FM stations in the same market. Included in proposed permissible combinations were UHF-AM-FM stations in the same market and combinations of AM stations with either UHF or VHF stations.

Under current rules, cross ownership of radio or TV properties is prohibited if the service contour of the purchasing facility completely encompasses the community of license of the station to be purchased.

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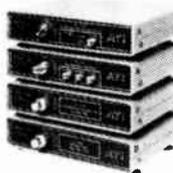


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NRSC Will Consider RF Mask

by Alex Zavistovich

Washington DC ... The National Radio Systems Committee (NRSC) is expected to come to a decision on an RF emissions mask during the Radio '87 convention.

An RF mask proposal agreed to by the NRSC's Subgroup on Methods and Procedures is being thrown open for discussion by the full committee.

In two separate teleconferences in early August, the subgroup hammered out a compromise proposal. The mask decision combines suggestions presented by Motorola engineer Greg Buchwald and Don Tyrie, of Canada's Department of Communications (DOC).

The RF mask is to be the transmission portion of the NRSC standard approved for stations' preemphasis and complementary receiver deemphasis early this year.

Under the terms of the new proposal, the RF emissions mask would use two types of specifications—a mask for a known pulsed test source, and a second, "peak" specification of 25 dB down at 10 kHz, 35 dB down at 20 kHz, and sloping by 1 dB/kHz to -80 dB.

Modified FCC bandwidth rules

In June, Buchwald put forth a specification for RF emissions limitation, which modified the FCC's automatic transmission system rules for occupied band-

width by including breakpoints reflecting the NRSC audio bandwidth specification.

A two-tiered proposal, Buchwald's recommendation included both peak and average specifications for program emissions.

The average specification required a reference level at ± 10 kHz. The level would drop to -35 dB at 20 kHz, tapering to -40 dB at a rate of 0.5 dB/kHz.

Buchwald's proposal was the subject of much discussion. Some members of the subgroup raised questions about how "average" should be defined and measured.

In response to those questions, Tyrie suggested using specifications recommended by the International Radio Consultative Conference (CCIR), a European-based standards-setting organization.

Occupied bandwidth is measured by the CCIR with the transmitter driven by a conference-approved noise source at a RMS modulation of 30%.

The subcommittee seemed in agreement, Buchwald said, about using a known test signal in place of an average. Instead of the CCIR noise source, however, the subgroup chose the pulsed noise test of the US Standards Institute (USASI), which they considered representative of program material.

When the USASI noise source is used

to drive a system, from audio processor to transmitter, the emitted spectrum is not to exceed the mask, Buchwald explained.

Buchwald stressed that such a mask would be set strictly for the USASI test source, in keeping with the CCIR mask definition in which the test source and percentages of modulation are all given quantities.

To take into consideration the total emitted occupied bandwidth, the subgroup is using Buchwald's original peak proposal. That peak specification would be "the actual RF emission mask during all forms of program material and any ancillary data or other emitted signals," Buchwald said.

The peak mask guarantees that second adjacent channels will have "consumer grade protection," he added.

Next step: full committee approval

The RF emissions mask is next slated to be submitted to the full NRSC, said Buchwald. A completed proposal is expected to be introduced at the next committee meeting, which will be held in Anaheim, CA, concurrent with the NAB Radio '87 convention, he said.

NRSC coordinator Mike Rau concurred, saying a decision will probably be made at Anaheim to release the RF mask proposal for public comment. The version approved by the NRSC would,

like the original NRSC pre/deemphasis proposal, become a draft interim proposal, pending evaluation of comments.

At press time, the comment deadline for the proposal had not been set by the NRSC. Rau speculated, however, that between three and six months would be allowed as a filing period.

The decision process on the RF mask issue apparently ran smoothly from the beginning "I don't think there was much disagreement at all about the mask," Rau said.

Still, the committee is making further inquiries into the issue of RF emissions limits. According to Rau, transmitter manufacturers have been notified about the subgroup's decision, and are expected to provide their perspectives on the proposed mask.

Until now, the NRSC has been occupied with the issues of preemphasis/deemphasis and RF emission limits in its quest for the technical comparability of the AM band with FM. Now that the RF mask issue is nearly resolved, where will the committee next turn its focus?

Rau anticipates the industry group will "concentrate very intensively" on the technical study recently initiated by the FCC into interference standards.

The FCC's study is "perfect and appropriate" territory for the NRSC, Rau maintained. "I feel sure that's what we're going to do next."

For additional information, contact Greg Buchwald at 312-576-4893. Contact Mike Rau at 202-429-5346.

Japanese Interest Aids FMX Optimism

by David Hughes

Greenwich CT ... Bouyed by a particularly strong turnout of audio manufacturers at a recent Japanese convention, FMX co-developer Emil Torick is optimistic about his FM stereo coverage extension system.

In addition to what he says was a very positive reaction from Japan, Torick told RW that the final specifications for the FMX system have been sent to IC producers, as well as generator and receiver manufacturers.

Torick called his trip to the mid-summer Audio Engineering Society (AES) sponsored meeting in Japan "interesting." The organization held a half-day seminar on the "new wave in broadcasting," which included FMX.

He said he expected only about 30 people to show up for the session, but instead 110 showed up. "They were primarily CEs and GMs of audio

manufacturing companies," he said.

While no contractual agreements were drawn, Torick admitted that the higher than expected turnout "demonstrated a high level of interest" in the system.

He also met with Sanyo officials to discuss FMX IC chip development while in Japan.

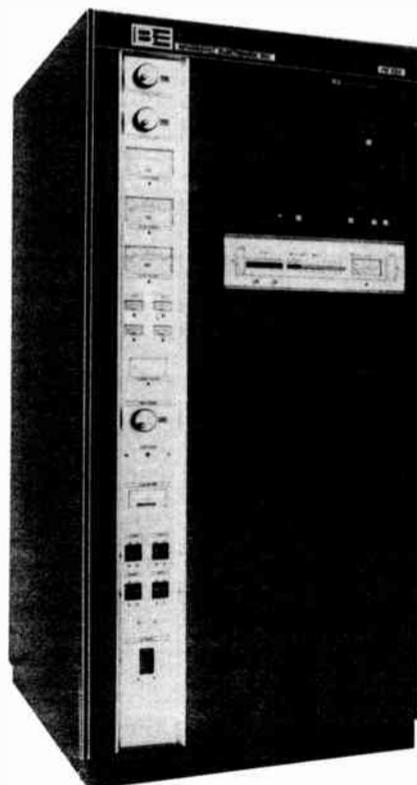
This good news on the FMX front counteracts some disappointments in 1986, when on-air FMX tests revealed multipath problems.

Since then, Torick and Broadcast Technology Partners (BTP), the organization formed to fill the void left by the late 1986 closing of the CBS Technology Center, which had backed FMX research, have reportedly modified the system to eliminate the problems.

The specs on the updated system were sent to manufacturers in early July, Torick said. On the IC front, he indi-

(continued on page 7)

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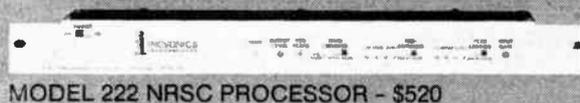
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Multimode Is Not a Solution

(continued from page 1)
moving toward multisystem," Sikes explained.

A number of countries, including Canada, Brazil and Australia, have selected a single AM stereo broadcast standard—the C-QUAM system. Sikes also reported that the Japanese government is likewise considering a single standard.

Given the hesitation on the part of the industry to embrace multisystem technology, there remains a question of why

the NTIA did not speak in favor of one or the other competing system as a standard for the US.

Before the NTIA's February report was issued, observers in the broadcast trade had anticipated the agency to name C-QUAM as, at least, the de facto standard for AM stereo.

Sikes acknowledged that 100% of AM stereo receivers are capable of decoding C-QUAM; of those, some 95% receive C-QUAM only. However, he said, such figures suggest only that C-QUAM may

be considered "a" de facto standard for AM stereo, not "the" de facto standard.

Sikes was reluctant to consider the Kahn ISB AM stereo system even "a" de facto standard, although he stressed he was not coming out in favor of one system over the other.

What was favored in the NTIA's August report was criteria for interference protection by the FCC for the AM stereo pilot tones.

Tone protection "would not imply government establishment of a stereo

standard," NTIA insisted; rather, it would protect accepted systems and would "promote greater certainty in the AM stereo market."

The agency in particular recommended protection of the C-QUAM pilot tone, although it was not as ready to support the same for Kahn's system.

NTIA wrote that "evidence of the substantial market support for the C-QUAM system . . . justifies protecting that signal from possible interference."

However, in discussing the Kahn system, the disparity in receiver numbers between Kahn and C-QUAM systems was again cited.

"While the Kahn system has won a number of adherents among broadcasters in several markets, its level of acceptance is substantially less than Motorola's. More significant, however, is the apparent lack of a significant number of AM stereo receivers in the marketplace capable of receiving a Kahn stereo signal."

The NTIA report did leave open the option that Kahn, "or any other AM stereo manufacturer," could petition the FCC to demonstrate that "its system has met whatever criteria are established by the Commission for pilot tone protection."

Pleased with decision

Motorola's AM Stereo Broadcasting Manager Chris Payne said the company was pleased with the NTIA's decision. He maintained the report showed "the market has definitely converged on the C-QUAM system, both in the US and internationally."

Payne said the NTIA's findings indicated "a pretty dim future, if any future at all" for multisystem radios. He also pointed out that the agency's recommendations to protect the pilot tones of AM stereo signals included support of Motorola's system, and not Kahn's.

If the Commission opted to provide the protection, Payne said, it would show to broadcasters and receiver manufacturers that C-QUAM has "some sort of official recognition."

The AM stereo market has "lived in doubt" over system choice because of the presence of multisystem technology, Payne said. With the NTIA finding, "no broadcaster should be in doubt over which system to pick."

Kahn Communications President Leonard Kahn refused to speak or issue a statement to RW about the NTIA decision.

NAB President Eddie Fritts, in a prepared statement, said the NTIA's reports "have made it clear that AM stereo is vigorous and growing."

Fritts encouraged broadcasters to implement both AM stereo and the new transmission standards instituted by the National Radio Systems Committee. He maintained that the two in combination "will make AM radio's new sound fidelity a winner in the marketplace."

Fritts' comments echoed those made by Sikes upon release of the report. Sikes had stressed that both the NRSC standard and AM stereo need to be implemented by broadcasters in order to achieve some measure of comparability with FM technology.

However, he added that there was "not much time left" for the industry to move on AM improvements.

"AM is on a zigzag path," Sikes maintained, adding that delays may result in a dwindling of interest in the technology.

For additional information contact R.T. Gregg at NTIA: 202-377-1551. Contact Chris Payne at 202-862-1500.

Technically Possible, ITS Study Concludes

by Alex Zavistovich

Boulder CO ... When the Boulder-based Institute for Telecommunications Science (ITS) was tasked by the NTIA to study multisystem receivers, it concluded "an automatic multiple system receiver, capable of receiving both the C-QUAM and Kahn systems, can be designed without unacceptable inherent degradation to one or both such systems."

Although the NTIA's subsequent verdict of the impracticality of conversion to multisystem AM stereo may have rendered the ITS decision moot, it finally puts the question of multisystem's technical feasibility to rest.

If the NTIA had come out in favor of multisystem receivers, it would have come as good news to Kahn Communications, which manufactures the Kahn/Hazeltine Independent Side Band (ISB) AM stereo system. Kahn-capable receivers are far outnumbered by C-QUAM units, and an endorsement of multisystem receivers may have convinced some broadcasters to choose the ISB transmission system.

On the other side of the coin, multisystem for Motorola would have meant a possible loss of sales or at least a shaking of its current lead position in the AM stereo race.

Regardless, the research process was slowed somewhat by Motorola, which had initially refused to contribute its C-QUAM equipment to ITS. Multisystem technology was a failure in the marketplace and degraded the quality of reception of the C-QUAM system, Motorola held.

The firm attempted, through engineering statements and other presentations, to convince NTIA that further testing was unnecessary. The NTIA, however, was determined to investigate the issue for itself, and ultimately Motorola complied.

The result of the ITS research into multisystem receivers

was a study, "Performance of Single and Multiple System AM Stereo Decoder Receivers," completed in July, which was one of the cornerstones of the NTIA's August report.

In its technical study, ITS compared performance of production equipment from each company with that of test sets employing multisystem integrated circuitry. Identical test conditions were devised, including varying stereo configurations, amplitude modulation levels and field strengths for "desired and interfering signals."

The research concentrated on distortion as the most sensitive performance parameter. "Compromises in the design" of receiver components, ITS explained, would "show up in the measurements as increased distortion" when compared with better designed receivers.

Field tests were also used to corroborate the conclusions drawn from laboratory testing.

In some instances—as in comparison of a single system decoder receiver with multisystem IC home entertainment and "boom box" receivers—there were "higher distortion levels" for the IC units. However, ITS held that multiple system receivers generally would perform as well as single system products.

Motorola's AM Stereo Broadcasting Manager Chris Payne acknowledged that the ITS had a large body of data to support its findings about the degradation of AM stereo signals by multisystem receivers.

In the interim, however, Payne said he was encouraged by the NTIA's findings.

In its first report in February, the NTIA commented that, if multisystem technology was found not to be an option in spreading the growth of AM stereo, it expected the marketplace would "coalesce" around one of the competing systems.

"Let the coalescing begin," Payne said.

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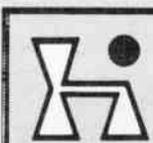
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OPINION

Readers' Forum

Got something to say about *Radio World*? Any comments on articles? Call us at 800-336-3045 or send a letter to Readers' Forum (*Radio World*, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776).

No more FM's

Dear RW:

Your editorial in the 1 August issue of *RW* made a case for the creation of short-spaced FM stations on a purely business basis. I take issue with your position from a programming perspective.

I believe the main reason behind the move of radio audiences from AM to FM is signal quality. People would rather listen to full-fidelity interference-free programming and FM presently offers that kind of quality.

Cramming the FM spectrum with stations in the same manner the AM spectrum has been crammed will not be a service to the public.

Signal interference will result, despite the use of directional antennas. AM stations use directional antennas to little avail.

Short spacing FM stations is just the first step in degrading the quality of signal available in the FM spectrum. The next step will be the compression of channel bandwidth.

The same justification can be used—more efficient use of the spectrum.

I sincerely hope the FM band never reaches the "saturation" point. My motive is neither monopolistic nor anti-competitive. It is concern for the quality of broadcast signal available to the public.

The spectrum belongs to the public and its use should offer some benefit to the public.

Raymond A. Shirley
Knoxville, TN

Contracting with Uncle Sam

Dear RW:

I enjoyed the guest editorial on the ways and means of contracting with Un-

cle Sugar (1 August *RW*).

I got in on some of this as the most junior employee of a now defunct firm which engaged in city planning and like services.

Most of what we did was funded either directly or indirectly by the Feds. Hence there are some unwritten rules which can be remembered for each job.

1. No bureaucrat may have an original thought. As a corollary, no original ideas are going to be approved by any bureaucrat. Save the time and trouble.

2. First send in the proposal with the glaring error, so the GS-3 in charge of the review can justify his/her job. You can be preparing the corrected one while you wait for the first one to come back.

3. Remember that the price of all federal contracts is double that of private sector work.

4. Lavish Christmas presents are worth much more than impeccable credentials, and are usually cheaper.

5. Cost-plus is the desired method of doing business—otherwise we have to get even on the change orders.

6. Faith in the federal boondoggle will keep you employed for many years.

(continued on page 15)

The long-awaited results of the NTIA's second study on AM stereo are a welcome climax to yet another chapter of this saga.

The report's conclusion, that multisystem technology is technically but not economically feasible emphasizes what many in the industry had already observed.

The report's second step, asking for AM stereo pilot tone protection, throws the ball back into the FCC's court.

The fact that the NTIA asked for protection of the C-QUAM pilot tone but stopped short of doing the same for any other system gives the FCC a chance to take a position on AM stereo which can help move the situation along.

The FCC should act positively and quickly on the NTIA's suggestion. But ultimately the power to resolve the AM stereo question still rests in the hands of the broadcasters.

The fact is that there are virtually no receiver manufacturers interested in making multisystem receivers.

Plus, the window of time remaining when any receiver manufacturer will want to make AM stereo products at all is shrinking.

Now that the multisystem question has been put to rest it is time for AM stations to "coalesce," as the NTIA hoped they would, around the single system which has gotten the lion's share of the market.

Many AM stations have already turned to the C-QUAM system. Stations which have been waiting for a decisive word on AM stereo should take the recent developments as a call to action and get on board.

Most importantly, stations using other stereo systems should help move the AM stereo question along by converting to C-QUAM.

Like a political race where one candidate is on a clear path to victory, it's time for the remaining factions to make the AM stereo decision unanimous.

For anyone who cares about AM's future it's time to act and create an AM stereo standard for the US.

—RW

Clarion Call To Action

Hams Will Oppose FM2 Band

by Ron Castro

Rohnert Park CA . . . While Larry Tighe may enjoy seeing his name in print, I can save him a lot of wasted time and legal fees in his ill-advised quest for an "FM2" broadcast band.

Although the military is tight-lipped about why it needs 225-230 MHz, it is widely believed that the band is deployed for use for weapons systems control and telemetry, fixed navigation, or by a network of over the horizon radar stations.

225 MHz signals are "bendy" enough to permit such stations to see beyond the normal line-of-sight range of standard radar systems.

Mr. Tighe would not have heard such signals since they would most likely be confined to missile test ranges or directed toward the probable path of incoming Soviet ICBMs.

Even so, such systems would be subject to interference from weak signals from a 10 kW transmitter over a path aided by Sporadic E layer ionospheric refraction, geomagnetic auroral curtain reflection, transequatorial ducting, meteor trail scatter, or inversion layer propagation.

Although these propagation conditions are rarely considered in broadcast engineering circles, they are well known to both the military and by amateur radio operators who have been us-

Ron Castro is president and GM of KRPQ, Santa Rosa, and a ham radio operator. He can be reached by calling 707-584-1058 or through ham radio calls on N6AHA.

ing the adjacent 220-225 MHz band for decades.

This brings me to Mr. Tighe's latest frequency foray into the 220-225 MHz amateur radio band.

Land mobile radio interests have been slaving over these five coveted megahertz for years, yet their repeated attempts to pry them from the highly organized hams have met with abysmal failure.

Guest Editorial

The most recent fiasco (FCC Docket 87-14) met with a firestorm of protest from over 2000 local ham radio clubs representing over 100,000 members under the national advocacy and lobbying umbrella of the American Radio Relay League.

The ARRL filed legal commentary that consumed some 80 pages of text and statistical exhibits attesting to the widespread current use and vigorous future development of the band.

Thousands of individual hams filed some 16 volumes of comments . . . so many in fact that the FCC Docket Room was plunged into a three week standstill just opening the mail.

Mr. Tighe's feeble letter-writing campaign would be ho-hum by comparison.

Abundant activity

If Mr. Tighe hears no activity on 220-225 MHz it must be because he has a short in his cut-rate crystal set!

There are over fifty 220 MHz repeaters listed in New Jersey, and hundreds more

across the nation each with many users.

There are also the frequencies used by amateurs for remote control service, repeater linking systems and experimental weak-signal communications.

Add to this the fact that on 21 March of this year the FCC changed its rules to allow Novice Class hams voice privileges (including FM repeater use), digital, and packet transmission in the 220 MHz band and you can see that the band is spoken for, thank you!

Lots of opposition

FM2 operators would face the same uphill battle that UHF-TV broadcasters have fought for years, except that they would be facing competition from 10,000 conventional radio stations.

750 million existing receivers would not be compatible, and with at least two of every format available in most markets there would be little incentive for consumers to rush out and buy new, more expensive radios that would pick up only 10% more channels than are now available on AM and FM.

If you liked FM Quad . . . you'll love FM2!

In the event FM2 were not successful the operators would be condemned to a leper colony existence, having given up their access to the established AM band.

Two important words about FM2: forget it!

If Mr. Tighe plans on rallying support for FM2, then I will be happy to help organize the opposition.

FM2 is simply a bad idea, and broadcasters don't need another embarrassing battle like we've got with AM stereo.

Radio World

Vol 11 September 1, 1987 No 17



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Daytimer Plan Comments Split

by Alex Zavistovich

Washington DC ... Comments recently filed with the FCC were split as to whether daytime AM stations, currently broadcasting for only one or two hours after sunset, should be allowed reduced power night-time operations.

Many of the organizations filing their statements with the Commission recommended that such authorization be granted on a provisional or interim basis. Still others suggested taking no action until the FCC completes a technical review of AM interference standards.

At the heart of the issue is the disposition of services to some 1,600 Class II and III AMs, now transmitting only during the day.

Broadly stated, Class I stations broadcast primary service on clear channels, while Class II stations use the clear channels for secondary service. Class III stations broadcast on regional channels.

Under the Commission proposal, approximately 1,600 Class II and III daytime AM stations now broadcasting until just past sunset would be allowed to broadcast all night—at reduced power.

Between 200 and 300 Class II daytime stations are excluded from the proposal, because of the potential for interference to Class I stations.

The proposal was made in response to a petition from the NAB and the Association of Broadcast Engineering Standards (ABES) in March 1986 requesting the FCC to permit night-time service for Class III stations. The Commission chose to extend the night-time proposal to both Class II and III AMs.

In some cases, broadcast station licensees recommended caution before implementing any sweeping evening operation authorization.

Hearst Corporation, owner of three full-time AM stations, said the addition of daytime stations at night would increase the interference to its stations.

"Disturbingly," Hearst stated, "these changes will pave the way for scores of new unlimited stations with authority to operate at night without the minimum hourly night-time operating restrictions

“ ————— ”

These changes will pave the way for scores of new unlimited stations.

” ————— ”
that are imposed on existing full-time stations."

Fisher Broadcasting also maintained that authorizing large numbers of new night-time services "will result in only minimal levels of new service and at the same time cause existing AM services ... to suffer."

At least one station proposed that a broader action be taken than simply allowing night-time operations on the AM band. Radio New Jersey (RNJ) urged the Commission to reconsider a plan to expand FM broadcasting to the 225 to 230 MHz spectrum, and give channels in the band to daytimers.

The plan was originally proposed to the FCC by RNJ last fall. The so-called "FM2" band, used for daytimers, would cut back the number of AM stations, and reduce the interference to stations remaining on the AM band, RNJ said, as well as enabling clear channel stations to provide long-distance service.

NAB urges power calculations

Many of the comments, particularly those of the NAB, recommended that the Commission proceed conservatively in allowing evening operations for daytime stations.

In its comments, the NAB suggested the FCC should calculate night-time power levels for the broadcasters, to ensure that existing interference standards are met. The association expressed hope, however, that the calculations would not "delay" the grant of night-time authority to the daytimers.

The broadcasters should also be granted blanket permission by the FCC, the NAB said, to keep stations from having to file individual applications.

New daytimers, however, should not be authorized by the Commission, NAB recommended, stressing "daytime-only AM stations simply are inefficient uses of the AM radio spectrum, when compared to the overall public interest benefits of full-time service."

Additionally, the NAB said, daytime broadcasts should be allowed to transmit at night on an interim basis until the FCC finishes its AM interference standard review.

In mid-July, the Commission initiated a review of AM standards to determine

whether changes to the standards would improve the quality of AM service.

The NAB noted that, if new interference standards are set in the review, the night-time operations of daytime stations should conform to them.

Wait for the review

The ABES, in its filing, maintained that the Commission defer action of the status of Class II daytime station's evening operations until interference standards are reviewed.

Acting on the daytimer's petition, "without addressing the many issues involved in the future of Class I clear channel service is inefficient and threatens to prejudice the issues in the proceeding just initiated," it stated.

Also opposed to any immediate action on the petition was the Clear Channel Broadcasting Service (CCBS). CCBS recommended that authorization of new night-time service should be held off by the FCC until it completely overhauls the interference standards.

Reconsidering the standards, CCBS held, would assure that new service would not increase clutter in AM or cause more of the audience to "abandon AM radio at night."

According to CCBS, current standards "fail to protect AM reception from today's insidious clutter." The association blamed a "multiplicity of interference sources" for the clutter in the band.

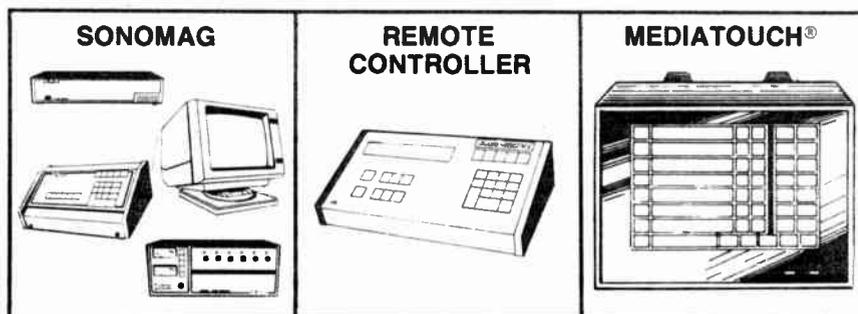
The FCC should put into effect new standards which would address such issues as improved signal propagation and the problems of skywave and ground-wave adjacent channel interference, the group said.

FCC docket is MM 87-131. For additional information, contact the FCC news media office at 202-632-5050.

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Holmes Considered for FCC Job

by Alex Zavistovich

Washington DC ... At press time, indications were that President Reagan's likely choice for the FCC position vacated in Dennis Patrick's move to chairman may be Bradley Holmes, of the Commission's Mass Media Bureau (MMB).

Rumors circulating Washington in early August said the 33-year-old Holmes, chief of the MMB Policy and Rules Division, would be tapped by Reagan for the Commission vacancy. The opening was created when Patrick assumed the chairman's role, filled for six years by Mark Fowler.

Holmes, who served as legal assistant to Patrick for almost two years before taking charge of the Policy and Rules Division, was also rumored to be one of the chairman's early choices for the slot.

Contacted by RW, Holmes would not comment on the possible appointment.

Before joining the FCC, Holmes was an associate with the law firm of Skadden, Arps, Slate, Meagher and Flom. He also served as law clerk for Mary Johnson Lowe, a US District Judge for the Southern District of New York.

Reportedly, Holmes' primary compe-

petition for the job is Peter Pitsch, formerly chief of the FCC's Office of Plans and Policy.

Originally opposed for consideration by broadcasters because of his ideological views on spectrum auctioning, Pitsch, now chief of staff in Patrick's administration, has returned to the good graces of some of his detractors.

Other rumors suggest that if Holmes is not selected for the FCC vacancy, he might be selected to take over the role of chief of the MMB, a position left vacant when Jim McKinney left in July for a White House appointment.



Bradley Holmes

FMX Specs Spark Optimism

(continued from page 3)

ated that Sanyo plans to have a product ready by November, while Sprague is looking at a January or February timeframe.

RE Instruments is manufacturing a test generator which will be ready for delivery this fall, Torick said.

He also indicated that the companies that had been working on FMX generator prototypes—Orban, Inovonics, CRL and Aphex—have also been sent the final specifications.

Following the multipath problems in the original FMX system, generator manufacturers had announced that they would put the system on the back burner while waiting for new data from BTP.

"They're still studying the specs," he added.

Torick also said that additional on-air tests of the improved FMX system are planned, but he did not reveal details.

The January 1988 Consumer Electronics Show (CES), to be held in Las Vegas, will feature the next major update on FMX, Torick said, including news about new FMX receivers.

BTP is also planning a booth at the September Radio '87 show to be held in Anaheim, CA. Michigan consultant John F.X. Browne, also of BTP, is expected to give an FMX update at that show.

For more information on FMX, contact Emil Torick at 203-622-2643.

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- Convert thousands of acres of antenna farms to millions in cash
- Let out patterns and increase power of remaining AM stations
- Re-establish effective clear channel broadcasting
- Eliminate each AM frequency as they are vacated, no reassignment

FM2 WOULD:

- Be computer assigned in descending priority to:
 - AM daytimers
 - AM share-time and limited-time
 - AM class IV's with unsatisfactory night coverage
 - AM stations with unsatisfactory night coverage
 - Non-commercial, educational applicants (one to a town)
- Not increase or decrease the number of commercial stations on the air
- Simulcast the existing AM with the new **FM2** channel for 5 years allowing the receiver market to catch up

The vacant band of 225 to 230 MHz is assigned to broadcasting in regions one and three. It is vacant and unused in region two (North and South America).

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Anaheim Show Multi-Faceted

by David Hughes

Anaheim CA . . . While the NAB's fall radio show, Radio '87, highlights programming, promotions, sales and management issues, engineering events and topics will not be forgotten.

The annual event, scheduled 9-12 September at the Anaheim Convention Center, only a stone's throw from Disneyland, will feature 80 sessions covering a wide range of radio topics, along with workshops, luncheons, award ceremonies, NAB meetings, as well as exhibits.

Five-thousand people, up slightly from last year's Radio '86 in New Orleans, are expected to attend this year's show, according to the NAB.

Seminars, sessions

On the engineering side, Radio '87 will feature three major seminars. They will deal with directional antennas, the NRSC AM pre/deemphasis standard and RF radiation compliance issues.

About a dozen engineering sessions will focus on RF maintenance, audio processing, new cart machine technol-

ogy, electrical interference, telco questions, AM synchronous transmitters, FM new technology (including FMX) and tower maintenance. An FCC "town meeting" is also planned.

For detailed information on the engineering seminars and sessions, see the accompanying story.

On the non-engineering side, a wide array of sessions will be held on issues including ratings and research, new formats, "AM success stories," sales compensation, choosing a program consultant, how to overcome a license challenge, radio production, buying a station and "how to deal with your staff."

Exhibits

The "Celebration of Radio" exhibit hall will feature approximately 129 exhibitors, up from 109 last year.

While many of the exhibitors are involved in programming, sales and other areas, equipment manufacturers and distributors will also be there.

About three dozen firms are equipment vendors. They include Broadcast Electronics, Continental Electronics, Dielectric, Fidelipac, Gentner Engineering,

Harris, International Tapetronics/3M, Motorola, Nautel, Shively Labs, Tenaplex Systems, and others.

Non-engineering exhibitors include Arbitron, the Federal Emergency Management Agency, Michael Fox Auctioneers, the NAB Legal Department, the Radio Advertising Bureau and WFMT/Beethoven Satellite Network.

The NAB engineering department will have a booth on the floor and will feature AM improvement demonstrations, including the new NRSC standard.

As for FM improvements, Broadcast Technology Partners, the firm created earlier this year to conduct the continuing development of the FMX FM stereo extension system, will also be featured in the booth.

According to FMX Co-developer Emil Torick, the booth display, with prototype FMX equipment, will be similar to the demonstration at the March NAB show in Dallas. For more details on FMX, see the related story in this issue.

Other events

A radio show would not be complete without hospitality suites. According to the NAB, they will be in operation from

8 PM to midnight on 9 September, 6 PM to midnight on 10 September, and 4 PM to midnight on 11 September.

A "Just For Engineers" reception is planned 10 September at the Anaheim Hilton.

The first annual "Crystal" radio awards ceremony will be held during the opening session of Radio '87, 10 September. KFI radio personality Gary Owens will emcee.

The opening session will also feature a salute to US radio stations with an "audio-visual panorama" entitled "Radio America."

CBS News Correspondent Douglas Edwards will receive the 1987 Radio Award during the annual Radio Award Luncheon to be held 11 September. America's oldest teenager, Dick Clark, will emcee.

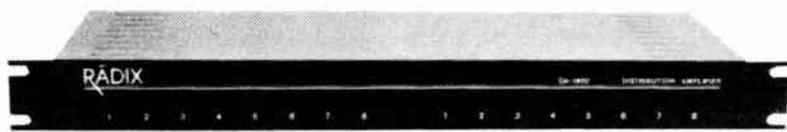
Country music group Alabama will perform during the show's closing dinner.

For more information about Radio '87's engineering related activities, contact the NAB Science and Technology department at 202-429-5346. For general information, contact Bob Hallahan at 202-429-5350.

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Digital Products Still Hot

Anaheim CA . . . Most of the products featured at Radio '87 were introduced previously at other shows. But in Anaheim they won't get lost among the proliferation of video equipment which overwhelms the spring NAB convention.

Predictably the most exciting new products are in the digital realm. However there are some other innovations to be seen.

Look for Broadcast Electronics to feature its PhaseTrak 90, the phase-correcting cart machine introduced in March. It's generated a lot of talk among CEs. BE should also have along its DV-2, the digital audio store and playback machine.

Digital carts

ITC/3M will have a chance to again show the HCDA-3000, its digital cart machine which uses a digital tape cartridge. It was the talk of the NAB show in March. The new audio switcher from ITC/3M has also garnered its share of interest.

CompuSonics will have a booth and is sure to emphasize its digital storage products. There's the DSP-1500 spot player and the DSP-1000 digital disk player. The first one uses floppy disks, the second, optical disks.

Allied Broadcast will have a suite and will also share the Media Touch booth. Allied is highlighting the Denon CD cart player, which plays CDs contained in a cartridge.

Media Touch will feature the much-talked-about Touchstone computer system for audio. The system offers Touchscreen control of any audio source for on-air or production.

Century 21 will feature its music libraries on CD in a variety of formats including current ones.

At the spring NAB show, the company also had a box which reads CD index codes, so stop by and ask about that as well.

Gentner should be showing its Digital Hybrid, along with its other well-known products including the company's new audio switcher.

Gentner plans to give away a Digital Hybrid, so be sure to drop by their booth and try to win.

Another digital product to take a closer look at is Harris' digitally modulated transmitter for AM, the DX-10. Its introduction earlier this year marked the digital dawn for transmitters.

Hot processing

For new processing gear, Modulation Sciences is expected to exhibit the Stereomaxx stereo image expander.

Interest is running high in NRSC, also, mostly due to a steady flow of conversions by AMers. The NAB will be demonstrating the standard on prototype receivers, including a brand new one from Delco.

Also look for the NAB's exhibit on FMX, with recently revived optimism in the stereo extension system for FM.

RADIO '87

Technical Issues Not Forgotten

by David Hughes

Anaheim CA . . . While most of the sessions at Radio '87 are not geared to engineers—but directed to sales managers, general managers and program directors—technical attendees will still be kept busy attending all 10 engineering sessions, not to mention a series of workshops and other events.

Those interested in the new NRSC pre/deemphasis standard, RF radiation, audio processing, the FMX system and other FM improvements, AM directional antennas, the latest in cart machine technology, getting good quality audio from phone lines, AM synchronous transmitters or tower maintenance will find a Radio '87 session or workshop geared to these interests.

Here is a day by day rundown of four days of engineering seminars.

Thursday sessions

Kicking off the session schedule on Thursday, 10 September, is an FCC "town meeting" at 1:45 PM. The FCC officials scheduled to attend had not been announced at RW's press time.

Also at 1:45 PM, a session will focus on RF maintenance for AM and FM. It will feature Paul Wolfcale of Booth American as moderator, and Mike Callaghan of KIIS and John Schneider as panelists.

Audio processing for AM and FM will be discussed in a 3:15 PM session featuring Stan Salek of Circuit Research Labs, Glen Glark of Texar, Eric Small of Modulation Sciences and Bob Orban of Orban Associates. The moderator will be Tom McGinley of First Media.

Topics on tap for discussion include modulation control, as well as the new NRSC standard.

At 4:45 PM, new cart machine technology will be examined by Jim Loupas of James Loupas Associates, Art Constantine of Fidelipac, Tom Becker of ITC/3M, Jack Williams of Pacific Recorders and Tim Bealor of Broadcast Electronics.

Digital carts, companded carts, floppy discs, digital audio transmission, RAM carts, and related technology will be discussed.

Also at 4:45 PM, Mike McKenzie of KALL will moderate a session entitled "Removing Electrical Interference." Panelists will include Philip Kane of the FCC's San Francisco office, Barry Epstein of Current Technology and the NAB's Mike Rau.

Friday and Saturday

The following day, Friday, 11 September, the engineering sessions begin with "How To Wring Hi-Fi From Ma's Bell."

Moderated by John Lyons of WRKS, New York, and scheduled for 2:45 PM, the panel will include John Cheney of Comrex, Bill Gillman of Gentner Engineering and Andy Laird of KDAY.

Also at 2:45 PM, a session will be held on AM synchronous transmitters featuring moderator Wally Johnson of Moffet, Larson and Johnson, and panelists Al Resnick of Capital Cities/ABC and Ted Nahill of WSSH.

Sessions slated for Saturday, 12 September, include "FM New Technology," which will be discussed by a panel at 4

PM.

Panelists include Tom Rucktenwald of Broadcast Technology Partners, the firm handling the development of the FMX system, Bob German of McMartin International, and Lyle Henry of KIQQ. John Furr of Clear Channel Communications, who has been pushing for a power increase for Class A FMs, will also participate. John F.X. Browne will moderate.

Improvements made to FMX, new ways to calculate FM service and interference, and FM receiver technology are scheduled to be discussed.

Also at 4 PM, Robert du Treil, a Washington DC-based engineering consultant, will moderate an engineering panel that will discuss tower maintenance—"The Low-Down on High-up Connections." Panelists will include Matt Vliissides of Structural Systems Technology and Ray Upsahl of Skilling Warner Rogers Barkshire.

Seminars

In addition to the sessions, three engineering seminars are planned.

A three-day Directional Antenna Seminar—the 19th annual—will be held Tuesday, 5 to 9 PM, Wednesday, 7:30 AM to 5 PM, and Thursday, 7:30 AM to noon.

Installation, operation, adjustment and maintenance will be discussed, with briefings on directional antenna theory and policy.

Participants include Al Gearing of Jules Cohen and Associates, Karl Lahm of A.D. Ring, consulting engineer Steve Kramer of Steve Kramer Consulting Engineers and Washington DC consulting engineer Ron Rackley.

Topics covered will include measurement techniques and analysis, an FCC review of proofs, broadbanding concepts, reradiation considerations, as well

as a Q&A session and individualized workshops.

NRSC standard

The NRSC Seminar will take place Friday from 7:30 AM to 12:15 PM. It will focus on the new NRSC pre/deemphasis standard and the advantages of its implementation.

Presentations scheduled include audio processing factors, with representatives from Orban, Texar, CRL and other processing manufacturers, and measurement techniques for spectral occupancy and bandwidth with participants from Tektronix and Hewlett-Packard.

Other topics include basics of receiver design and future work of the NRSC including the completion of an RF mask.

The NRSC is also slated to meet just prior to the convention on Wednesday, 9 September, to consider the RF mask

proposal from the NRSC subgroup (see related story, this issue).

A third seminar, on "RF Radiation Regulation Compliance," to be held 12 September from 7:30 AM to 1:45 PM will deal with what constitutes excessive levels of non-ionizing RF energy, as well as FCC regulations, and assessment methods to determine levels.

It will also examine facility design and modification, the legal aspects of compliance, and occupational exposure situations.

Participants include John F.X. Browne, the FCC's Robert Cleveland, Shiveley Labs' Robert Surette, Dane Erickson of Hammett and Edison, and Ken Keane of Wilner and Scheiner. A Q&A session is also planned.

For more information on the sessions and seminars, contact Mike Rau at the NAB: 202-429-5346.

Equipment Exhibitors

| | |
|--------------------------------|--|
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| Broadcast Audio Corporation | IDB Communications Group, Inc. |
| Broadcast Electronics, Inc. | International Tapetronics/3M LPB Inc. |
| Broadcast Supply West | Media Touch Systems, Inc. (Allied Broadcast Equipment) |
| Cablewave Systems, Dv. Celwave | Modulation Sciences Inc. |
| Century 21 Programming, Inc. | Motorola Inc. AM Stereo |
| CompuSonics Corporation | Nautel |
| Continental Electronics | Schafer International |
| Dataworld | Shively Labs |
| Dielectric Communications | Shure Brothers Inc. |
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FCC Shuts Down Pirate Station

(continued from page 1)

Washington DC area, the signal, at times, was as clear as the local AMers.

Weiner said he was also relaying RNI on 103.1 MHz with 5 kW, as well as long-wave 190 kHz and in the 6 MHz region on shortwave.

He stressed that RNI carefully selected the frequencies to avoid any interference with licensed stations on the mainland. While the AM frequency was outside the broadcast band, the FM frequency would have fit into the FCC's allocations had there been a land mass where the ship was, he contends.

Originally, the day the two were ar-

rested, an FCC spokesperson indicated that no interference complaints were reported regarding RNI's operations. However, Smith later indicated that several complaints were filed regarding the use of 103.1 MHz, although he would not release additional details.

FCC acted "illegally"

Weiner is adamant that the FCC did not have the right to board his ship and shut down RNI. "We were boarded illegally, arrested illegally, searched illegally, and (the station was) ripped apart illegally," he said. "The FCC went wild."

"We are just a group of radio en-

thusiasts who wanted to put a station on the air," indicated Weiner, who has had several run-ins with the FCC before. Reportedly, he was cited by the FCC in 1985 for broadcasting on unassigned frequencies, and in 1971 for operating a land-based pirate facility.

Weiner maintained that RNI is building a case on its allegations that the FCC had not obtained a search and seizure document in order to board the vessel. He said that the FCC also did not produce any written, legal verification that Honduras had given permission to board the ship.

FOB Chief Smith maintained that

since the ship was outside the three mile US territorial limit, Coast Guard officials did not need court permission to board and search it. He added that even though Honduras gave permission to board and search the Sarah, neither Coast Guard nor FCC officials were required to present written documentation to Weiner or Rothstein.

Damages alleged

While Weiner, Rothstein and Voice columnist Smith sat handcuffed for seven hours, the FCC dismantled the equipment. "They damaged quite a bit, cut many cables, including the transmission lines," Weiner said.

However, Smith stressed that the Commission did not damage any gear. He admitted that it was dismantled and disassembled. "We did not have a hacksaw, as one press account indicated."

Weiner also indicated that the FCC did not confiscate any equipment from RNI. An FCC source said that it is customary for it to confiscate gear, even items such as telephones and record albums, if it can be used as evidence against the pirate.

Smith confirmed that the FCC ran into a major snag in attempting to seize the gear—Coast Guard officials could not raise the ship's anchor to allow the vessel to be navigated back to port where the gear was to be unloaded and stored.

The FOB chief said that the FCC had to abandon its "original plan." Upon advice of the US attorney's office indicating that the Commission had enough of a case against Weiner and Rothstein without physically seizing the gear, it decided to abandon the plan.

After Weiner and Rothstein returned to the ship a few days later, they discovered that the only items missing from the ship were two flags—a Honduran flag and a skull-and-crossbones pirate flag. Weiner said he thinks the items were heisted as souvenirs.

Back on the air?

Several days after their arraignment, Weiner and Rothstein were told by the Coast Guard that they could have their ship and its dismantled contents back.

As of mid-August, the vessel sits at port. Weiner had to promise to the court that he would not attempt to put the station back together while the charges against the RNI operation are pending.

But he admitted that clearing the court hurdles and getting RNI back on the air is his primary goal.

He said that as many as 20 people—with about seven involved in a core group—had donated \$150,000 in money, gear and time to get RNI on the air. Some, Weiner indicated, had been involved with legitimate radio stations, while others were "radio buffs."

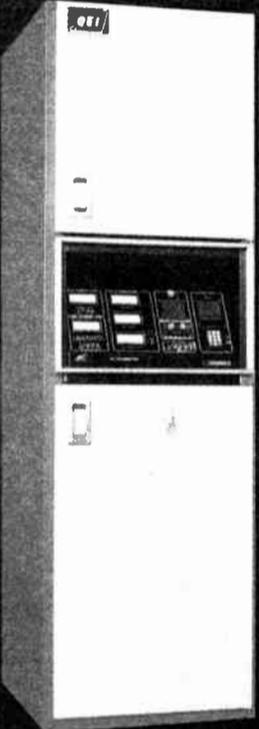
"We don't have \$50 million to buy a radio station in New York City," he said.

Weiner stressed that his station was not an illegal pirate, but instead a legal, off-shore operation similar to those in Europe, such as Radio Caroline, that have been in operation—on and off—since the mid-1960s.

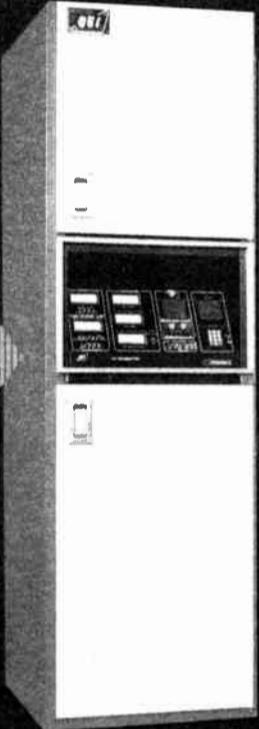
However, an FCC source indicated that if RNI does eventually win the right to return to the high seas and get back on the air, a whole slew of off-shore radio stations would soon come into existence and potentially raise havoc to legitimate, licensed broadcasters.

The FCC contact on the issue is Sue Earlewine at 202-634-1940. A message can be left for Allan Weiner at 207-538-9538.

WATTS UP?



3.5KW



5KW



10KW

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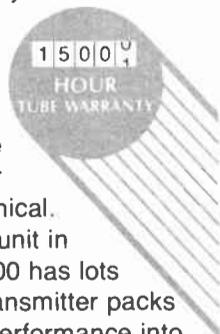
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New Owners Revive McMartin

by Alex Zavistovich

Omaha NE . . . After almost two years, the Omaha-based subcarrier manufacturer McMartin Industries is preparing to re-open its doors—under new management and ownership—fueled by an influx of cash from the neighboring state of Iowa.

Meanwhile, in nearby Colorado, the company's former president, Ray McMartin, with his new venture McMartin International, has fallen on hard times.

McMartin International, established after the bankruptcy of McMartin Industries, is slated to have its assets auctioned because of debts owed to the state of Colorado and the city and county of Gunnison.

The original company, McMartin Industries, which had been placed in involuntary bankruptcy in May 1985, was purchased in July 1986 by Pollution Research Control Corporation, a California-based research and development firm.

Included in the transaction were all of McMartin Industries' assets, as well as product designs, schematics and trade names, according to Pollution Research VP/Finance John Miller. The assets were acquired from the company's secured lender, Congress Financial Corporation, of Minneapolis, MN.

Neither Miller nor a Congress Financial spokesperson was willing to discuss the terms of the transaction. However, one source reported the figure to be approximately \$750,000.

Orchestrated purchase

Miller said he and Pollution Research President Jerry Martin, along with Charles Goodrich (an ex-McMartin engineer), originally orchestrated the purchase of McMartin Industries.

Maintaining that McMartin Industries "would best be served as a public entity, rather than being privately held," Miller said, the McMartin assets were merged into Pollution Research in exchange for stock, turning the company public, he explained.

During the acquisition process, Pollution Control also obtained "economic development funds"—by some reports in excess of \$200,000—from the state of Iowa. A building in Council Bluffs, approximately 10 miles from Omaha, was purchased to serve as the firm's new headquarters.

At press time, the new McMartin Industries was in the process of relocating to the Iowa facility. Miller anticipated the move would be completed by September.

Because it owns the trade name, Pollution Research decided to conduct business as McMartin Industries, added Miller. However, he noted, no members of the McMartin family are employed in any capacity by the company.

Miller stressed that the revived McMartin Industries will manufacture high-quality products in the tradition of the original company. To aid in the effort, he said, many of McMartin's ex-employees are being rehired, particularly in the factory and customer service areas.

A number of finished pieces of equipment and projects in progress were purchased as McMartin assets, Miller said. As the work in progress is completed,

that gear, and the finished pieces, will be shipped.

The company is presently engaged in booking orders for customers. Several 3 kW and 5 kW transmitters, as well as various amplifiers have been ordered, Miller said.

Although Miller did not state outright that warranties for previously-purchased McMartin gear would be honored, he said the company would be "very interested in talking" with owners of the equipment.

The purchase of McMartin Industries' Omaha facilities by Pollution Research is

the latest attempt to revive the once-prosperous radio equipment manufacturer. The first attempt was made by the company's former president, Ray McMartin, after the firm's bankruptcy in Nebraska.

Colorado attempt

In May 1985, McMartin Industries—which produced audio amps, transmitters, and other products in addition to SCA gear—was placed in involuntary Chapter 7 bankruptcy. The filing was converted to Chapter 11 on 13 September 1985.

Following the change to Chapter 11, Ray McMartin began planning his return to the industry. Officials in the city of Gunnison, Colorado, reportedly actively solicited McMartin's move from Nebraska to Colorado.

Local newspaper accounts expected the company would bring 100 new jobs and a payroll of over \$1 million to Gunnison within two years. By August 1986, McMartin International—as it was now known—had grown to 30 employees and was working on a product line which included SCA tuners, amplifiers, field

(continued on page 16)

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Hard Look Review is Refused

by David Hughes

Washington DC ... The FCC has rejected a petition asking for review of its "hard look" policy for processing FM and TV broadcast applications.

Last spring, the Washington DC-based consulting engineering firm du Treil-Rackley asked the FCC to ease up on its hard look policy, which was developed in 1985 in order to reduce the number of speculative filings and those that simply copied figures contained in other applications.

du Treil-Rackley's petition requested that the FCC "remove the requirement

of Section 73.3564(a) of the rules that requires an engineer to be infallible," according to Louis du Treil.

However, in a letter sent to the firm in late July, the FCC said it decided not to initiate a rule making proceeding in response to the request. The Commission maintained that du Treil-Rackley's arguments were not convincing.

With the filing of the petition, Ron Rackley said he wanted the FCC to shift the "burden" of filing a proper application away from the engineer who prepared the application, and instead direct it toward the qualifications of the applicant.

He said the Commission should better screen the financial character of applicants rather than rejecting for "minor errors" applications prepared by engineers.

The firm's petition claimed that the hard look system "has not functioned properly, is unduly harsh, and establishes an adversarial barrier between the engineering community and the Commission's staff."

It said that engineers are subject to "unreasonable consequences" if an application prepared by them is found to be unacceptable. "If an uncaring or unscrupulous application preparer faces a

returned application, there is little consequence, while the return of an application prepared by a legitimate engineer can result in dire consequences," the petition claimed.

However, the FCC did not buy du Treil-Rackley's arguments. In turning down the request in a letter dated 31 July, the FCC said that applications are not returned for "minor errors."

"Rather, these represent carelessly prepared and unprocessable applications which have burdened our application processing system," Mass Media Bureau Acting Chief William Johnson said in the letter.

"Based on our previous experience, permitting such applicants to perfect incomplete applications after tender would result in delay and be unfair to the vast majority of applicants who submit substantially complete applications," Johnson added.

"Inasmuch as the vast majority of applicants are eligible to be considered in a subsequent comparative proceeding, we feel that the current policy strikes the appropriate balance between selecting the most qualified applicant and the expeditious dispatch of Commission business," he said.

In its petition, du Treil-Rackley also charged that the hard look policy has not only delayed the processing of applications, requiring as much as a year's time for a routine processing, but has also failed to significantly reduce the number of applications filed, including speculative filings.

Yet, Johnson said that the increase in applications is related to overall opportunities for new stations. He said that the Docket 80-90 procedure, which allows for 700 new FM stations, was responsible for the increase. The FCC's application processing policy was not responsible for delays, Johnson stressed.

"Contrary to the suggestion contained in your petition, the influx (of applications) did not result from the Commission action ... which established the FM filing window procedure and hard look policy at the tender stage of processing," Johnson responded.

He maintained that the FCC's policy had contributed to "the orderly influx of FM applications."

The FCC also failed to act on du Treil-Rackley's request to allow "at least one opportunity to correct an error, as is the case in other broadcast services."

"Engineering firms are no more capable of absolute perfection than is the FCC staff, which almost daily issues corrections to previously published news releases," the petition claimed.

For more information, contact du Treil-Rackley Consulting Engineers at 202-659-3055.

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Clarification

An article by W.C. Alexander in the 15 August RW on using DAs for short spaced FMs contained an error. Instead of plotting the ERP and having the radiation taper off in 2 dB intervals per degree, the article should have stated .2 dB.

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Booth Selection is Underway

by David Hughes

Washington DC ... The NAB says its new system allowing exhibitors to hand-pick their convention exhibit space is running smoothly and should be completed by October.

While the NAB acknowledges that the new procedure, instituted under the guidance of the Exhibitors' Advisory Committee for next year's NAB show may be time consuming, it says the process has been well received by firms requesting space.

As of early August, the booth selection procedure for the 1988 show, which will be held 9-12 April in Las Vegas, is about one quarter completed, according to NAB Exhibit Director Rick Dobson.

"It's going slow, but that's not unexpected," Dobson said of the plan which was unveiled by the NAB earlier this year. In previous years, the association assigned space based on a firm's floor placement at previous shows.

Dobson also indicated that the 1988 event will feature a separate "radio/audio" hall, in addition to the main TV hall.

The change from previous shows will allow attendees to visit a core of radio booths without having to "walk miles and miles of aisles," he added. A separate radio/audio booth guide is also under consideration.

According to the "priority point" system, exhibitors now get to pick their booth space in an order determined by a formula based on the size of previous booths and the number of years they have exhibited.

Often firms must "go through several choices" before finding a suitable space, Dobson indicated.

If, after four submitted alternatives, a space cannot be found, the NAB then contacts the firm by telephone to remedy the situation. Space accommodations for the next firm on the list cannot be processed until the accommodations for the previous company are completed.

"We're doing it one at a time," Dobson said. "There is a tremendous volume of personal calls."

While he admitted that the process is time consuming, exhibitors appear to favor the new procedure as opposed to having the NAB select their space for them. The NAB Exhibitors Advisory Committee received an update on the procedure at a meeting in late July.

Another issue of concern to exhibitors is what to do if floor space at the Las Vegas Convention Center runs out before all the firms have made their selections.

The last time the NAB show was held in Las Vegas, an overflow hall was estab-

lished in the nearby Las Vegas Hilton Center. However, firms located in the auxiliary hall complained bitterly about poor traffic.

Dobson indicated that no decision has yet been made on overflow procedures for the 1988 show. A decision will not be made, he said, until later in the space assignment procedure when the convention center floor space is completely reserved.

The NAB is considering several options should the overflow space be needed, especially the use of space at the nearby Hilton Center, he indicated.

Dobson said in case auxiliary floor space is needed, improvements will be

made including sandwiching the outdoor exhibits between the two areas to facilitate traffic flow.

The NAB may also open exhibits in the Hilton overflow area earlier, or close them later than the main exhibit hall. Registration could also be held near the secondary hall.

A decision on where the outside exhibits will be held is also up in the air, pending a resolution of the overflow hall's location, he added.

For more information on the exhibit procedure contact Rick Dobson at the NAB, 202-429-5335, or NAB Exhibitors Advisory Committee Chairman Irwin Ungerleider at Sony, 201-833-5200.

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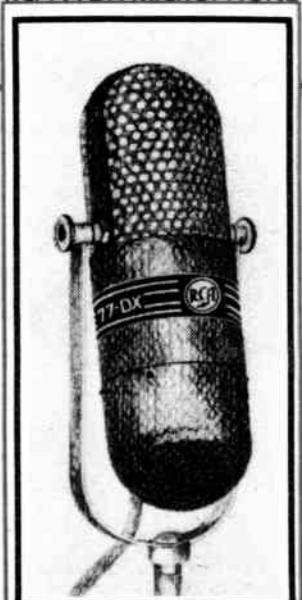
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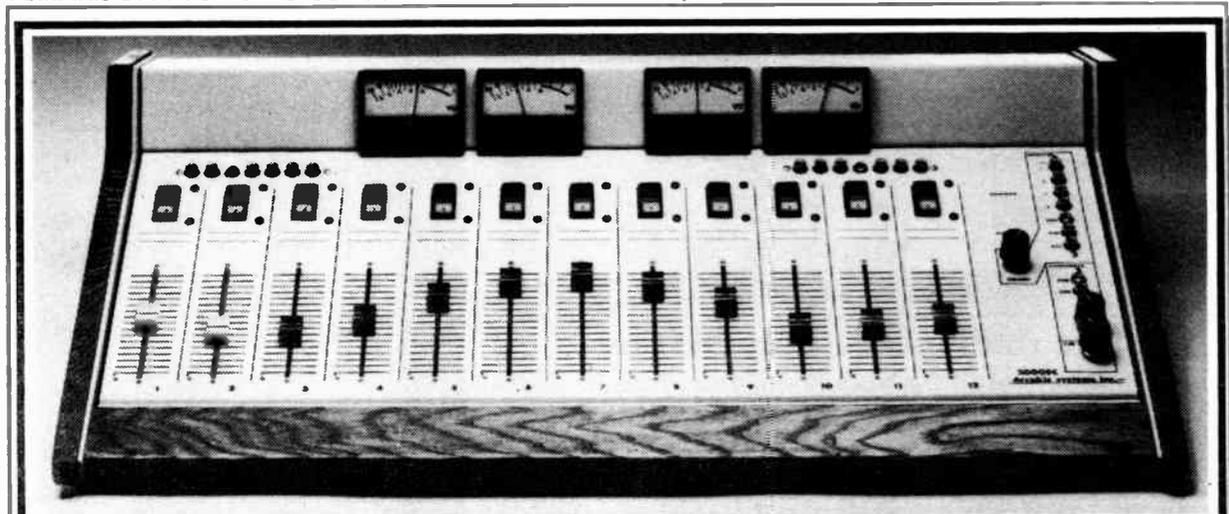
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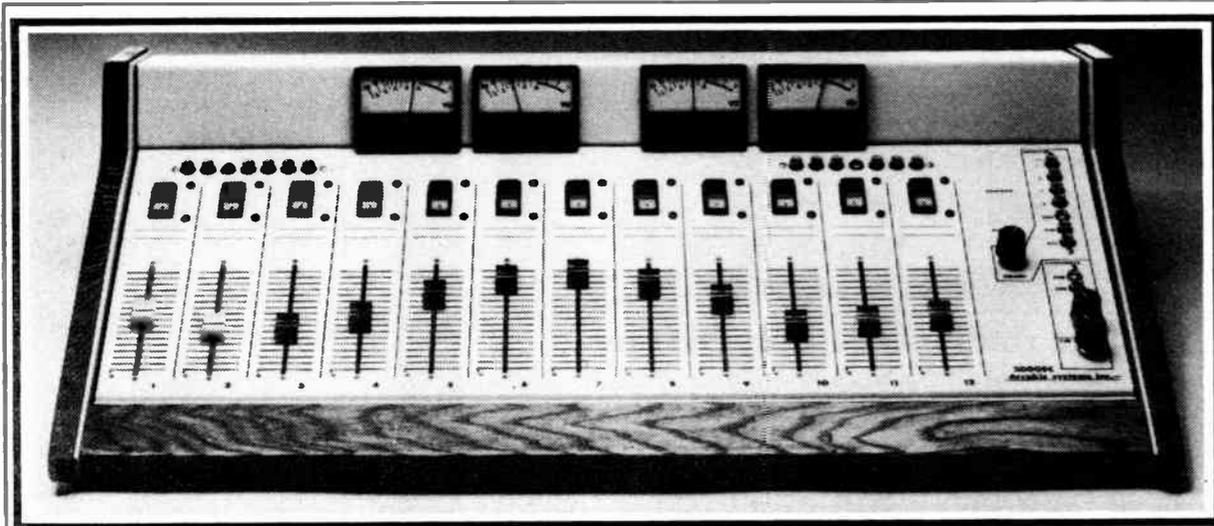
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Circle Reader Service 26 on Page 29

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Circle Reader Service 50 on Page 29

IEEE Spotlights FM Concerns

by Alex Zavistovich

Washington DC ... Multistation FM antenna design and FM multiplexing will be among issues spotlighted at this year's broadcast symposium of the Institute of Electrical and Electronics Engineers (IEEE), to be held 17 to 18 September at the Hotel Washington in the nation's capital.

Symposium Chairman Robert du Treil, of the DC-based consulting firm du Treil-Rackley, said several papers presented during the two-day event will concentrate on applications of FM technology.

"There's been a lot of interest in FM recently," du Treil said, "which is obvious—that's where most of the big dollars are going."

However, du Treil also noted that not all the presentations will address FM matters. Many will also focus on AM issues, such as the pros and cons of synchronous transmission in the AM band.

Synchronous transmission "is being pushed heavily by the FCC," du Treil commented. He said the symposium will give engineers a "chance to get the whole picture of what's happening" in that aspect of broadcasting.

Analyses of various modelled AM antenna designs and related issues will round out the technical sessions.

Divided by day, the IEEE symposium

will address television engineering issues on the first day, and radio issues on the second. The radio engineering session, chaired by Bruce Hunter of the Voice of America (VOA), includes a wide range of broadcast-related topics.

Dean Sargent, of D.W. Sargent Broad-

*'FM ...
that's where
most of the big
dollars are
going.'*

cast Service, will present a paper on a multi-station FM antenna system. An FM combiner for a multi-station antenna system will be the focus of a presentation by Cole Plummer, of Dielectric Communications.

Shively Labs' Robert Surette will speak about methods of combining networks for FM multiplexing.

A paper on AM broadcast antennas with elevated-radial ground systems will be delivered by Richard Adler of the Na-

val Postgraduate School. Jim Breakall of Lawrence Livermore Labs and Al Christman of Ohio University are co-authors of the presentation.

According to Adler, the presentation springs from research done at the Naval Postgraduate School on the effectiveness of AM antennas with radial ground systems.

The research, originally presented at last year's IEEE symposium, used numerical electromagnetic code (NEC) modelling to evaluate an antenna design submitted for the NAB's anti-skywave antenna project.

An NEC analysis will also be used in a study of AM directional antenna nulls and the "proximity effect." Presented by James Hatfield, of the Seattle-based consulting firm of Hatfield & Dawson, the study is expected to touch in part on proximity correction coefficients for determining AM array field strengths.

An ad hoc committee of the Association of Federal Communications Consulting Engineers (AFCCE) has been tasked to investigate use of such coefficients.

General engineering

A second session on 18 September will cover general topics of engineering technology. The session will be moderated by John Kean, of DC-based Moffett, Larson & Johnson.

An evaluation of 500 kW shortwave transmitters at the VOA will be presented by the government station's Gerald Berman and Thomas Garlington.

Synchronous transmission will also be on the agenda for the second session.

Greg Thursby, VP of Harris Corporation, will discuss techniques for synchronizing AM transmitters.

Following Thursby's paper will be a presentation on difficulties encountered in AM synchronous transmission.

David MacCarn, of Boston's WGBH Educational Foundation, will speak on the subject of direct to home digital audio broadcasts.

Also that day, a panel discussion will be held on MM Docket 82-334 and restrictions on broadcast auxiliary microwave. On the dais will be Don Campbell, of the FCC's Office of Engineering Technology, and Greg DePriest, of the Association of Maximum Service Telecasters.

Speakers selected

Besides the technical papers, several speakers from the broadcast community have been selected to make presentations.

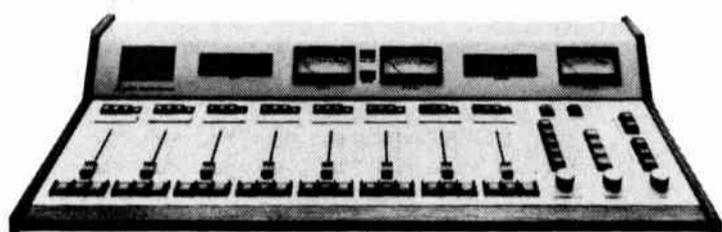
At noon on 17 September, after the morning television session, a joint luncheon will be held for members of the IEEE and the Association of Federal Communications Consulting Engineers (AFCCE). The luncheon speaker will be Wilson LaFollette, of the FCC's Mass Media Bureau Policy and Rules Division.

LaFollette is expected to discuss various international activities affecting broadcast services.

Later that evening, former FCC Chairman Mark Fowler will speak to the IEEE during a banquet at the hotel. Fowler, who during his six years as Commission chairman maintained a policy of deregulation, is currently employed at the Washington office of the Los Angeles-based law firm Latham & Watkins.

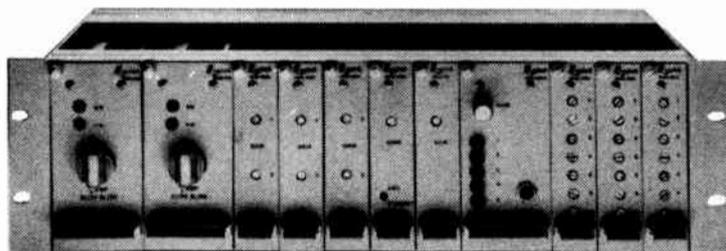
For additional information, contact Robert du Treil at 202-659-3055.

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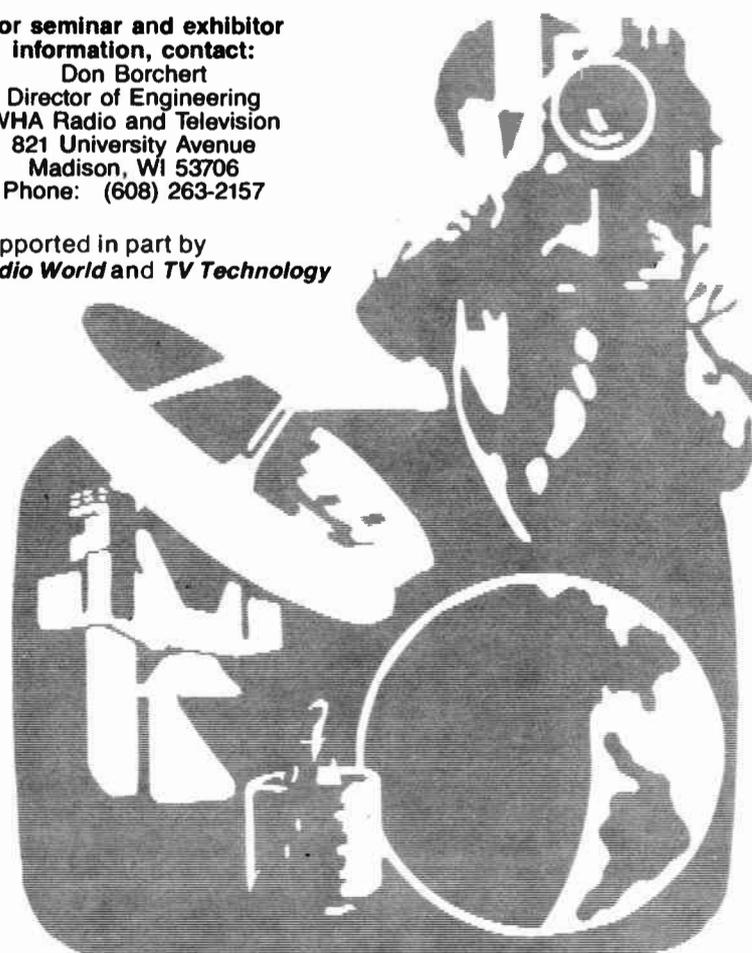
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Cuban Radio Blasts KSL, WHO

by David Hughes

Washington DC ... Two 50 kW stations, WHO, Des Moines, on 1040 kHz, and KSL, Salt Lake City, 1160 kHz, have received the wrath of what are believed to be powerful broadcasts from Cuba.

In July, according to the FCC, Cuba began sporadically interfering with the US AM clear channels, apparently with its own 300 kW operations.

However, the broadcasts, which caused disruption on the frequencies, were only noticed on a handful of nights. At *RW*'s press time in mid-August, the nighttime broadcasts, which were in English and Spanish, had ceased.

KSL CE John Dehnel said that his station received interference on two nights—

20 and 21 July. Because the incidents occurred in summer, with longer periods of daylight, the interference was not as bad as previous Cuban interference the station had experienced in winter months.

The Cuban broadcasts ran until 9 PM (EDT) on the 20th and until midnight (EDT) on the 21st.

Most of the complaints originated from listeners who were more than 70 miles from KSL's transmitter, Dehnel said. He added that no cases of interference were reported in the Salt Lake City area.

Dehnel also indicated that he was upset at an FCC request that he shut his

station down at 5:47 PM local time—in the midst of afternoon drive-time—so that the Commission could monitor the Cuban signal underneath.

FCC officials indicated that the two Cuban stations were probably running upwards of 300 kW. The signals were monitored by the FCC as far away as Arizona and Nebraska.

Cuba had been running powerful signals on at least one of the frequencies before the July incidents. However, the broadcasts were confined to daytime hours.

Since mid-May, the Soviet Union's in-

ternational service in English has been beamed from Cuba on 1040 kHz, but it had been confined to daylight hours on weekends only.

Owing to the good propagation characteristics of salt water, the daytime 300 kW signal interfered with two Florida daytimers on 1040 kHz.

The signal had been heard Sundays and alternate Saturdays from 8 AM to 6 PM. The broadcasts began 23 May.

The US State Department has informed Cuban authorities as well as officials from the International Telecommunications Union (ITU) about its displeasure with the various cases of interference.

For more information on the Cuban interference situation, contact Wilson LaFollette at the FCC: 202-632-5414.

Readers' Forum

(continued from page 5)

While these may seem cynical, they are necessary for doing business with the Feds, for the reasons Mr. D'Alessio set forth.

If I were considering selling something to the VOA, I'd sell it to the contractor, and let him take the heat while I took my money and ran.

Many of the better broadcast suppliers qualify as small businesses.

A look at the overhead created by trying to bid something to the Feds shows the small business that it can't compete, regardless of the merits of the product.

What then will the VOA get? A serviceable set of studios, probably up to the standards of 1965.

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Today, after hundreds of hours of discussion and study, the standard finally exists that will allow receiver manufacturers to increase and flatten their frequency response without risk of increased interference. But for them to do this, broadcasters must implement the standard: a "modified 75µs" pre-emphasis specification brightens up the sound on older radios while minimizing interference to adjacent stations, while a sharp-cutoff 10kHz low-pass filter specification protects the second adjacencies by limiting occupied bandwidth.

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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Like its predecessor, the new 9100B can be configured to operate optimally in mono, C-QUAM® stereo, or Kahn stereo. Mono units can be field-upgraded to stereo by simply plugging in additional cards.

For owners of OPTIMOD-AM Models 9100A and the older 9000A:

We underscore our commitment to the new standard with low-cost Field Upgrade Kits to add the NRSC-standard pre-emphasis and filtering. They are available through your authorized Orban Broadcast Products Dealer.

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.

orban

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FCC Files

(continued from page 2)

Many commenters, however, supported ownership of stations as long as the contours of 5 mV/m for AM and 3.16 mV/m for FM stations did not overlap. Commenters also maintained that such multiple ownership and cross-ownership would enable struggling stations to survive and would not hamper diversity of viewpoint.

No timetable has been set for action on the matter. Contact Andrew Rhodes at 202-632-7792.

Call Letters

In comments filed with the FCC earlier this year, broadcasters opposed a proposal which removes the geographical restriction for K and W call letters, and allows the use of the same call letters by more than one station.

The most common complaint raised in the comments was that the FCC plan would cause confusion in the radio audience. Broadcasters also feared the policy would lead to new stations "trading" on the good reputation established by other stations with the same calls.

According to sources, the FCC will most likely reject the plan, which also calls for the sharing of call letters by non-related parties in different services.

Docket number is MM 87-11. Contact Sharon Briley at 202-632-6302.

Cuban Interference

The level of AM interference from Cuba has been on the increase. In the

spring, a relay of Radio Moscow's North American service has been heard on weekends on 1040 kHz. However, owing to its operation only during daylight hours, widespread interference to US stations has not been reported.

However, in July Cuba continued broadcasting on 1040 kHz well past sunset, as well as on 1160 kHz, causing widespread interference. The transmissions are said to be at the 300 kW level. (See article in this issue of RW for more details.) The US State Department has filed complaints to Cuban authorities.

In other news, responding to the Cuban interference problem, the FCC has recommended granting nine monetary awards since 1985 in a program to compensate AM stations for transmission system improvements made to battle Cuban interference. The most recent recommendation was made in February—a second request filed on behalf of St. Petersburg FL's WSUN.

The requests total more than \$1.5 million. However, Congress has recommended appropriation of only \$500,000 to the US Information Agency (USIA) which distributes the funds.

The Cuban interference contact is Louis Stephens: 202-632-7792. The compensation program contact is Leonore Cunningham: 202-632-6485.

Synchronous Transmitters

The comment and reply comment deadlines on the FCC's proceeding to authorize use of synchronous transmit-

ters by AM broadcast stations have been extended by the FCC to 9 November and 9 December, respectively. This is the second such extension granted on the proceeding.

In filing its request for extension, the NAB pointed out that technical data was still unavailable about several experimental synchronous tests being conducted at stations, including KROL in Laughlin, NV. The new deadline dates would "afford a reasonable amount of time for the receipt of the data," the NAB explained.

The issue is contained in docket MM 87-6. Contact Jay Jackson at 202-632-9660.

RF Lighting

At press time, a Report and Order on the issue of emission limits for RF lighting devices was being circulated around the FCC, in the hope that a statement

from the FCC would be made by mid-August.

The FCC's Office of Engineering and Technology (OET) had a deadline of early July for completion of its recommendations. OET spokesperson Liliane Volcy declined to comment on the recommendations, except to say that closing of the subject had been proposed.

RF lighting devices have been reported to cause interference to AM radio reception. Last year, the FCC proposed radiation limits on such devices at frequencies below 30 MHz.

Volcy would not speculate on when a statement from the FCC could be expected, but remained hopeful that some decision might be reached before September.

Docket number is GEN 83-806. Contact Liliane Volcy at 202-653-7316.

McMartin is Revitalized

(continued from page 11)

strength meters and line amps.

However, in early July this year, the Colorado Department of Revenue contacted McMartin. According to agency spokesperson Kathy Kanda, McMartin International reportedly owed the state approximately \$5100 in sales and withholding taxes.

McMartin, she said, acknowledged the debt and promised he would make payment in 30 days. On 5 August, however, when a department agent was sent to collect the money, it was discovered that McMartin had "left town and left the business behind."

Employees were running the company, Kanda said, which by that time had had its utilities disconnected. Shortly thereafter, to protect the state's assets, McMartin International business assets were seized, and operations at the plant were halted, Kanda noted.

Subsequent investigation by the Department of Revenue showed that Ray McMartin also owed money to the city and county of Gunnison. Exact figures were unavailable.

Attempts by RW to contact McMartin International were unsuccessful—the company's Gunnison telephone number had been "temporarily disconnected." However, a source familiar with the story asserts that McMartin is planning to reopen the business.

At press time, an auction by the state of McMartin International assets was scheduled for 15 August.

SMC International

In related news, SMC International, a SCA company founded by former McMartin Industries VP/Jay McMartin, is expanding slowly but deliberately, with several new products planned for release this year.

SMC International emerged in late summer of 1986, following the bankruptcy of McMartin Industries. Headquartered in Omaha, the company launched its operations last year, manufacturing a conductor/identification tone generator and SCA tuner, the NT-1.

Newly introduced this year from SMC is a dual channel tuner, which covers both the 67 kHz and 92 kHz bands. The company is also engineering a five-channel, crystal-tuned field strength meter, at press time anticipated to be shipped by October.

In July, SMC consolidated its business from two small plants in the suburbs of Omaha to a larger location downtown in that city. The company has also reportedly "doubled" the size of its staff, although exact figures were unavailable.

For additional information, contact John Miller at 402-331-7515. Contact Kathy Kanda at 303-866-3729. For information on SMC International, contact Jay McMartin at 402-453-0332.

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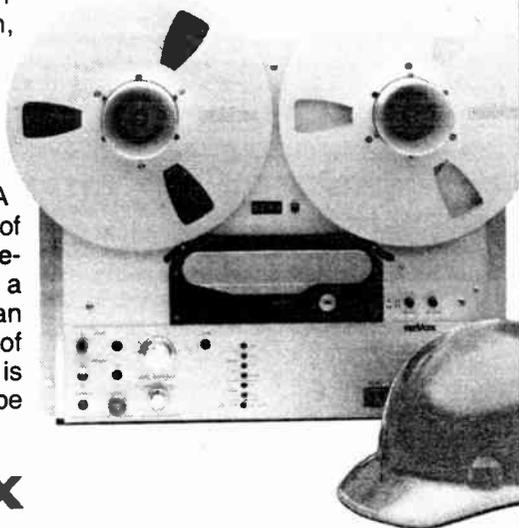
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Cancer Rate Higher Near Towers

by Alex Zavistovich

Honolulu HI ... In a survey undertaken last year, eight of nine areas in the Honolulu vicinity in which broadcast towers are located showed higher incidence of cancer among residents than similar areas without towers.

The survey, prepared in October 1986 by the Hawaii Department of Health, was requested by the Honolulu City Council.

A study of RF emissions in the city—conducted by the FCC and the Environmental Protection Agency (EPA)—

prompted the city council request, according to Alden Henderson, an environmental epidemiologist who, with Dr. Bruce Anderson, co-authored the Honolulu survey.

In the joint FCC-EPA study, conducted in May 1984, RF levels at two rooftop sites exceeded the 1,000 $\mu\text{W}/\text{cm}^2$ standard set by the American National Standards Institute (ANSI). Reportedly, residents in nearby apartment buildings had complained of shocks, burns and interference to electronic equipment.

Henderson and Anderson used data from the Hawaii Tumor Registry to de-

termine the incidence of cancer and leukemia for the years 1979 to 1983 in nine census tracts in which broadcast towers are located.

The study did not specify whether the broadcast towers carried radio or television antennas. The test group was comprised of tracts with towers, regardless of type.

Data gathered from these tracts was adjusted for age, sex and race, and was compared with control data from the Honolulu suburb of Nuuanu, and the outlying area of Wahiawa.

"Altogether," Henderson and Ander-

son wrote, "the observed incidence rate of all cancers for males and females was found to be significantly higher in census tracts with broadcasting towers than the expected rate."

Further, they found, males had "significantly" higher cancer rates in most of the studied census tracts.

The Hawaii findings were "of concern" to Dr. Bill Morton, professor of environmental medicine at the Oregon Health Sciences University. Earlier this year, Portland was the sight of another joint FCC-EPA RF radiation survey.

The Portland survey showed that RF levels in areas of public access were generally within ANSI limits. However, they were in excess of local standards set by Multnomah County, in which Portland is located.

Morton said the Honolulu study indicated a "need for continued research" in the matter of biological effects of RF radiation. The study also confirmed information developed by the Oregon Health Sciences University on the connection between RF radiation and cancer, he said.

Approximately four years ago, a "significant association" was discovered between proximity to broadcast towers and the incidence of nonlymphatic leukemia in the Portland-Vancouver area, Morton said.

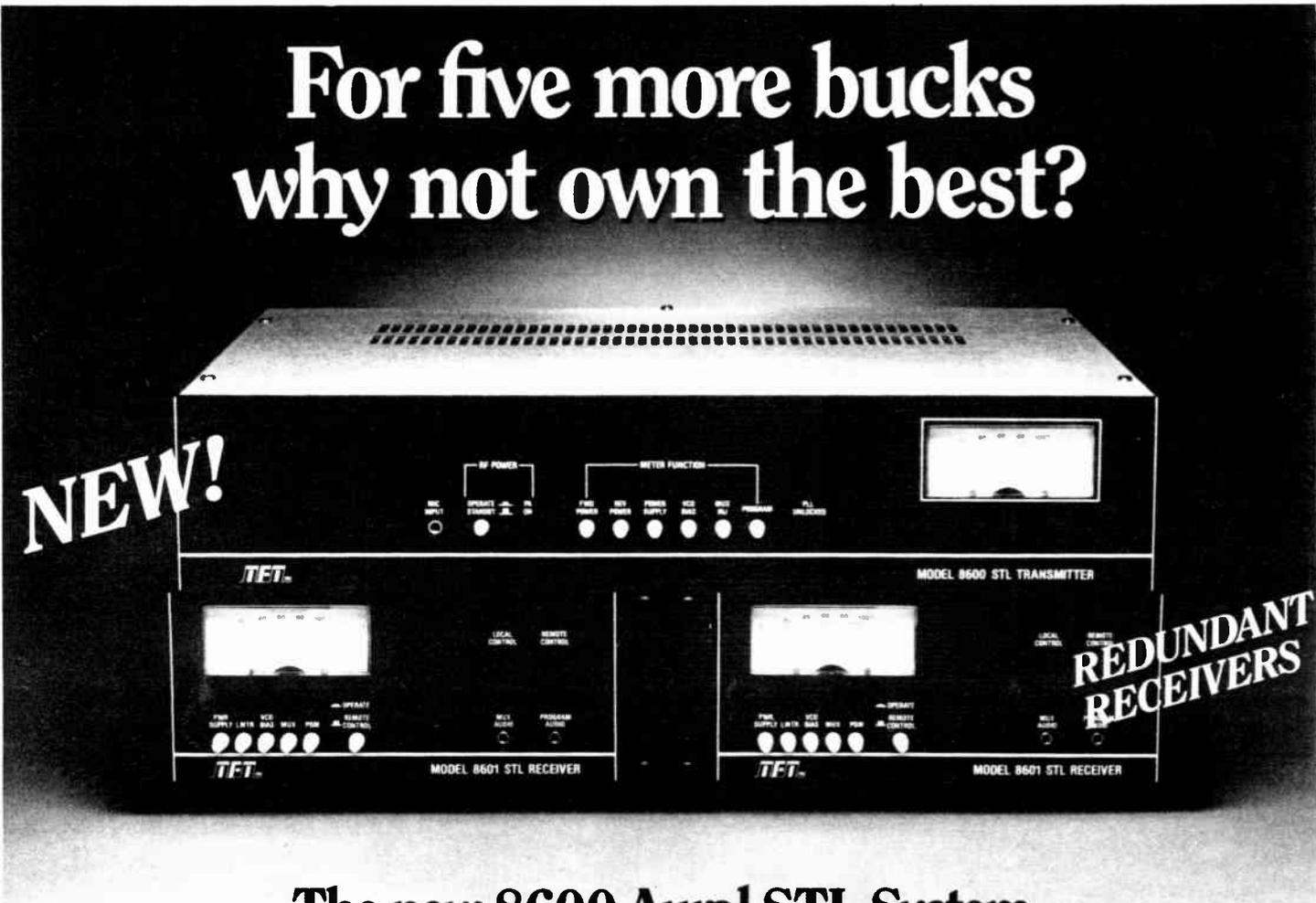
Despite the findings, the authors stressed, "the study design utilized does not allow for drawing a cause-and-effect relationship between cancer incidence and RF radiation exposure."

Certain personal characteristics—how long people lived in the tract, their occupations, and whether they were smokers—were unavailable, Henderson explained. Such factors are required to draw a causal connection, he said.

Henderson noted that the "public may have taken the study too seriously," adding that the findings show only that there is "some relationship" between RF radiation and cancer.

"We may have just uncovered a risk factor, but the strength of that risk factor is undetermined," he said.

For additional information, contact Alden Henderson at 808-548-2076.



The new 8600 Aural STL System

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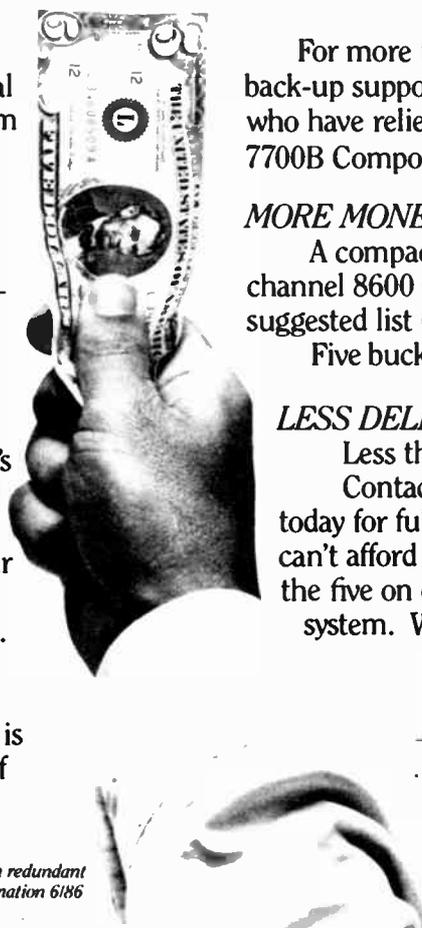
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Photo shows 8600 STL System (Model 8600 Transmitter) as a single link with redundant receivers (Model 8601 x 2). *Based on available price information 6/86

Circle Reader Service 39 on Page 29



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Circle Reader Service 18 on Page 29

DAT Bill Set For Committee Vote

Alex Zavistovich

Washington DC ... After Labor Day, the House Commerce Committee is expected to decide on a bill, recently passed in subcommittee, which would block for one year the sale of digital audio tape (DAT) recorders unless certain measures are taken.

The measures include a microchip placed in DAT recorders—the CBS Copycode, or “dip chip”—which would scan for notches in the sound of prerecorded material.

Bill HR-1384 passed 3 August in the House subcommittee on commerce, consumer protection, and competitiveness, chaired by Representative James Florio (D-NJ).

But the bill, which requires endorsement of the full Commerce Committee, narrowly missed being placed on the last agenda before Congress recessed in early August. The body will reconvene after Labor Day.

The copycode scanner required in the bill reads audio in the frequency range of 3500 to 4100 Hz. The device scans for an encoded notch or “dip” in the audio range of 3700 to 3900 Hz.

When the scanner reads the notch, it automatically prevents the DAT machine from recording for 25 seconds, thereby eliminating the possibility of creating digital reproductions of other digital recordings.

Supporters of the Copycode system—including the Recording Industry Association of America and other recording concerns—maintain that, without the device, bootleg reproductions of recorded material could infringe on sales of the material.

Parties in opposition, however, say that the notch to be scanned—at 3,840 Hz—produces an audible degradation of the sound of source material, such as compact discs.

This past spring, supporters of the copycode were able to attach the provision to the trade bill before the House. It was temporarily removed from legislation in April by House Speaker James

Wright (D-TX).

A stipulation in the bill allows the anti-taping requirement to be lifted if the sound quality of prerecorded material is found to be degraded by the notch. An analysis was undertaken by the National Bureau of Standards (NBS), due for completion by year end.

Florio reportedly asked record companies not to encode records and hardware companies not to import machines until after the results of NBS testing of the Copycode system.

In June, however, Marantz Corporation announced its intention to sell DAT machines beginning in October, before the NBS testing was completed.

Some in the industry speculate the adoption of the bill was the subcommittee's response to having its request to wait on DAT sales undermined from within the industry. Fortunately for those opposed to the measure, however, no further action was taken on it before Congress recessed.

One source familiar with the proceedings told RW, “I wouldn't be surprised if they were trying to steamroller it through so they can bring it back on the floor,” when Congress meets again.

The source also suggested that the legislation may actually be a “bargaining chip,” in an “attempt to demolish audiophile opposition” to taxes on blank tape

and related gear.

Regardless of perceived subcommittee plans, Len Feldman, audio consultant for the Home Recording Rights Coalition (HRRC), which opposes the scanner, stressed that the approved bill is “still a long way from being a law.”

“(The bill) still has to come out of the full Commerce Committee,” he said, stressing that a large number of the 42-member group was opposed to the measure. Feldman also noted that “there's still the entire House of Representatives to contend with.”

For more information contact the Home Recording Rights Coalition at 800-282-TAPE.



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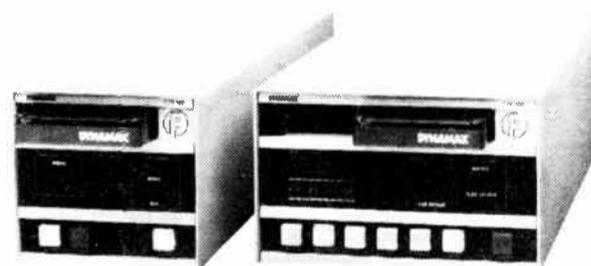
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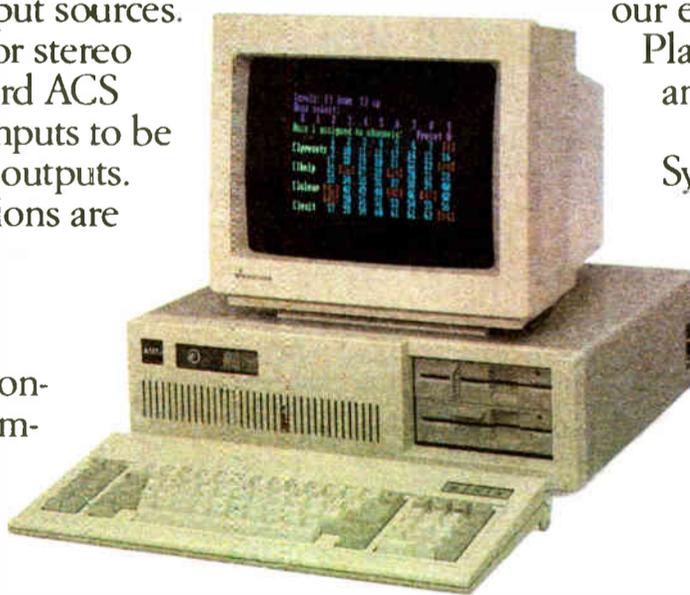
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Becoming a Parts Scavenger

by John "Q" Shepler

Rockford IL ... In our never-ending search for parts, tools and test equipment, there is always another untapped resource out there just waiting to be discovered.

Here are some more ideas to save money or perhaps bail you out of a tight situation.

Back to school

Are you on good terms with the electronics instructor of your local college? Maybe you've taught a course or two or filled-in at the vocational center.

Many community colleges, vocational education centers and even high schools have a wealth of test equipment in their labs.

It is often possible to borrow scopes, frequency counters, audio generators and maybe even something exotic like a spectrum analyzer.

Knowing somebody at the school helps but as a member of the tax paying public you also have a right to just call up and ask if they would be willing to let you have such-and-such overnight.

Your station can reciprocate by plugging student events and so on.

Speaking of schools, does your area have a student radio or TV station?

It could be that those people have an FM field strength meter or a time delay reflectometer or other such expensive gadget that gets used only a couple of days a year.

They might also be training your next assistant engineer. Maybe you should drop in for a visit this week.

Cable and other local sources

What does cable TV have to do with radio broadcasting? Nothing, except that you're basically on the same frequencies.

That means your friendly cable operator might also have that elusive spectrum analyzer or field strength meter available.

In addition they no doubt have extensive knowledge of, and spare parts for, satellite receivers, FM receivers and preamps, fiber optic links and miscellaneous parts and shop equipment.

But the place most likely to have a spare modulation transformer within a few miles is another radio station.

Your broadcast buddies may also have such hard to find goodies as high voltage ATU capacitors, power tubes, Hex FETs, audio input transformers, cart machine record amplifier cards, tower light bulbs and the ubiquitous Belden 8451 wire.

If you make it a practice to help out other engineers in trouble the favors will come back to you eventually.

Why not put together an inventory list of extra parts that you would be willing to share with other stations provided they returned the original or came up with a duplicate?

Send the list to your neighbors and encourage them to do the same. You might even put in a section of items you would like to sell along with asking prices.

There must be at least a dozen stations within driving distance that would go for

John Shepler is a broadcast consultant, teacher, writer, former CE and regular RW columnist. He can be reached after 8 PM at 815-654-0145.

something like this.

What a parts jobber is to components your helpful hardware store is to tools and fasteners.

You should get the boss to let you set up a charge account with one of his good hardware store accounts.

Be sure not to abuse this privilege by running up megabuck tabs.

Q-Tips

Keep an eye out for hardware store closings. When one of them goes belly-up, you want to be first in line to pick the bones.

At a going-out-of-business sale it is not unusual to get brand new, top-grade tools for 50 cents and maybe even 10 cents on the dollar.

You can also stock up cheaply on fastener assortments and stuff you'd love to have but can't normally justify purchasing.

Robbing from Peter

Murphy's Law says that the tape machine most likely to catch on fire is the critical one in the production studio.

When it does, shoot it with the Halon extinguisher and replace it with a spare. No spare? Okay, steal the least critical recorder and put it in the scorched location.

Sometimes you don't need a whole recorder. A plug-in module will do. This is where commonality pays off.

If all of your recorders, control boards, etc. are exactly the same, you can rob from any one to fix any other. You can also substitute modules to help isolate the faulty part.

Occasionally you'll run into a circuit board that's only a little flaky but refuses to be 100% functional. Maybe the PC fingers are damaged or there's a crack in a foil trace on an inner layer.

It's still worth keeping such a troublemaker around so you can steal

parts from it. Nearly everything will be usable and will be the exact replacement value for the component that went bad.

Where I'm from every homeowner becomes an entrepreneur during the summer. Telephone poles are plastered with garage sale signs nailed three and four deep.

Some cynics say these should really be called garbage sales, but you would be surprised what can be had for an afternoon's picking around.

Tools are a good bet. If you can live without brand new Craftsman screwdrivers you can probably get some 10 year old, only slightly used ones from the little old lady down the street who wants to dump the whole box for \$10.

Power saws, disc sanders, drills and pipe wrenches can also be had for prices that make them affordable.

You may even find goodies like new outlet boxes or rolls of brand new electrical wire that somebody just never got around to using.

If after all of this you still can't find what you need, you might consider renting it.

Occasional use

It's only natural to think of buying whatever you need. Many times whatever it is gets a lot of use for a couple of weeks and then goes on the shelf where it is "always available."

What's usually forgotten is how much that availability costs. It's not just the cost of the unit. It's what that money could be earning year after year if it wasn't tied up in a grey box full of knobs and meters buried deep in a supply cabinet.

Before you grab that next purchase order form stop and think. Is this tool or test instrument something that will be used day after day or will it solve an immediate need and then be set aside?

If that latter is true let somebody else pay for keeping it on the shelf. You can rent whatever you need for however long it takes to solve the problem and then pay no more.

What is available for rent? A lot. You may have to really look around since the local rental place that has shovels and trailers probably doesn't carry storage oscilloscopes.

Collect the catalogs for different rental places as you come across their ads. Visit the local ones and look around. Find out what the going rates are.

A lot of rental prices are structured so that if you kept the item a year you paid for it. But, you only need that meter for a month. Better to pay 8% once than 100% for the same usage.

Why don't you be the renter? If you want expensive seldom-used equipment in the shop, the cost can be justified by advertising it for rent when you can get along without.

The risk is that somebody else will have your analyzer just when you need it. However, many times you can schedule maintenance activities so that won't happen.

Used equipment

It's funny that people who don't think twice about replacing one used car with another won't go near used broadcast equipment.

Now it's true that the sweet smell of new equipment makes the heart beat faster. If you're heavy on cash—go for it. If not let's be a little more creative. Buying or trading for pre-owned equipment makes a lot of financial sense.

The risk of getting stung is a lot less if you know the person selling you the equipment and even less if you know the equipment itself.

Tom down the street doesn't need a four-channel scope anymore since they got rid of the automation. You do. Make him a deal. The scope is probably like new anyway.

Well, I've probably not covered every nook and cranny where you can scrounge for parts, tools, and test equipment. If you have some personal favorites not mentioned here please write in and share them with all of us.

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W.C. Alexander is Director of Engineering for Crawford Broadcasting Company, and a soon-to-be-published novelist. He can be reached at 214-445-1713.

found quite the widespread acceptance that the Class C plate-modulated design has, even with all its drawbacks and limitations.

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Only recently has this innovative design begun to find acceptance with broadcasters.

Some amplifier basics

The efficiency of a Class B amplifier can be greatly increased by saturating the tube with grid excitation. If we then modulate the drive, the output waveform shown in Figure 1a will result.

Obviously if the tube is saturated at the carrier level, its output cannot rise above the carrier level, and the positive peaks will be clipped at carrier level.

The output voltage will, however, follow the modulation waveform from carrier down to cutoff.

This would make a fine linear ampli-

fier for AM, except that there would be no positive modulation above carrier level.

As those who are familiar with Class C amplifier circuitry know a Class C stage will remain cut off except on the positive-going half of the driving waveform.

If we further bias such a stage to the point where it is driven with the same modulated excitation as the Class B stage discussed above, the tube will be driven into conduction only during the positive going half cycle of modulation. The resulting waveform is shown in Figure 1b.

This waveform is exactly what we need to complement the output of the Class B amplifier to produce the complete modulated wave. Were we able to combine these two signals the waveform shown in Figure 1c would result.

Combining these two outputs into a single modulated wave is not as easy as one might think. It was Mr. Doherty that came up with the method of combining these signals successfully.

Before we examine the problems associated with combining two such stages, let's review some of our basic DC parallel circuit theory to see what happens when two voltage sources are combined into one load.

In Figure 2a, we have a 12 V battery feeding a 12 ohm resistor. The current in the circuit is accordingly 1 amp.

Now suppose that another 12 V battery is added to the circuit in parallel

with the first one.

With the voltages in parallel, the voltage remains at 12 and the current remains at 1 amp, with each battery supplying one half of the current to the load, as shown in Figure 2b.

This principle is the key to understanding the operation of the Doherty linear amplifier.

Using Ohm's Law, we can assume in either half of our battery circuit that when the additional voltage source was added the impedance of the load as seen by the original battery must have doubled.

Such is the case with two tubes operating in much the same fashion, as shown in Figure 3.

Combining scheme

For AM, we must achieve four times the carrier power at 100% modulation.

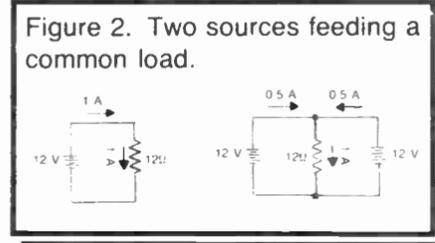
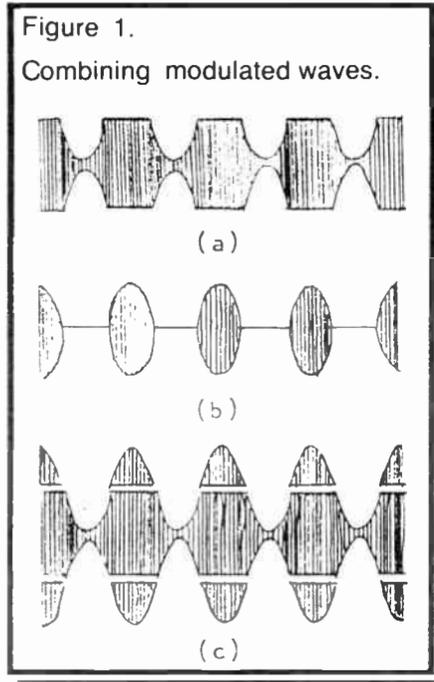
If the Class B stage, which we will call the carrier tube, is contributing 2000 W, for instance, across a 4000 ohm load, Ohm's Law tells us that the stage is delivering 1000 W to the load.

When the Class C stage (which we will refer to as the peak tube) begins to conduct and produce power, the impedance seen by the carrier tube will double to 8000 ohms.

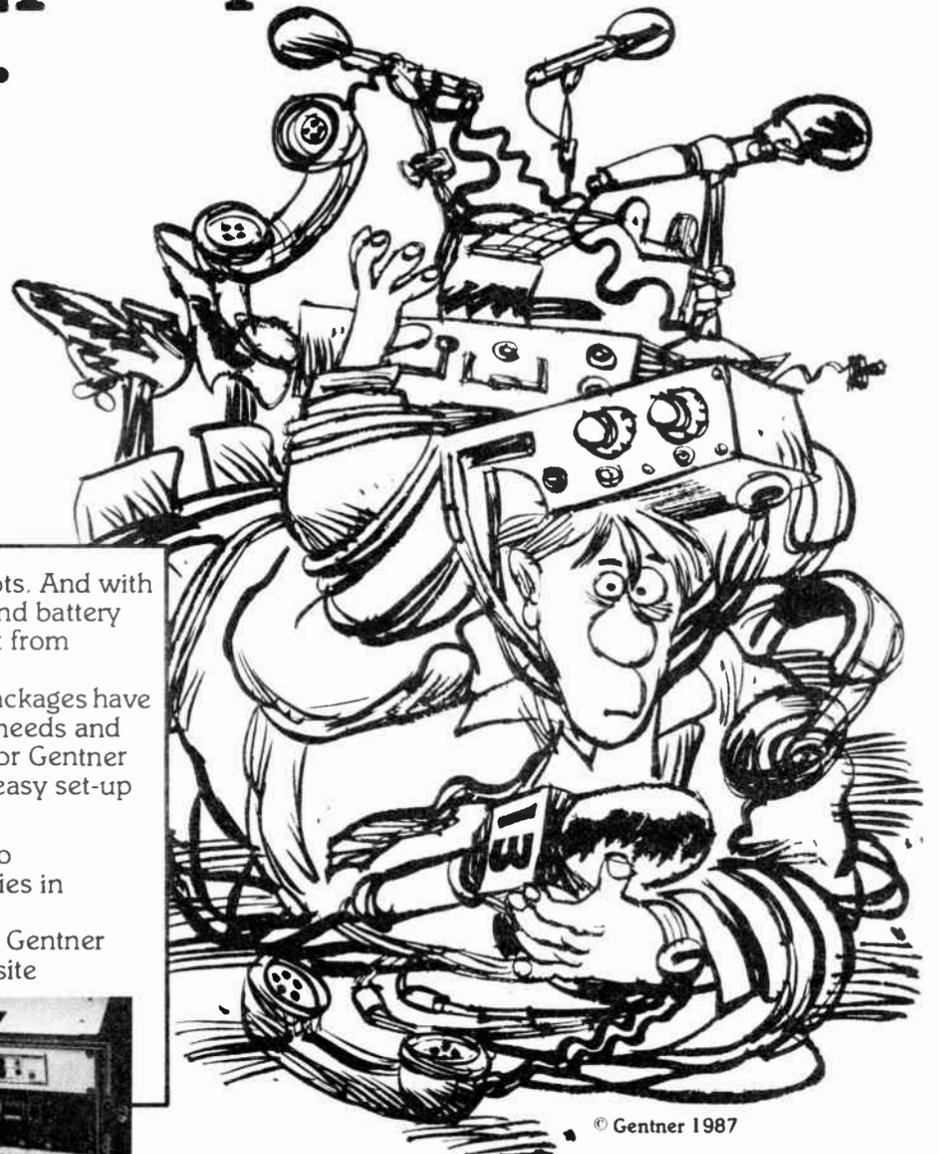
Using Ohm's Law, we can calculate that that stage is now delivering only 500 W to the load.

What is needed is a way to effectively decrease the impedance of the plate circuit of the peak tube as seen by the carrier tube as the peak tube begins to conduct.

Such a transformation is possible with
(continued on page 27)



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Circle Reader Service 35 on Page 29

Calibration Rules Have Shifted

by Harold Hallikainen

San Luis Obispo CA . . . In our continuing review of FCC requirements, we'll look at 73.1410(b), (c) and (d).

Rule 73.1410(b) states that the remote control system must be designed, installed and protected so that the transmitter can be activated or controlled only by licensed transmitter operators authorized by the licensee.

This regulation has changed little over the years. In the past, dedicated circuits (wire line or radio) have existed between the transmitter site and any control points.

With the transmitter remote control system under the direct supervision of an operator authorized by the licensee, or in a locked building when such an operator is not present, this requirement was considered to be met.

With the use of non-dedicated circuits (such as shared radio channels or dial-up telephone lines) some additional security is required since an unauthorized operator could gain access to the system without having access to the locked building.

This additional security typically ranges from the use of passwords to authorizing an operator to "call back security" where the operator is called back at an authorized telephone number after presenting the password.

None of these systems is completely secure, however. Someone can discover a password, tap a phone line or break into a building.

Equipment calibrations

According to Rule 73.1410(c), the remote control and monitoring equipment must be calibrated and tested as often as necessary to ensure proper operation.

This has changed considerably over the years. The rules did require each remote meter to agree within 2% of the value read on the corresponding meter at the transmitter site.

This calibration was required at least once a week.

In the deregulation of the rule, the calibration frequency was reduced from at least once a week to as often as necessary, and the required tracking specification between local and remote meters

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was removed.

It is interesting to note, however, that 73.57(d)(2) still requires remote antenna and common point ammeters to agree with the local meter within 2% of the reading.

This section refers both to stations that operate by remote control and to those stations that do not operate by remote control.

Those not operating by remote control but which still have a remote ammeter are typically saving the operator from having to walk through the rain to read the tower base current.

Insight on Rules

All other readings are read on the transmitter directly. In any case, even though there is no specified accuracy for most remote meters, remote antenna current or common point ammeters must agree with the actual meter within 2% of the reading.

Other meters

What is the required accuracy for other meters? This question was presented to the Policy and Rules Division of the Mass Media Bureau.

The reply, in a letter of 6 February, 1987 states:

"The Commission no longer specifies calibration tolerances for remote control instruments. The remote control system must be designed in such a way that the remote indications or alarms enable the operator to ensure that operation is within required transmission tolerance limits.

"Since the licensee is responsible for operating the station within the limits specified in the Rules, it is up to each licensee to be aware of the possible errors in the the remote control indications.

"For example, if a frequency counter used by an AM station is accurate to within 10 Hz, that station must keep its carrier frequency to within 10 Hz of its assigned frequency to assure operating within the 20 Hz tolerance."

In order to insure that a station is operating within the authorized power limits (90 to 105% of licensed power), it must operate within a tighter "window" to allow for the inaccuracy of the indicating instruments.

In other words, if the speed limit on a highway is 55 mph, and your

speedometer is rated for $\pm 10\%$ accuracy (is that 10% of reading or 10% of full scale?), you must not go faster than an indicated 50 mph to insure compliance.

Worst case

Let's look at a worst case example of an AM station meeting required accuracy for its antenna current meter and remote antenna current meter.

Assuming we use a linear scale ammeter (such as the Delta TCA series) the required accuracy of the antenna ammeter is 2% of full scale with full scale not exceeding five times the minimum normal indication [73.1215(a)].

For a worst case analysis we'll assume that full scale is five times the minimum normal indication so the accuracy of the reading is $\pm 10\%$ of the reading.

Further, the remote ammeter must agree with this ammeter within 2% of the reading.

If the ammeter reads 10% low and the remote ammeter disagrees by reading 2% low, the remote ammeter reads 88.2% of the actual antenna current.

In order to keep the power into the antenna between 90 and 105% of the licensed value, the antenna current must be between 94.9 and 102.4% of the licensed value (assuming the antenna resistance measurement had an error of 0% and has not changed).

The maximum authorized indicated antenna current would then be 88.2% of 102.4% of the licensed antenna current, or 90.3% of authorized.

Minimum current

To find the minimum authorized indicated antenna current, we'll let all the errors accumulate in the opposite direction.

The antenna ammeter reads 10% of the reading high. The remote ammeter reads even higher, but agrees within 2%. The remote ammeter reads 112.2% of the actual antenna current.

The actual antenna current must be at least 94.9% of authorized, which requires the remote meter to read 112.2% of 94.9% of the licensed antenna current, or 106.5% of authorized.

To summarize, if you are using an antenna current meter that just meets the accuracy requirements of 73.1215(a) and a remote ammeter that just meets the requirements of 73.57(d)(2), you must keep your indicated antenna current above 106.5% of the licensed antenna current and below 90.3% of the licensed antenna current. Good luck!

This shows that having instruments that meet the FCC accuracy requirements does not allow you to meet operating requirements if the rules are interpreted according to the "tightened window" concept.

Of course, it is quite possible to get instruments that exceed the FCC requirements, and to operate a linear ammeter above 20% of full scale (improving its rated accuracy). It would be interesting to see how the numbers work out on some actual stations.

Accuracy required

Prior to the current "as accurate as necessary" rules, stations generally kept the remote meters within 2% of the local meters and then kept the indicated power (with accumulated errors) within the 90% to 105% range.

The stations were actually operating over a wider range of powers, but the minimum and maximum were still limited by the limits on indications and required instrument accuracy.

Since the rules say you must keep your power within certain limits [73.1560] instead of keeping your indicated power within specified limits, it would appear that instrument accuracy must be taken into account.

I'll look forward to your comments!

Next month we'll look at 73.1410(d) and 73.1410(e). Did "fail-safe" really go away?

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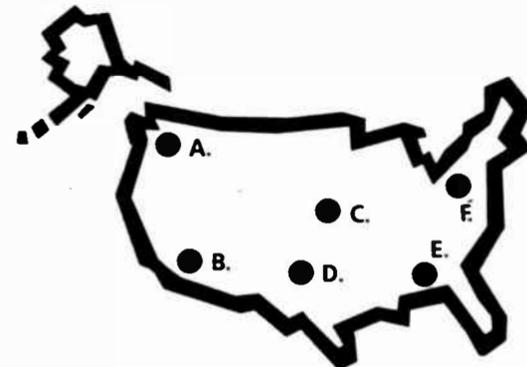
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Circle Reader Service 15 on Page 29

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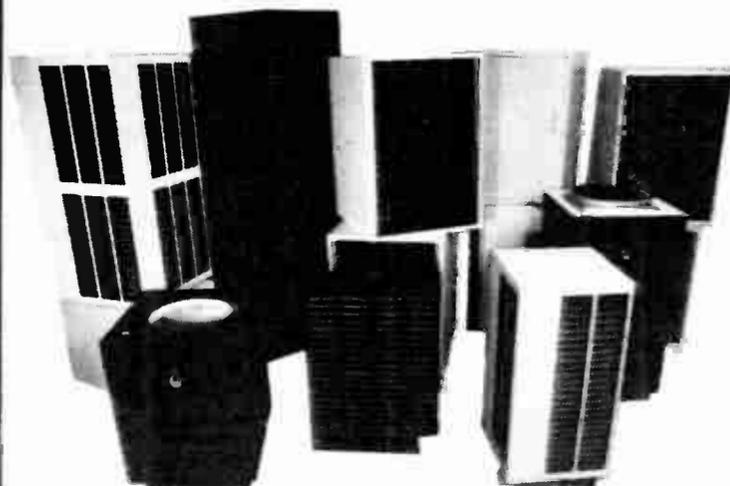


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Stop Random Access Babbling

by Tim McCartney

Boise ID ... When you ask someone for the time you don't want to be told how to build a clock.

And if the undesired description is scattered and disorganized, you are in the presence of a full-blown RAB—random access babbler.

A parallel to this is the distinction between news and public affairs. The former describes the fact that a thief robbed a bank while the latter explains why it was done.

The fact is a brief concise accounting, while the "why" demands a broad, in-depth examination of society.

This is not to say that there is no value in learning how to build clocks or in understanding the forces which drive a person to steal.

Rather it's a question of the proper time and place in which to consider such topics.

RAB comes forward in many forms. Some of the obvious ones are unnecessary repetition, irrelevant information,

Tim McCartney is CE of KBSU, Boise State University, Boise, ID. He is a regular contributor to RW, is an SBE Broadcast Engineer, has a masters degree in human resources development, and is a former GM. He can be reached at 208-385-3760.

venturing light years beyond the question posed or giving an overdrawn history of the topic.

Some of the worst classic cases include unwanted information as in the "Ask Me About my Grandchildren" bumper sticker or speculation on how to respond to every possible future scenario.

Babbler identification

There are some easy ways to spot babblers. Most of their working day is spent out of the office in hallways and by coffee pots.

You cannot pass them in the hallway without at least a 10-minute conversation each day. They talk at length about how overworked they are.

They are more willing to make or buy food for the staff than to do their job. And they tell you how quiet you are!

If any of these sound familiar (you may be guilty yourself) this can be verified by watching for cues from others.

If you are babbling, your victim may react with impatience, such as checking the time.

Your victim may get a look of mesmerization or glossy eyes, have no questions, comments or reaction whatsoever or attempt to change the topic or end the conversation.

These are your cues to back off. All of use are guilty of RAB from time

to time. Hopefully, it happens only rarely and then causes us concern. We must want to control it.

If you think others perceive you as a babbler there are ways to focus in on what you have to say.

Outline your thoughts, then evaluate just how much the person really wants and needs to know on the topic.

For example, does he/she really understand electronics? If not, the details of a circuit will go uncomprehended. Instead, just describe what the box does.

Use clear language, stay on topic and ask questions to determine if the material is being communicated.

Ask also if you should continue or review what's been said.

But above all: follow your outline.

Then follow-through at a later time to assess if the person was able to commit the basic information to long-term memory.

Dealing with the babbler

Depending on who the babbler is (peer, employee or boss), your response must vary.

As a group leader it is your job to control RAB while conducting a meeting.

Announce at the start of the meeting which items are to be discussed and how much time is to be allotted for each.

Remind the group that you plan to exercise your responsibility to limit off-topic discussion. Never publicly embarrass babblers, just re-aim the discussion while blaming the clock.

For your employees it's hoped that you don't have rampant RAB: that amounts to a colossal problem.

Babbling at work

It is very difficult to tell your employees that they are babblers. In fact, you might not be able to squeeze it into the conversation.

If you are able to confront them directly with the problem, then do it.

If not, you may have to rely on job performance issues—after all, babblers are not usually top job performers.

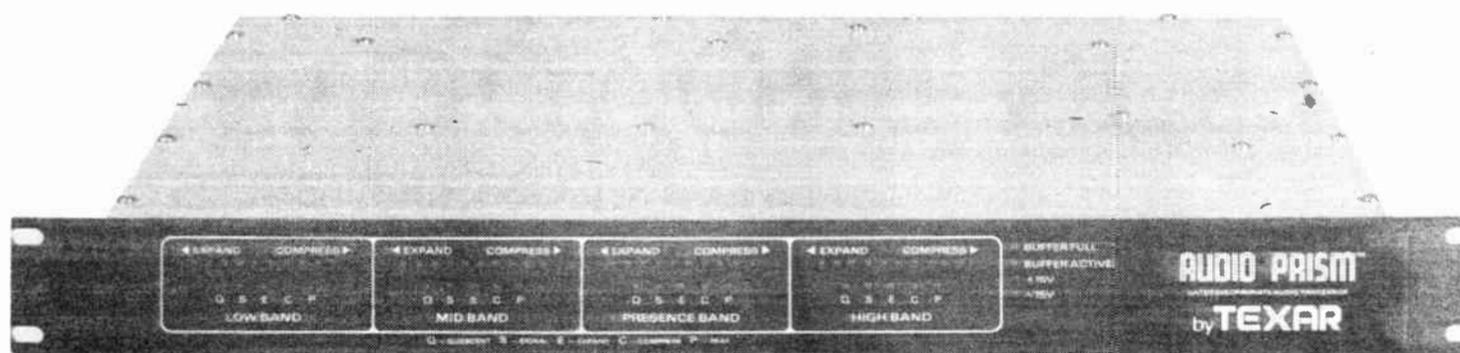
For others, your response to RABs might be uniform. If it's your boss or peer and you suspect that babbling is about to begin, announce that you have an appointment in just five minutes. Or, simply excuse yourself.

We are all social creatures and most of us enjoy visiting with others at work.

But simple logic says that we cannot have a 10-minute conversation with all 20 people at work each day. That would amount to over three hours of daily babbling!

And when someone asks for the time, that's exactly what we should give them.

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

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

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

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

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My Career as a BROADCAST CE

by Margaret Bryant

San Antonio TX ... "Let me talk to the Chief Engineer," a voice on the other end of the phone said.

"I am the Chief Engineer," I replied. All this because the part number of the item I wanted was not listed in the transmitter manual.

The voice on the other end of the phone assumed I was a secretary despite the fact that I had just described, in some detail, where the part was located in the transmitter. (I believe knowing what an anode strap looks like is taught right after shorthand in secretarial school.)

Oh well, just another day being a woman in a job traditionally held by men.

"Chief engineeress"

I have been in radio for 11 years. For nine of those years I have been CE of various stations.

Now being CE is still an unusual job for a woman. There are many women technicians and operators but still only a handful of Chiefs.

This makes for some very interesting reactions when I tell people what I do for a living. Once I was asked, "Why would you want to do that?"

Other times I get silence and a mouth hanging open in surprise. Frankly I

Margaret Bryant has been CE of several radio stations and is currently chief of KQXT-FM in San Antonio. She is also the chairwoman of her local SBE chapter, and has recently taken up flying. She can be reached at 512-220-3100.

haven't yet found a good response to that kind of reaction. Mostly though everyone accepts me at face value and that's just fine.

When I started in this business, I found there were some "important" skills I was lacking.

For example, fastening a cable tie around a wire bundle located out of sight deep in a cabinet with only my left hand (I'm right handed) was something I wasn't prepared for.

Neither was I prepared for fixing the float on the flush mechanism of a toilet (this is real life here). They should include toilet repair in Broadcast Electronics 101, because sooner or later it will happen!

Anatomical obstacles

I also found I had to employ a little creativity to overcome problems created by the physical differences between men and women.

I had this transmitter that used a 3CX3000 tube in it. Now this tube doesn't have any handles on it and replacing it is quite a job. The upper body strength of women isn't as great as that of men.

I ended up using my car tire jack to get the tube in. It wasn't an original idea, but it worked just the same. I have used the jack many times since in placing audio consoles in studios, but I have yet to use it on a flat tire.

The other problem created by physical differences comes in the area of transmitter buildings. They are all obviously built by men. One can tell this at first glance by the lack of toilet facilities.

Because of this I have found that there are times when it doesn't matter that it is 10° outside with a 15 mph wind!

Blasting those stereotypes

I'm sure you have noticed there is quite a stereotype about broadcast engineers. And like all stereotypes it is a generalization that is not always true.

Engineers are seen as first male; they talk a language no one else talks; they wear their pants a little too short so their white socks show and of course, there is the ever present pocket protector loaded with screwdrivers.

Now using stereotypes like these can be very embarrassing. Take for example the experience of the PD of the station I once worked for.

He attended a seminar on "How to Get Along With Your Engineer."

One of the instructor's suggestions was to have the PD get to know the engineer better. Go out for a few beers, find a couple of young ladies and let nature take its course. Okay, so that's not exactly how he phrased it, but you get the idea.

At that time my station's PD stood up and asked what he should do since his CE was a woman.

The room erupted in laughter. So you can see stereotypes can be embarrassing. (I never did find out how this man thought a woman engineer should be handled.)

Pockets of prejudice

I have found it very interesting how, almost without exception, my peers have accorded me the same respect they

would give any other (male) engineer.

Likewise the people I work with at the radio station. My abilities are never questioned. And let's face it, what's important is ability—not gender.

It is especially interesting that the group of people least accepting of a woman in this position are the equipment vendors. I don't think women have cornered the market on transmitter questions.

Most equipment vendors are courteous and helpful. But a handful of vendors have treated me in a manner that can only be called disgraceful. And they wonder why I no longer do business with them.

A few equipment vendors are exceptional in their sense of humor.

One had paid me a visit early this year. We got talking about the calendars that some manufacturers send out at the beginning of each year. Occasionally I still see a calendar with a scantily clad woman pictured on it.

We were joking about how behind the times these vendors were, using pictures like this. A few weeks later I received anonymously a calendar that featured scantily clad men! It didn't take me too long to figure out who sent it.

As time goes on there will be more and more women getting into broadcast engineering. This is good since the industry needs good engineers regardless of gender.

I still have visions of getting beeped when I am out for the evening and having to work on a transmitter in a long gown and high heels. It hasn't happened yet.

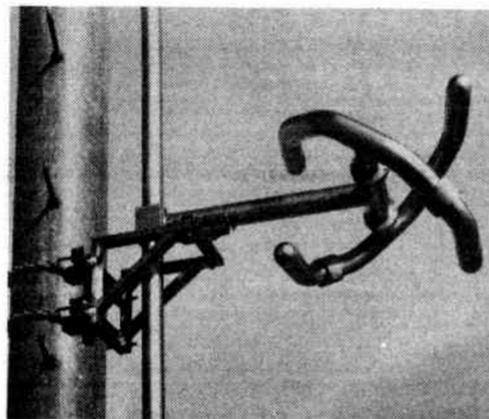
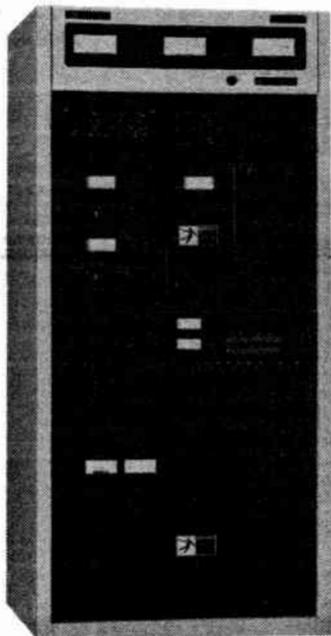
This is still a challenging job and a rewarding field to be in. Besides it's just plain fun—I wouldn't be doing anything else!

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Doherty Amplifiers

(continued from page 22)

a quarter wave line section, or a 90° network, which exhibits the same property of inverting impedance.

In the Doherty design a 90° network was placed between the plate circuits of the two tubes.

In our example of the carrier tube producing an RMS voltage of 2000 V at its plate across a 4000 ohm load shared by the peak tube, the carrier tube will produce 1000 W at carrier level with the peak tube not conducting.

Now when the peak tube begins to conduct, the impedance of the load as seen by the carrier tube would normally begin to rise.

However the 90° network now inverts that impedance so that instead of increasing, the load impedance as seen by the carrier tube will effectively drop from 4000 ohms to 2000 ohms.

Once again, using Ohm's Law, we can determine that the carrier tube is now producing 2000 W.

The RF voltage of the peak tube will at this time also be at the saturation value of 2000 V RMS.

As the load resistance will also appear to be 2000 ohms to that stage, it will also contribute 2000 W for a total of 4000 W at the positive peak of modulation.

This completely satisfies our require-

ment for four times the carrier power at 100% positive modulation.

Network description

You might have noticed that the signal from the plate of the carrier tube will be 90° behind that of the peak tube at the load.

We can remedy that by placing a 90° leading network in the grid circuit of the carrier tube.

In the practical Doherty amplifier circuit shown in Figure 3, C_{pg} , L_{cg} and L_{pg} serve as the leading 90° network. R_{gs} is a grid swamping resistor that effectively lowers the load impedance as seen by the driver.

In the plate circuit each tube has its own tank circuit. L_{ip} is the interplate coil, and the HV is fed through it to the anodes of the two tubes.

Neutralization is provided by the two neutralizing coils, L_{pn} and L_{cn} .

The Doherty linear amplifier has a considerably higher output impedance than circuits with only tank circuits in their outputs.

Therefore, a "tee" network is needed between the amplifier output and the load to match the impedances.

Unlike many other types of amplifiers the Doherty amplifier must be tuned with an RF bridge.

The tee network is set to provide the

correct value of pure resistance to the amplifier circuit.

The interplate components can then be adjusted to the correct values of reactance as determined by the manufacturer.

The intergrid network can likewise be tuned with an RF bridge. It is set in such a way a resistance of 1.5 or 2 times the value of the swamping resistor appears at the grid of the peak tube.

Properly adjusted, a Doherty linear amplifier will achieve an efficiency in the order of 65%.

The DC value of the carrier tube plate current will remain constant as modulation is applied.

The peak tube will remain biased off until positive modulation is applied, at which point it will begin to conduct.

One large advantage of the Doherty amplifier is that since it is not limited by the frequency response characteristics of

a modulation transformer, it is capable of being fully modulated at frequencies as high as 30 kHz.

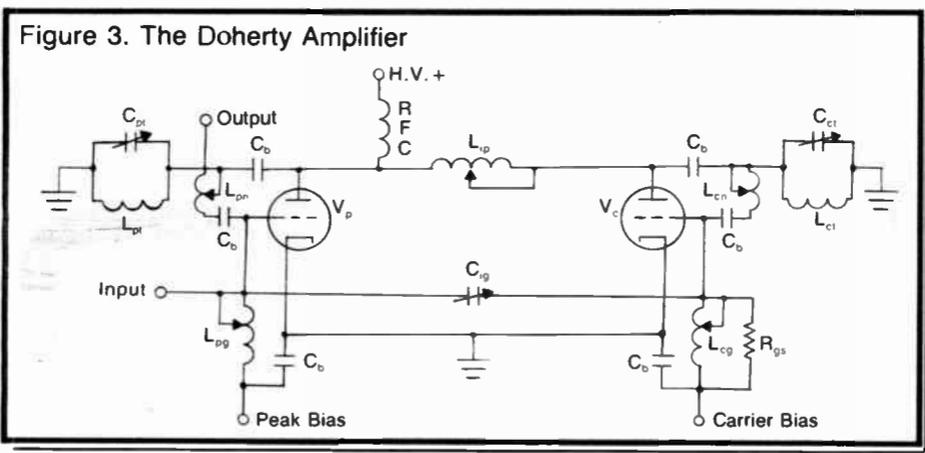
Another advantage is that plate circuit components can all have a much lower voltage rating, since they are not subject to the high transient peak voltages that occur in plate modulated transmitters.

A distinct advantage that the Doherty amplifier has over plate modulated transmitters is that overall feedback can be used.

This in of itself can be extremely beneficial in the elimination of noise, distortion and IMD products.

All these advantages together make the Doherty amplifier particularly useful in high power applications.

At least one US transmitter manufacturer, Continental, currently produces Doherty transmitters for high power AM and shortwave applications.



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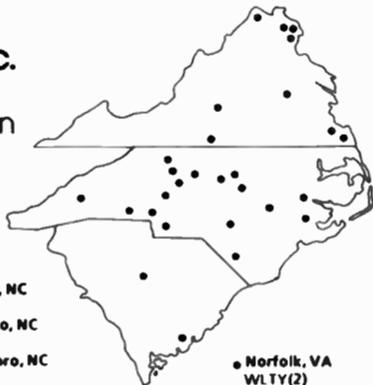


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DIGITAL DOMAIN

Plan Now For Digital Conversion

by Skip Pizzi

Washington DC ... Digital audio is no longer a vision of the future—it's here.

It's not only the playground of edge-of-the-art pioneers. It's already in the hands and ears of Joe Consumer.

As the CD gains in market penetration, and R-DAT establishes itself, will radio inherit the caboose on the audio quality train?

As the consumer's own CD and R-DAT library grows, will his/her choice from the sonic menu bypass the tuner switch more and more often (even in the car!)?

How soon the shift?

As far as music programming goes, I think that this scenario is a distinct possibility in the not-so-distant future.

Just as FM surpassed AM, mostly due to audio quality, digital will leave analog in the dust before long.

Of course, this *analog* we speak of includes all broadcasting as we presently know it.

And although way down the line (10 years?) there may be a new band of digital radio broadcasting, we're stuck with an analog delivery mode to our audience for the foreseeable future. So what to do?

Well for starters our *programming* has to make listening to the radio as attractive, if not more so, than listening to discs or tapes for at least some parts of the listeners' day.

That should be obvious and has always been the case. Nothing's changed there except that now it's even more of a challenge than before. And that's where improved broadcast audio quality comes in.

CD revolution

The CD revolution has grown new ears on our audiences almost overnight. Remember when the first listening tests

Skip Pizzi is the Training Coordinator for National Public Radio's Program Engineering Department. He can be reached at 202-822-2483.

of the Ampex 300 were conducted?

Reactions like, "The reproduction was indistinguishable from the live sound," were rampant. Fat chance even the layperson would say that today in the same test.

The consumer's tastes have improved. Hot running water was once a rarity yet no one would think of buying a house without it today. But the changes happen a lot faster now.

So even though the FM audio band-

probably look back and laugh at analog in a few years.

Or second, it's inexorable, it's unavoidable; digital is coming, and we can't do anything to stop it; the competition's got it, etc.

Either way, you're right, but embracing the challenge as in #1 seems like a lot more fun, and it doesn't have to break the bank.

In the next few issues of this new RW department (says something right there,

ning a successful approach to digital conversion. It's a global function, and requires an awareness of the big picture, not just a "line-of-sight" approach.

The "squeaky wheel theory" applies here, as well. The narrowest bottlenecks to audio quality get widened first.

The only exceptions to this exist where regulatory and/or marketplace obstacles intervene (i.e. digital transmission, both point-to-point and broadcast, but especially broadcast).

The "onion skin" model involves itself as well. As soon as you solve one problem or improve one area, another is revealed.

Although this new area had not previously been perceived as a problem, it is now the limiting factor.

Good engineering allows us to forecast at least the next few layers so we have some idea of a path to follow and what to expect as we continue the peeling process, but remember we're dealing with a multi-dimensional onion here.

Perpetual process

Finally, there's the "bridge painting" analogy.

As soon as you finish solving/improving all the component parts as you first conceived them, it's time to start all over again at the beginning.

It's a perpetual process, or as one colleague of mine is fond of saying, "It never gets better. In fact, it never even lets up a little bit."

He's right but he doesn't mean it to come out as negatively as that might sound.

If you like working with "it" that translates to constant challenge and growth, or at the very least, job security.

Well, we've mixed enough metaphors for one day. Next time, we'll look at the parts of the broadcast chain and prioritize our plan of attack for conversion.

Your facility, like all audio systems, will become an analog/digital hybrid for the next few years, so prepare ...

width is only 50 Hz to 15,000 Hz and the usable dynamic range in stereo isn't always terrific, there is a great amount of audible difference you can make to your signal with an incremental approach to digital conversion in your plant.

If that's not enough to convince you, there are others on your market's dial who are already doing it.

Economics play a big part here, too, of course. These capital expenditures have to be justified and spread out wisely.

That's why it's time right now to develop a *Digital Conversion Master Plan* for your station.

Your facility, like all audio systems, will become an analog/digital hybrid for the next few (many?) years, so prepare, and make the change prudently.

Don't be surprised to find that in some areas you may actually save money, and not just in the long, long term.

A new frontier

There are two ways to look at it. First, this is an exciting time. We're seeing the dawn of a new era of broadcast audio technology.

It's our challenge and mandate to implement this as best we can and we'll

too, doesn't it?), we'll be exploring these possibilities.

We'll look at the existing formats, and those on the horizon. We'll do a little crystal-ball gazing, and take a look at the whole audio chain to see what goes digital and when.

And we'll throw out some suggestions for that "Master Plan" I mentioned. But first, a little review of basic problem-assessment technique, as applied to our situation.

Surveying the scene

Gather up the *whole* problem, then break it down into its smallest separate parts. First make sure you've covered the entire situation when defining the territory of assessment. Don't leave anything out.

Step back and get a sense of conceptual perspective. It can really help to draw you out of the rut, and pull off the day-to-day blinders we all wear.

This sort of thing is essential in plan-

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A Southwest top 10 market CE explained to us:

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

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

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

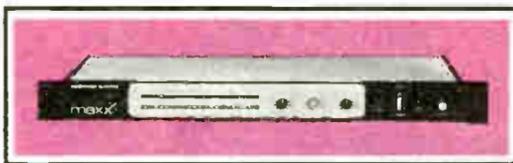
We're glad he said that. Enlarging the stereo image is one thing, but doing it without creating big hassles is quite another. A top 5 market CE put it this way:

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

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

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

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A Closed System Needs a Back Door

by Frederick Baumgartner

Englewood CO ... We seldom talk about it, but it seems to be a human trait when designing systems, software or building hardware to leave a "back door."

Just about any closed system can have a back door.

In hardware test points, LEDs on subsystems and data lines serve entry points for the designer.

In software a backdoor may allow the programmer to enter the program or bypass portions (often security portions) for maintenance or monitoring.

Broadcast stations can use backdoors also. A specific example is a telephone system backdoor (see Figure 1).

Front vs. back

The front door to the telephone system is the listed number that rings the receptionist or gets a recording on the weekend.

Other private line numbers go to specific offices or studios, where they can be ignored.

In short, there are a lot of things you cannot do from an outside phone unless, through a back door, it becomes an inside phone.

As an example, let's say it's the weekend and all heck has broken loose, the main number has a recording and the operator is ignoring the "contest" lines.

You know how to fix the problem if only you can get the operator out of the panic cycle and give instructions.

Call the extension through the back door, or better yet, the pager.

A voice from above comes into every room in the station and you say "This is the chief. Forget the reset button, push the aux filament, that's the green button on the red panel, etc ..."

Multitude of uses

Another example is when you need a piece of information so you call the back door and dial up a modem.

Or, let's say you are on a remote and need an IFB; you call the back door and one of the internal couplers.

If you need to talk to the remote, call the back door and dial up the two way communications system.

If you forget your keys call the back door and dial up the door release with your HT.

If you need to talk to the transmitter call the back door and then the transmitter modem or control.

With some planning, there are piles of things you can put on the internal phone system and with a back door you can access them anywhere in the world.

Only a person with the back door phone number can get into the internal system, and hopefully it's a person who needs to know what's happening.

Technical details

With a purely passive coupler (say an 11C repeat coil) there are signal losses, which usually are not enough to keep the touch tones from working or be

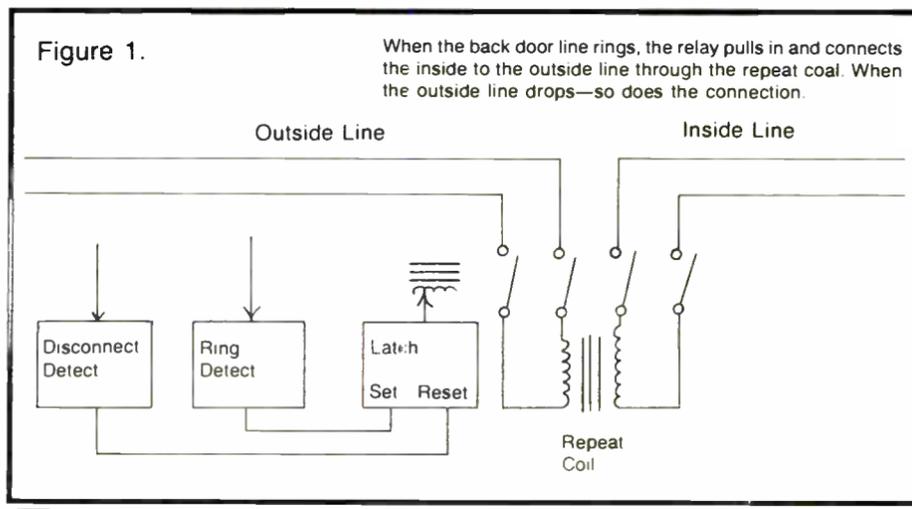
Frederick Baumgartner, assistant CE at KWGN-TV and former CE of WBA, Madison, WI, is a frequent contributor to RW. He can be reached at 303-740-2883.

an extreme problem. A phone type two wire repeat amplifier can solve this.

The line used for the back door entry can be used to make calls from the station—an originate only line.

This is good for a modem line—dial out only—especially if it is unlikely to be used after hours.

Of course, back doors are also nice to have in other systems.



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NRSC Helps Tupelo AM Shine

by Buster Wilson

Tupelo MS . . . When the NRSC voluntary AM Quality Standard went into effect in January 1987 I was living in Arlington, TX and preparing to return to my home state of Mississippi.

I was to return to Tupelo, the famed birthplace of Elvis Presley, to take charge of a 1 kW AM daytimer that had for four years been struggling with a "blocked" Christian format.

Fortunately I had the privilege of working among some of Christian radio's "greats," like Brad Burkhart and Jon Rivers.

One thing that these guys had indelibly burned into my mind was a format concept that holds true not only for Christian radio, but for any radio format:

Be the very best that you can be! Strive to be a quality, professional radio station.

A quality plant

I came to WCFB with some concerns about quality because it had been several years since I had worked with an AM station.

I found several factors that quieted those concerns. One was an excellent staff. Another was a relatively new facility with very decent equipment.

The station had been 250 W for years. But that changed in 1986 when the station went to 1 kW directional with a solid state Harris transmitter.

Therefore, I had a completely new transmitter. CRL processing was in line. So everything in the audio chain was in good shape.

Another factor working in my favor was my engineer, Michael Dailey and Associates, which had maintained the

Buster Wilson has been in broadcasting for 17 years. He has produced two national and worldwide syndicated radio programs and authored a book called The Counterfeit. Currently he is general partner and GM of WCFB and can be reached at 601-844-4646.

station for a couple of years.

Fortunately for me Michael and his assistant Tom Scott maintain the same high level priorities as I do when it comes to quality professional broadcast standards.

Having been in the Dallas/Fort Worth market for two years I had gotten a chance to work with and hear daily some of the finest radio stations in the world.

So I had several ideas about improvements that were needed at WCFB. My goal was to be able to say that WCFB was the finest AM station in the state.

Making changes

The first thing I did was to put in a new Fostex on-board cassette multitrack setup. (I have since switched to a Mississippi manufactured AMR multitrack console/cassette system.)

I then purchased three new Dynamax CRT-10 cart machines for the control room. All of this dramatically improved the overall quality of our sound.

We determined that one other step could be taken that would not only be a first for the area, but a first for any Mississippi Christian station.

We added a CD player to the control room and purchased all of the CDs we could find that were currently available in our format—at that time around 25 CDs.

I then began the fact-finding steps into converting to AM stereo. However I wasn't very happy with what I discovered.

First, it was cost prohibitive for us. Second, there was already an AM stereo station in town, and I didn't like what I heard on the AM receivers currently available.

But in the midst of this fact finding process is when I discovered that the NRSC standard might be a possibility for us.

I found out that I could convert to the NRSC standard very easily and cost-effectively by adding the new CRL unit to our existing CRL processing chain.

The cost was only \$500.

Installation was easily done within 20 minutes and setup took about an hour.

We were somewhat afraid that the 10 kHz bandwidth would hurt our present sound. After all, we were playing CDs!

Fortunately Michael Dailey was smart enough to educate me to the fact that it didn't matter that we were currently broadcasting about 13-15 kHz in audio frequency. The majority of AM receivers on the market today receive no more than 3-5 kHz.

So I consented to the conversion on the basis that CRL would give us the

When you tuned the station in, you had it.

What is happening is that even though our signal occupies less bandwidth with the 10 kHz filter, what's there is being processed more effectively.

Before converting to the standard, the processor was processing information that can't be heard by our listeners.

As Michael Dailey likes to put it, the NRSC standard is actually a case where "less is more."

It just seemed that finally everything we'd worked so hard to process into our signal was suddenly there.

After checking with the Mississippi Association of Broadcasters Executive offices in Jackson we discovered that we would be the first station in the state to

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VOLUNTARY STANDARD!**

WCFB, 1000 watts daytime, 1060 AM, Tupelo, Mississippi,
on Friday, June 5, 1987, became, according to the office of the
Federal Communications Commission, the first station in the state to
convert to the NRSC standard.

WCFB publicizes its conversion to the NRSC standard in its media kit.

unit for a 30-day trial commitment.

I consistently wondered, how could you improve on a new solid state transmitter and the best audio chain possible when there were no NRSC matched radios on the market yet?

Brand new sound

First our sound immediately brightened. We were clearer and crisper than before.

I stood there at the transmitter clicking the CRL filter switch on and off listening to the AM receiver in amazement. It was like listening to two different stations.

What we immediately noticed from the 10 kHz filtering was a dramatic improvement in the station's tunability. Unlike before, we no longer had to "tune up" to center frequency.

go to the new standard. So we decided to use it as a marketing tool.

Before switching the system on we produced a taped announcement declaring the whole realm of AM radio's sound problems and the now available solution in the NRSC standard.

We then declared that we were the first station in the state to go to this standard and that we would turn the system on next.

We demonstrated the "old" sound against the "new" and asked for listener comments. Then we jingled into an Amy Grant CD, got through the first verse, re-jingled and turned the CRL NRSC unit on and restarted the CD.

What a difference it was and what a dramatic statement we made with this demonstration!

It was so powerful that we went to the transmitter later in the week and repeated the whole demonstration two more times.

Success story

Listener comment was very favorable. Most comments were along the line of "boy, we can really tell the difference" or "you sure sound better."

We've since produced a piece for our media kit telling our story as the first in the state to go to the newest in AM improvement. So far it has impressed quite a few clients.

Going to the NRSC standard has for us been an engineering victory, an image building marketing tool, a station morale booster, and a revenue producing factor!

WCFB's billing has increased nearly 21% a month since April and I am convinced that the *better* sound produced by the NRSC standard has been an active factor in that increase.

I have the highest regards for the progressive thinking and technically competent engineering team of Dailey and Associates, and the highest praise for the quality and ease with which the CRL unit worked for us.

If you own/operate an AM station and are not now on the NRSC standard, then why don't you get out of the dark ages and join the future?

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MONITORS - Many Brands, AM, FM & SCA

REEL TO REEL - Ampex, Tascam, Crown, Teac, Metrotech, Revox

TURNTABLES COMPLETE - Russo, QRK, Collins, Sparta

SOUND PROCESSING - Optimod, CRL, DAP, CBS

TRANSMITTERS - Harris, RCA, Collins, Gates (Set on your Freq.)

**BOOTHS
235, 237, 239
N.A.B. "RADIO '87"**

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AMPLIFIERS

Want to Sell

Crown D-60, \$250. J Diamond, Blue Diamond Studios, Box 102C, Chubbick Rd RD1, Canonsburg PA 15317. 412-746-2540.

Shure M67, gd cond, w/A67B & manual, \$200 plus ship. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

McIntosh 240, BO. H Quinon, BRT Recd, 275 E Oakland Pk Blvd, Ft Lauderdale FL 33312. 305-925-7117.

Altec 1570 tube power amps, 160 W, very clean, work well, \$130 ea. B Busetti, 1124 W 2nd, Florence CO 81226.

McIntosh MC60 tube amp, fair cond, 60 W mono, \$225; Dynaco 70 & PSA2, mint cond, 70 W (35/150) stereo, \$150; Opamp Labs 240W, (6) 40 W amps, \$75. C Elmesian, Tri-Cor Recd, 27503 5 Mile Rd, Livonia MI 48154. 313-427-0832.

Ultra Audio 5 x 5 audio dist amp w/VU metering, rackmount, O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Shure M64 phono preamp, needs minor repair. BO G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Crown D-150, \$400. F Grundstein, WRHU, Holstra Univ, Hempstead NY 11565. 212-415-2616.

Amps: McIntosh MC-30, \$125; (2) Quad II tube amps, \$125; (2) Dyna MK III, \$95; Dyna Stereo 70, \$125; Futterman H-3AA tube, BO over \$495. C Richardson, Richardson Recd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Altec 1569A pwr amps, mono, 80-100 W (15), \$125 ea; Ampex 3200/custom PB 3200 transports, handle 1/4 & 1/2" tape, 4/3/2/1 trk heads, customized Ampex PB cards, \$500 ea; RCA BA21A(21), BA23A(3), BA33A(4) preamps, line amps, etc. plug-in trays, etc. \$750. W Staten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Pulse Com 1671-4L1 switch gain amp, vgc, \$50. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

McIntosh 222 stereo tube, \$200; MC 110 FM/AM tuner, \$150; MC 2105 stereo, \$500. SA Cislser, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Dynaco PAT 5 stereo preamp w/assoc Dynaco stereo 120 power amp, assembled from kit by station personnel w/manuals, B Mins, W'SU, Troy St Univ, Troy AL 36082. 205-566-3000.

McMartin MS-75 (2), great cond, \$100 ea. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

RCA MI-9377 rack mt, theatre amp, 50 W, working, gd cond, (6), \$75 ea; Dukane 100 W rack mt, tube PA amp, working, gd cond, (3), \$45; HH Scott LK-72 stereo tube amp, \$40. N Carlson, Mobile Snd Group, 721 W Melrose, Chicago IL 60657. 312-871-7459.

Want to Buy

Fisher 90-A amp, any cond, J MacLane, The Plate Voltage Club, 1740 N Gramercy Pl, Hollywood CA 90028. 213-465-1762.

McIntosh, Marantz, Dynaco Quad, Audio Research, etc. amps; WE, Tannoy, Altec, EV, JBL, Hartsfield, Olympus, Harness, Laguna speakers; Thorens, Fairchild turntables; WE tubes & microphones, Lapine, 10919 Oasis, Houston TX 77096. 713-723-5281.

McMartin 2500B tube type RF amp, also need schematic, B Coleman, WIST, POB 460, Lobelville TN 37097. 615-593-2294.

McIntosh C4 preamp w/EQ switches, any cond, SA Cislser, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Ampex AA620 speaker amp in case, SA Cislser, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

ANTENNAS & TOWERS

Want to Sell

Rohn 65G (350') w/guys & light fixtures, excel cond, \$10,000; (14) 20' sections of 4" face w/Torgue Gay Dresser tower, \$15,000. G Johnson, Johnson Tower Service, POB 66, Burlington ND 58722. 701-839-3229.

H&W microwave antenna, \$500. R Smith, WGSB, POB 406, Summersville GA. 404-857-5815.

Gates 6 bay, 106.5 MHz or trade, K Le Masters, Thomas Comm, POB 249, New Martinsdale WV 26155. 304-455-3030.

Shively Labs 6811, 1 kW low power CP, 2 bay FM, 103.1 MHz, w/mounting brackets, \$300. D Matthews, KASK, 802 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

Tower, 85' heavy duty, free standing tapered tower, base 8' square, S Bauder, WOEf, E 1825 Hwy 182, Park Falls WI 54552. 715-762-2611.

Hughes & Philips beacon, side light flasher & cell, trade for Marti equip/BO, B Zellmer, KRZ, POB 2224, Greeley CO 80632. 303-351-8354.

Rohn 45-G 10' section, w/tapered base, B Zellmer, KRZ, POB 2224, Greeley CO 80632. 303-351-8354.

RCA TFU24DM UHF ant, ch 41, \$5000; MC UHF corner reflector ant, gain of 10, \$250. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TFU 24DM UHF ant on chan 41, \$5000; EMCEE UHF corner reflector antenna 10 gain, \$200. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Anixter 10' parabolic antennas (2) 950 MHz, grid construction, will sell individually or as a pair. M Hendrickson, KEEZ, 102 Capital Rd, Mankato MN 56001. 507-345-4646.

Phelps Dodge 3 bay, CP, cut to 92.1, \$1200. B Hughes, KNET, POB 649, Palestine TX 75801. 214-729-6077.

Potomac 4 tower digital phase monitor, T Jordan, WFNC, POB 35297, Fayetteville NC 28303. 919-864-5222.

Pirot tower, 700' tapered, excel cond, BO. D Sloatman, Metroplex WJYO, 2001 N Mercy Dr, Orlando FL 32808. 305-298-5510.

RCA 51.5 ohm transmission lines (5) MI 19313, 30 used full length lines & 5 short sections, 11 flanged elbows stored inside, BO. J Wright, WBOY, 912 W Pike St, Clarksburg WV 26301. 304-623-3311.

AKG K340 headphones, \$115. S Rosenthal, Rosenthal Prod, 3145 Geary Blvd Ste 344, San Fran CA 94118. 415-665-1035.

Symetrix TI101, in new cond, telephone hybrid interface, \$295. T Johnson, KEST, 1231 Market St, San Francisco CA 94103. 415-626-5585.

Telefunken C4-DM NR cards, (2) brand new, \$395. C Richardson, Richardson Recd, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Elgin ERC-19645-4, gd cond, will record or play from line, will also answer for listen line, (2), \$60 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

dbx 142 NR unit (2) encoder/decoder, J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

dbx 150X, new in box, \$195 free ship. J Shepherd, Globe Prod, 539 Westminster Ln, Salem VA 24153. 703-389-1670.

Shure 610 feedback controller, mint, \$90; Shure SE30 compressor mixer, \$100; EV XEQ2 crossover (2), \$120 ea; Accosit Noise Gates 3 chans w/PS, mint, \$175. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Panasonic SE-405H CD-4 system disc demodulator, w/cartridge, test disc, etc, \$100. W Staten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Comex Bleepmate 675 3 or 6 sec digital delay, \$700. S Bush, KTKK, 3595 S 1300 West, Salt Lake City UT 84119. 801-264-8250.

Telefunken C4D Telcom NR cards (8), \$300 ea; (2) dbx K9-22 NR cards, \$250 ea; BTX 4100, 4500 & 4010 SMPTE gen & reader, \$2000 package, E Sanders, 7th St Snd, 688 S Santa Fe #105, LA CA 90021. 213-627-5392.

Eventide BD955 digital delay, \$1300/BO; Studer telephone hybrid, dual, \$995/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Want to Buy

Tabbie Cat 1/4" tape splice unit, S James, Re-nu Carts, Rte 6 Box 127, Ottumwa IA 52501. 515-684-7012.

Sontec, Pultec or API EQ's, D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

AUTOMATION EQUIP.

Want to Sell

Harris random access & Carousel interfaces for SMC 250 units, work w/older Gates automation system, fair cond, (2) avail now. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Microprobe Elect 100 programmer w/manual, some mods, 6 source, 30 event, looks gd, \$200. R Sherwood, WPSL, 9344 S US 1, Port St Lucie FL 34952. 305-335-8800.

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41 North 7th St., Hudson, NY 12534

Gates FMC-10, 10 bay FM w/de-icers, avail soon, \$5000; Utility Type 480, 95' guyed tubular tower, 30" face, non-insulated, avail soon, \$1000; Utility 95' pole, approx 10" diameter, avail soon, \$2000. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Andrew 250' heliast on spool w/GB & GP EIA connectors, B Hughes, KNET, POB 649, Palestine TX 75801. 214-729-6077.

TWR FB300MM code beacon light (2), used 3 mos, like new cond, \$600 ea. K Harnack, KWLN, 88 Union Cntr Ste 309, Memphis TN 38103. 901-529-0098.

Cablewave, 480' of 3" coax, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Phelps Dodge 10 bay FM w/deicers, 380' of 3-1/8" line w/connectors, \$3000. D Overbye, Overbye Tower Erection, 229 E Johnson St, River Falls WI 54022. 715-425-5421.

Phelps Dodge, 3-1/8" rigid line, (12) 20' sections plus (3) 20' sections of 6" line, new, sell all or part, G Smith, WDUU, POB 10, Gainesville GA 30503. 404-532-9921.

LI 42" base, 480' tubular tower, welded, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Kintronic FM isocoupler, 98.1, 7.5 kW, \$850/BO. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

Cablewave xmsn line, 115', 3", new w/o fittings, BO. T Pace, KEKB, POB 68, Fruita CO 81521. 303-858-3699.

Jampro 6 bay FM at 95.5 MHz, call for price. D Steed, KFOX, Box 588, Lufkin TX 75901. 409-634-5596.

Trusscon 270' self supporting tower, solid, still standing in Pella IA, BO. J Hansen, KFMD, 515-282-1033.

Scala FMVH-4 CP 4 bay w/divider network & all cables, excel cond, \$700 plus ship. S Lawson, KAK-FM, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055 aft 6 PM PST.

Bird 8572-115-6 dummy load, air cooled 25 kW, 5 hrs daily use, \$3000. J Keyes, WA1TKG, POB 645, Yellville AR 72687. 501-449-4147.

Rohn 65 370', w/many access, \$13,000. A Crain, Box 157, Collierville TN 38017. 601-895-6483.

Tower, 370', 4' face, Windcharger type, guy wires, dismantled, you ship, \$19,000. A Crain, WWEE, POB 157, Collierville TN 38017. 901-853-4735.

Windcharger, 370', \$19,000/BO or may take 1 kW AM xmtr trade & 2 tower phaser. A Crain, Box 157, Collierville TN 38017. 601-895-6483.

Rohn 65 370' incl guy wires, dismantled, you ship, \$13,000. A Crain, WWEE, POB 157, Collierville TN 38017. 901-853-4735.

Gates/ERI FMS-2A, 2 bay CP antenna w/factory de-ice & tower-leg stand-off mounting brackets, 1-5/8" interbay, tuned to 103.9 MHz, \$1200/BO. L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

Tower, 980' solid leg, zone A, w/guy wire on ground, call for price. L Dupree, KQID, POB 7057, Alexandria LA 71301. 318-445-1234.

Want to Buy

Antenna feed line, 7/8", 500-1000'. R Wright, WLLX, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-2916.

Heliast 1-5/8" or 3" line, also need matching connectors, J Powley, WIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Bogner UHF TV antenna, B4U, B8U, B16U, any chan incl old translator band 70-83, low to medium power input series, J Powley, WIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Tower sections (4), either Rohn #80 or Stainless G-36, new or used, J Powley, WIIM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

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IGM 78 tray Go-Cart, stereo, excel cond, on line now, BO or trade for 2-24 tray Go-Carts. J Howell, Howell's Audio, PO Box 6184, Kingman AZ 86401. 602-753-3054.

Control Design Corp 24-R stereo random access Cartel w/cables & manual, \$995 plus shp. J Meloon, WDBA, 28 W Scriener Ave, Du Bois PA 15801. 814-371-1330.

SMC Mini Pro, excel for small automation, complete, \$1500. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

SMC 521 dual play, \$700. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

SM Carousels, (2) Series 350 RS, (3) Series 352 RS, best serious offer, R McKay, KXRB, 3295 S Meadow, Sioux Falls SD. 605-361-3300.

TA-C-1 time announce controller, \$350. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

SMC 452 Carousels (3), stereo, Audiotronics TM-915 video display, PDC-4X clock, SMC ESP-1 programmer, 2 racks, TSB-3 power control, DS-20A digital switcher, 2 Otari R-R reproducers & all manuals, well maintained, \$20K plus shp. C Larsen, KAMI, 835 Meridian Cozad NE 69130. 308-784-1580.

Scafer system, assume lease, small down, w/controller, 48-tray Audifile, 3 ITC R-R decks, 903 logging card w/Extel printer, studio/network I-O card, time announce package, 2 racks, E Routt, KCKL, Box 489, Malakoff TX 75148. 214-489-1238.

Control Design CD25G tone gen, BO, G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5332.

Harris System 90, excel cond, \$4500. D Robertson, WOXY, 100 St James Ste 100, Baton Rouge LA 70802. 504-383-4411.

IGM 250 mono seq Carousel, working, \$200. L Buller, KSDB, 104 Kedzie KS STU, Manhattan KS 66502. 913-532-7645.

SMC TS25 dual 25 Hz sensor, \$250. M Persons, WCOMP, Rt 2 Box 230, Pine City MN 55963. 218-829-1326.

Harris 9000, (4) single deck ITC carts w/Harris interfaces, (4) Scully 270 R-R PB, (5) SMC Carousels w/Harris interfaces, 1 logging printer, TI-840 RO, (2) Tec-70 terminals, Harris brain & switcher w/Tec 70, spare pinch rollers, heads, etc for Carousels, spare cables, all equip housed in 19" racks (5), terminal completely operational, \$60,000. GM, KYSD, 21 S Chadbourne, San Angelo TX 76903. 915-655-1340.

BE Control 16 Automation System: (4) Otari ARS1000DC decks, (2) ITC 770 decks, (4) IGM Go-Carts, ITC 3D cart deck, (2) ITC RP decks, (5) racks, (3) CRTs, (2) control stations, battery backup & charger, auto logging, cart encoder, D White, WYBR, Box 7180, Rockford IL 61126. 815-874-7861.

SMC satellite automation MSP 10 channel w/3 stereo Carousels, 4 stereo singles plays, Brain, rack, wired, mint cond, bargain at \$10,000. B Kramer, WOXX, Box 3176, Longwood FL 32779. 305-682-5463.

Model 20A (250) Carousels, (4), \$600 plus frt. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Harris System 90, (4) R-R's, IGM Go-Cart 48, (2) cart decks w/logger, \$7600. D Tarum, KRZ, 2402 E 37th No, Wichita KS 67219. 316-832-9600.

Schafer 800F complete system, call for details, complete or components, \$10,500/BO. B Van Prooyen, WYGR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Control Design Corp, CD-28AS w/12 source stereo switcher, sequential programmer & 8 event clock & manuals, BO, J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

Control Design Corp CD-24R stereo random access cart Carousel w/manual, J Aasen, KFJM, Box 8116 Univ Station, Grand Forks ND 58202. 701-777-2577.

Want to Buy

IGM 24 Go-Carts, (2) pref stereo, J Howell, Howell's Audio, POB 6184, Kingman AZ 86401. 602-753-3054.

RCA-15A instruction manual wanted, JB Crawley, WLBN, POB 185, Campbellsville KY 42718. 502-465-8884.

IGM Instacart, 48 tray stereo in gd to excel cond, for non-profit educ station, J Tocknell, Cedarville College (WCDR), POB 601, Cedarville OH 45314. 513-766-5595.

Cetec 7000 automation system, D Williams, KLCB, POB 730, Libby MT. 406-293-6234.

IGM 364J program logger-printer, for parts, L Ayer, KRPL, POB 8849, Moscow ID 83843. 208-882-2551.

CAMERAS (VIDEO)

Want to Sell

JVC KY210 video camera, w/case, AC adaptor, 10:1 Fujinon lens, gd cond, \$3295. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

JVC GZ3SU compact satcon color camera, 270 lines, 30 lux, 2.7", stereo audio capable, vgc, VHS plug, \$350. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

JVC KY950 w/AC adaptor, 14:1 Fuji zoom, Sony BVU110, Portabrace cases for both, O'Connor 50 head & tripod, sell as package, \$20,000. T Neill, Wave Inc, 72 Cambridge St, Worcester MA 01603. 617-795-7100.

RCA PK-701 color studio camera, \$1250; Panasonic 3890B color portable camera, new, \$1995; Norelco PC-70 studio color camera, BO; Norelco PCP-90 minicam color camera, \$750; Houston Fearless camera pedestals, \$950. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

JVC KY1900 color cameras, (1) 10 x 1 servo-zoom, \$2500; (1) 6 x 1 manual zoom, \$2000, w/cases, AC adapt/bat charger & (1) battery/camera, gd cond. P Costa, Eastern Snd & Video, 482 Merrimack St, Methuen MA 01844. 617-685-1832.

IVC 500 (3), BO, JB Salazar, Missionary Bible Crusade, 102 E Lyon, Baredo TX 78040. 512-722-6832.

Sony Tricon HVC2500 video camera, J Hayes, Programming Plus, Box 90486, San Diego CA 92109. 619-272-7587.

Remote control camera cable w/push buttons, to trade for tripod, J Baltar, Maine Reel Comms, 67 Green St, Augusta ME 04330. 207-623-1941.

CART MACHINES

Want to Sell

Tapecaster X-100 cart winder, used twice, like new, \$225. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

BE 5303B stereo 3 tone 3 deck PB machines (2), \$1250 ea. D Solinske, WSYR, 2 Clinton Sq, Syracuse NY 13202. 315-472-9797.

Magnecord 1021, fair cond, \$100. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Contel 101P-B mono PB, \$150. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

BE 3200P gd cond, just off air, \$450. D Sparano, WVCR, Rt 9, Loudenville NY 12211. 518-783-2990.

ITC R/P mono fresh Beau motors, excel cond (2), \$1595. S Homer, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

Beaucart 22-143-001, gd cond, many features, \$900. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Beaucart Type-20 R/P, 3 cue tones, motorized azimuth adjust, \$2500. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Twin Tape 642E-1 (2) PB mono, \$150 ea. M Matus, WSSA, POB 831, Morrow GA 30260. 404-381-8843.

Beaucart 11-123-001, gd cond, (3) \$500 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

BE 5304-B triple deck stereo, 1 yr old, 3 tones, like new cond, \$3300. S Homer, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

ITC PB mono w/fresh Beau motor, excel cond, wide play unit, \$995. S Homer, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

ITC SP excel cond, \$850. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

BE Spotmaster 505CR rack mount player, \$200; 500CR rack mount recorder, \$250. M Persons, WCOMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

Sparta Sparkomatic, gd cond, \$100/BO; Gates ATC, fair cond, \$125/BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Spotmaster BE 5300B 3 deck, gd cond, \$1200. M Daley, Daley & Assoc, 311 S Cluster, Tupelo MS 38801. 601-841-1506.

ITC 3D triple stack machine w/rec amp & heads, 3 tones, 1 yr old, \$3400. V White, 4600 E Herndon #244, Clovis CA 93612. 209-298-2373.

Hams R/P, R Sanchez, KUCV, Lincoln NE. 402-486-2520.

ITC Premium stereo play w/SWA elec, BO, B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

BE 4300RPS R/P stereo, excel cond, \$895. B Anthony, Anthony Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

ITC RP (2), one excel, one cracked VU & missing case, works, \$850/both. G Sive, Your Video Connection, POB 239, Bonsall CA 92003. 619-729-7662.

Gates Criterion, R/P, stereo, \$500/BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Revox PR99 (2) w/tones, PB only, mint cond, \$850/BO. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

Tapecaster PB, \$200. C Mandel, KAMP, Box 1018, El Centro CA 92244. 619-352-2277.

Tapecaster 700RP (2) 2 tones on ea, gd cond, \$250 ea. S Bush, KTKK, 3595 S 1300 West, Salt Lake City UT 84119. 801-264-8250.

ITC Premium line, new stereo PB elec, new motor, 3 tone, \$2000. J Rosso, WCZE, 869 Church Rd, Elmhurst IL 60126. 312-834-6474.

Gates R/P, works well, \$350. S Angram, WTMX. 317-545-8100.

ITC ESLY eraser splice locator, \$400. J Rosso, WCZE, 869 Church Rd, Elmhurst IL 60126. 312-834-6474.

RCA mono PB (3) all work, \$200 ea; RCA mono reproduce, gd working cond, \$300. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

BE 200PS w/30 blank cartridges, \$250. S Angram, WTMX. 317-545-8100.

Want to Buy

Schematic for Sparta 300C-R mono & 150 Hz detector for same; also schematic for Gates CC-III 3 deck, rack mount adapter & 150 Hz cue tone card. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

BE 3000 & 2100 cart machines wanted. Exporter needs 90 used machines, working cond, not more than 6 yrs old, reasonable price avail. Send particulars to: RW, POB 1214, Falls Church VA 22041. Attn: Box 1-1.

Used splice finder. P Allen, Bdct Cart Rewinding, 5516 H Tomahawk Dr, Greensboro NC 27410. 919-855-6726.

ITC or BE late model stereo R/P. P McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

ITC or Criterion. G Miller, PA Network, 260 S Broad, Phila PA 19102. 215-732-7100.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Revox A77 1/2 trk stereo w/built-in amp & speakers, gd shape, \$500; (2) Teac V-350, \$85; Teac V-300, \$75. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

MCI/Sony capstan & reel motors, any cond., recdg heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

Scully 250-2 3.75/7.5 ips & 7.5/15 ips, Dictaphone mfgs, never used, make offer. H.M. Dyer, Dyer Electronics, 48647 12 Mile Road, Novi MI 48050. 313-349-7910.

Ampex AG 350-2 in Ampex console, gd cond w/manual, \$395 plus shp. J Meloon, WDBA, 28 W Scriener Ave, Du Bois PA 15801. 814-371-1330.

MCI JH16-8 JH100 transport, \$3000/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Otari ARS1000 (2) in excel cond, \$1000/BO. R Knapp, KENE, POB 350, Toppensish WA 98948. 509-865-5363.

Magnecord 1000-D stereo tape duplicator system, w/duplicator master transport, master elect, dist unit & slave transport, \$100. R Skelly, 103 Brandywine Ct, Bricktown NJ 08724. 201-840-8136.

Magnecord M90 7.5/15 ips mono, 19" rack mountable, w/amp, power supply (6), rack available, \$50 ea. R Skelly, 103 Brandywine Ct, Bricktown NJ 08724. 201-840-8136.

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Uher 4000 Report L, excel cond, \$100; Magnecord 728, for parts. P Andrus, No Coast Media, POB 261, Chimum WA 98325. 206-732-4085.

Uher 440 stereo Reporter; Ampex 440 2 trk servo transport w/elect. JB Salazar, Missionary Bible Crusade, 102 E Lyon, Baredo TX 78040. 512-722-6832.

Technics RSM85MKII cassette deck, brand new, in box (3), \$500 ea. K Warner, WLOO, 875 N Michigan Ave, Chicago IL 60611. 312-440-3100.

Sony TC155, 10", 5 power settings, line out, PB remote, needs work, \$75. B Sallade, 1108, Stone Dr, Harrison OH 45030. 513-367-2202.

3M/Wollensack 2770 duplicator, 1 master 2 slaves, mono high speed cassette dup, mint cond, \$500. J Diamond, Blue Diamond Studios, Box 102C, Chubbic RD 01, Canonsburg PA 15317. 412-746-2540.

Scully LJ10 1/2 trk PB w/preview elect in Lang roll around console, 15/30 ips w/manual, \$375. R Quan, Foxfur Stds, 2204 Siesta Ln, Santa Rose CA 95404. 707-528-9269.

Ampex 350 FT w/manual, \$500/BO. B Fower, Fower Prod, 38190 Twin Pines Dr, Warrenville IL 60555. 312-393-1179.

Ampex 3200 hi-speed tape duplication system, 10 slaves, 1 master. P Hogan, TM Comm, 1349 Regal Row, Dallas TX 75247. 214-634-8511.

Scully 280 8 trk 1", 7.5-15 ips remote, balanced ins & outs, extra 4 trk set head (1/2"), \$3100. E Mauro, Natl Recdg Std, 3016 Greenmount, Baltimore MD 21218. 301-467-7900.

Alkai GX-4000D 7" R-R, 4 trk stereo, 2 speeds, 7.5 & 3.75 ips, \$90. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

Teac 80-8, DX8, low hrs, excel cond, Teac alignment tape, PB64 patch bay, 5 reels, good used tape, manuals, \$1800. B Busetti, 1124 W 2nd, Florence CO 81226.

Nagra 4SL sync recorders, 1 excel cond at \$5200. 1 gd cond at \$4800. S Smith, Chicago Audio Works, 1005 W Webster Ave, Chicago IL 60614. 312-327-5533.

NEC 3/4" time lapse VCR, \$400 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Revox A77, fair cond, 2 trk, 3.75-7.5, \$400. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Nagra QHP handle, \$25; Nagra QHTP case for IV-S, \$69; Nagra QHTP-C top cover of 7" cover, \$49; Nagra record amp circuit board for IV-S, \$395. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Nagra QSLS synchronizer for Nagra IV-S, \$295; Ampex MR-70-4 4 chan, in near mint cond, BO over \$2500. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ampex 350 elect w/PS, \$25. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

King 680 cassette loader, gd cond, w/spares & manual, \$4000. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Alpha 21, 16:1, hi-speed, mono cass dupl, one copy/pass, one side or both sides simult, man or auto rewind, vgc, \$700. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

VSC Soundpacer, C-4 vari-speed, vari-pitch, speech compression cass rec, AC/DC w/throughput to use w/ext vari-speed rec, new cond, \$125. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Superscope RBC-2, 5 V, 4 C-cells, NiCad battery pack, gd for Sony TX-142 & similar recorders, \$12. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Ampex parts, 351 transport, no capstan motor or heads, \$100; 7.5 3.75 ips motor, 15 & 7.5 ips motor, \$75 ea; AG-350 2 trk elect, \$150 for pair; some Ampex heads, inquire; (2) HB wood rec console w/overbridge for 7" of elect, \$50 ea. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Scully 280, 2 trk, gd cond, wood console avail at no extra charge, \$600/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Revox A77, \$350. B. Surrott, WINA, 501 E Main St, Charlottesville VA 22901. 804-977-3030.

Sony TC 142 mono portable cassette R/P, fair working cond, BO, G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Tandberg TCD 310 cassette stereo R/P, fair, needs work, BO, G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Otari ARS-1000 PB w/25 Hz detector, T Jordan, WFNC, POB 35297, Fayetteville NC 28303. 919-864-5222.

Scully 270 PB 3-3/4-7-1/2 ips (7), \$150 ea. A Tallman, Visual Magic, POB 1789, Pacifica CA 94044. 415-359-4036.

Inovonics 370 excel cond, \$250. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

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Revox B-77, gd cond, recently overhauled at Revox 2 trk, 3-3/4-7-1/2. \$750. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL



Broadcast Equipment Exchange

CASSETTES . . . WTS

Crown 700 FT R-R, like new, \$300. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

3M Series 500, 16 trk 2", 15-30 ips, totally re-built, \$10,000/BO. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Scully 284-B 1/2" 4 track heads & misc. parts - New - Make offer or trade for Ampex 440 B or C electronics. Ampex ATR 100 circuit boards 1/2 price—Ampex PR-10-600 heads 75% off. What do you have to trade? All items in this offer limited to stock on hand.

Teac A3300SX, 7.5-15 ips. \$450 free ship. J Sheperd, Globe Prod, 539 Westminster Ln, Salem VA 24153. 703-389-1670.

Sony 1/4 trk mono R-R (3), \$35 ea. J Lipski, Ind Engr, POB 1456, Lompoc CA 93438. 805-733-2726.

Otari MKII-8 1/2" 8 trk, \$3000 firm. D Marcum, Thin Man Prod, 3204 Bruce, Austin TX 78735. 512-892-4433.

Technics RS886DS portable stereo cassette, AC/battery w/box & manual, vgc, \$150. S Hofmann, Cameron Univ Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Scully 280/2 R-R deck w/motion sensing in portable cases, gd operating cond, \$1100. H Doane, Art Records, 5800 SW 17th Ct, Plantation FL 33318. 305-581-4383.

Ampex AG500 & PR10, several avail, \$300-500 ea. K Peckham, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Telefunken M-15A (2) 2 trk w/cabinet, \$3000 ea. E Sanders, 7th St Snd, 688 S Santa Fe #105, LA CA 90021. 213-627-5392.

Teac A3440 4 chan multitrack simul-sync deck, pro-dbx interface, less than 5 hrs use, \$675. H Doane, POB 15032, Ft Lauderdale FL 33318. 305-584-1904.

Sony AC61 power supply for TCM5000, \$15. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

Want to Buy

Service manual or schematic for Pentagon C-1000 cassette dup. J Newman, Box 7703, Atlanta GA 30357. 404-876-8623.

Ampex 30690-11 or -12 351 elect. ETS Record, POB 932, Honolulu HI 96808.

Ampex 1/2" 4 trk head gate for 300-351 machine. ETS Record, POB 932, Honolulu HI 96808.

Dog house for Ampex 300 roll around cabinet. ETS Record, POB 932, Honolulu HI 96808.

ITC 750 for automation, record not necessary, must have rack mount. C McCarthy, KNCQ, 2551 Park Marina Ste F, Redding CA 96001. 916-244-9700.

Remote control for A77 & Ampex ATR 700's. G Hale, Tag Prods, Box 52, Pratts VA 22731. 703-948-6459.

8/16/24 trk recorder, any cond, also mixer 8/16/24 lines out, any cond. J Price, Price Recdg Std, 2651 Globe, Dallas TX 75228. 214-321-6576.

Teac A-3300SX-2T or similar, units needing repairs will be considered, will also consider Revox A-77, prefer 7.5/3.75 ips versions, pay or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

CONSOLES

Want to Sell

CCA Ultimate, 10 pot stereo; Sparta AS30, 5 pot stereo; Moseley TRC15AR, gd cond, w/manual, 67 kHz boards. B Miskind, KKPW, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3792.

Ward-Back R-1200 on-air console, dual power supply, ESE timer & clock, (2) mic & (1) stereo line input modules, (2) stereo/1 dual mono line out mod, talkback, mix-minus & tape machine controls all included, \$9500 firm. S Boucher, KQKQ, 1001 Farnam, Omaha NE 68102. 402-342-2000.

MCI JH416 16 chan mod w/low noise opamps, \$2000/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Studiomaster 16x8x2, Anvil case, like new, \$1600. B Busetti, 1124 W 2nd, Florence CO 81226.

Russco 505 Studio Master console, mono, BO. K Schipper, KQKS, 9191 Sheridan Blvd, Ste 205, Westminster CO 80030. 303-427-7700.

Sparta 8 ch stereo w/power supply, \$375. B Fouer, Fouer Prod, 38190 Twin Pines Dr, Warrenville IL 60555. 312-393-1179.

Shure M-267, almost new, \$195. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

McMartin B-801, mono, 8 chan, gd cond, w/spare boards, \$650. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

Sony MX-16 8x4 mixer, works fine, OK cosmetics, w/spare pot & service manual, \$175. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

McMartin 5 ch mono mixer, very clean, \$250. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

Automated mix system retrofitable to any console, Optimix disc based system w/40 chan capacity, 32 VCAs in this system, \$10K. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4468.

Gatesway mono 8 pot board, tube type, fair cond; also Collins 212E in fair cond, sell or trade for R-R. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

LPB S13 Signature II, 3 mic, 5 line inputs, meets all specs, excel cond, BO. B Gellhaus, WDVTV, New Market 900, Phila PA 19147. 215-238-3905.

Teac Model 2 6 pot stereo mixer, used in fair cond, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Quantum 12P stereo 12 chan, \$5000. K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

Sparta AS-30B 5 pot, 9 inputs, stereo/mono switch, works good, \$400. G Corey, Morning Show Prod, 3253 Foxcroft Ste 215, Miramar FL 33025. 305-432-6006.

Radio Systems ESA10, new, BO. R Larson, 7560 Hollywood Blvd Ste 306, Hollywood CA 90046. 213-851-4445.

Tascam M30, excel cond, \$650. D Parrott, Water Gulch Prod, 1334 Ironsides, Bremerton WA 98310. 206-377-7687.

Shure M267 mixer, brand new, \$275. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Ramsa WRT820 16x16 monitors, almost new in teakwood, w/meter bridge & patchbay, photos avail, \$6500. J Block, The Production Block, 906 E 5th St, Austin TX 78702. 512-472-8975.

Tascam 512 12x8 mixer, brand new under warranty w/SRC manual, \$2750. F Wyatt, BTM Studios, Box 928, Burnsville NC 28714. 704-675-5685.

Spotmaster 4BEM50, vgc, must sell, BO. D Lilling, 1301 20th St NW Ste 202, Wash DC 20036. 202-331-3833.

API 28x8x24 w/16 echo returns, avail w/r w/Optimix automation. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Optimix console automation system, has 32 VCAs, floppy disc storage, expandable. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

LPB S-13B/8 8 pot stereo, used, gd cond, needs some work. BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Ampex MX35 (3), \$275 ea; Sigma 4 chan (3), \$100 ea; Altec portable mixers/meter 4 chan/master con 1567A (2), \$275 ea/both \$525. L Oliver, 212-874-0274/7660 (PM).

Ramko 8 chan stereo console, new pots, \$999. B Kramer, WQXO, Box 3176, Longwood FL 32779. 305-682-5463.

RCA BC-7 wired for stereo, gd cond, \$2000/BO. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Bogan LOM-5 mic mixer, gd cond, \$75/BO/trade. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Yamaha PM1000 32 input, \$6000 FOB. J Damien, Sheraton Wash Hotel, 2660 Woodley Rd NW, Wash DC 20008. 202-328-2000 X2693.

Teac 15 16 in 8 out tape remotes, \$3000/BO. D Marcum, Thin Man Prod, 3204 Bruce, Austin TX 78735. 512-892-4433.

Sunn audio control board, 24-chan, like new w/custom Nashville road case, \$1800. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

Gates Yard power supplies & monitor amps (4), two rebuilt & in excel cond w/tubes, \$75 ea plus ship & two need minor work w/o tubes, \$30 ea plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Harris Micromac 16 ch, 32 input, stereo, 3 mixdown buses, \$3200. D Tarum, KRZ, 2402 E 37th No, Wichita KS 67219. 316-832-9600.

GE BC-1A power supply, gd cond but needs minor work, \$30 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

BE 55150 5-chan stereo, gd cond, \$1300. S Angrum, WTMX, 317-545-8100.

Gates Yard misc parts, some new, some used, call for details. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

LPB 8 chan stereo, gd cond, \$1000; UREI 1/3 octave mono EQ, needs work, \$100. C Ocean, WIZD, POB 1047, Daphne AL 36526. 205-626-9600.

Want to Buy

Stereo prod board, 8 or 10 chan, gd cond, must be transparent. C Lamb, U of North Iowa, Cedar Falls IA 50614. 319-273-2774.

Tascam 15 or 16 modules. H Henson, Henson Prod, 4569 Havencrest Rd, Winston-Salem NC 27106. 919-924-8717.

DISCO & SOUND EQUIP.

Want to Sell

Sparta A-16-R 15 input mixer, \$550; Shure M67, \$120; Teac 3300SX RR, \$275; RE16 mic (2), \$100. C Elmasian, Tri-Core Recd, 27503 Five Mile Rd, Livonia MI 48154. 427-0832.

KLH Burwen TNE7000A transient noise eliminator, excel cond, rk mt, w/copy manual, \$275. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Studio Tech Ecoplate II, \$1200/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Studio package, 16 input console, 2 trk & 8 trk Scully, D150 Crown amp, Russco TTs, (2) Altec limiters, Fairchild limiter, (2) mixdown speakers, 8 mic booms, cassette recorder, Sony & AKG mics, \$6500. B Burchett, Bur-K Inc, 842 Balfonte Princess Rd, Ashland KY 41101. 606-324-8812.

EMT 140ST reverb plate, excel cond, \$3200. R Vogt, Vogt Quality Rec, Box 302, Needham MA 02192. 617-444-8687.

Delta Lab DL-4 digital delay, \$325; Loft delay line/flanger, \$200; Eventide phaser, \$375; Omni-Craft 4 chan noise gate, \$200; UREI 9 band stereo graphic EQ, \$425; (2) dbx 216 16 chan NR systems w/spare modules, \$2000/16 chan system. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

Valley People rack, (3) Gain Brain II, Maxi Q parametric, \$950; Shure room analyzer, \$175; Linn drum computer, \$1400. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1454.

Orban 245F, (2) brand new, BO. B Salzman, Steves Com, 2695 Regis Dr, Boulder CO 80303. 303-476-8786.

Audio Kinetics 310 cue lock, set up for JVC, MCI, ATR100, \$4500/BO. A Lucciani, National Video Ctr, 460 W 42nd St, NY NY 10036. 212-279-2000.

Shure Pro Master 6 chan, excel cond, BO. A Sutton, WMAA, POB 1380, Moultrie GA 31776. 912-985-1130.

JBL studio monitors, 4311B, \$600/BO for pair. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

Misc Items: Rek-O-Kut S-320 12" tone arm, \$100; AR mdl XB TT, \$30; Bogen SCW-80 sound column speaker, \$195; Denon PCC-1000 crusstalk canceller, \$195; (2) Quad full range electrostatic speakers, \$295. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Vanco IIM-7, stereo/mono audio prod/disco mixer, 2 mic inputs w/pan, 2 TT inputs, 2 line-tape inputs, cue buss, \$100. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-872-1191.

E-V 12TRXB 3 way speaker, \$50. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Laxicon 224 w/all programs loaded, \$2990. R Martens, Solid Sound, 1289 Dixboro, Ann Arbor MI 48105. 313-662-0667.

Misc Items: Shure SR-110 mon mixer, \$175; (2) Shure A102A 70 V xfmr, \$20; Ampex 503 AM/FM tuner, \$50; Ampex portable case for PR-10 & MX-10, \$55; Fisher MPX-200 multiplex adapter, \$25; Garrard Model T Mark II manual TT, \$15. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

dbx mdl 21, brand new, swap for KLH, Burwen, or SAE noise filter, working or not. E O'Brien, Outhouse Recdg, 3041 Crawford St, Terre Haute IN 47803. 812-238-9312.

Pye stereo compressor, discrete transistor design, late '60s vintage, spare parts, w/service manual. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Eventide flanger. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Masterroom reverb mdl MR II, MR III, excel cond, \$250 & \$350. J Von Vleck, Vtech, 2833 Beechtree La, Woodbridge VA 22191. 703-221-6984.

BGW 10, mono 2-way electronic crossover, rack mount, EC w/manual, \$150. S Hofmann, Cameron Univ Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

ARP Odessey keyboard synthesizer, recently removed from service in gd cond, BO or trade. F Vobbe, 706 MacKenzie, Lima OH 45805.

Mobile disco w/Superscope mixer, BSR TTs, 800 W Heathkit amp, custom corner speakers, mirrored ball, black light, pin spots & color wheel, \$1500. J Lipski, Ind Engr, POB 1456, Lompoc CA 93438. 805-733-2726.

DX-8 mint, \$500; dbx 155 mint, \$300; MXR digital delay, \$250; Ursa Major digital reverb & echo, mint, \$1500; Delta Lab DL-2 stereo delay & effects, mint, \$600. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Tapco amp, 260 W. Tapco 4400 reverb, Enter Sound PRV1 reverb, \$60, equip rack on rollers, cheap, BO. D Marcum, Thin Man Prod, 3204 Bruce, Austin TX 78735. 512-892-4433.

6-chan snakes, 100' (2), \$150/both. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

Lang PEQ 2 EQ's (2), \$1000 ea. A Polhemus, Excalibur Snd, 750 8th Ave, NY NY 10036. 212-302-9010.

Deitalab 1024 ADM digital delay, \$175. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

dbx 150 NR unit, rack mounted, \$100. S Steele, Platinum Prod, 815 W Hollow Rd, Greenup KY 41144. 606-473-7279.

EMT 140 plate reverb system, solid-state w/on-board mdl 262 amps, w/manual, excel cond, \$1750/BO. JG Von Vleck, Vtech, 2844 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Pultec EQP1A, \$2250. L Oliver, 212-874-0274/7660 (PM).

Quantec room simulator, like new, \$8000. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Lexicon M93 Prime Time digital delay, \$350/BO. M Fiedler, Mahoney Fiedler Prods, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0018.

EMT 140 stereo tube plate, \$3000/BO. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Want to Buy

Pultec, Sontec, Lang, ITI EQ's. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Will trade new Studer CD player and/or cash for used Pultecs, Lang, program EQ's. D Pelly, Larrabee Sound, 8811 Santa Monica, W Hollywood CA 90069. 213-657-6750.

Klark Teknik DM360, any outboard equip. J Price, Price Recdg Std, 2651 Globe, Dallas TX 75228. 214-321-6576.

LIMITERS

Want to Sell

Texar Audio Prism, (2), \$2800/both. M Wilson, KNOE, Monroe LA. 318-388-8888.

CBS FM Volumax 4110 stereo, BO. K Schipper, KQKS, 9191 Sheridan Blvd, Ste 205, Westminster CO 80030. 303-427-7700.

Harris solid state limiters, \$100. C Haynes, Haynes Com, POB 31235, Jackson MS 39206. 601-948-1515.

CRL SEP 800 limiters, great shape (2), \$1600/pr. P Parks, KHYS, 7700 Gutway Dr, Ft Arthur TX 77642. 409-963-1276.

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LIMITERS . . . WTS

Symetrix 525 stereo/dual gated compressor/limiter, new, manual, \$325. M Gollub, WMJS, Box 547, Prince Frederick MD 20678. 301-535-2201.

Universal Audio BL40 limiter. J Hayes, Programming Plus, Box 90486, San Diego CA 92109. 619-272-7587.

CBS Audimax 4440A, new caps, excel cond, \$400 plus ship. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

UREI LA-4 C/L, gd cond, BO. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

RCA tube type limiter, \$75. M Celenza, WRKQ, 64 Belmont Ave, Plainview NY 11803. 516-681-9535.

Kahn SP58-1A, Symetra-Peak, \$95; Allison Research Kepex 500 (2) & Gain Brains (2) w/PS, \$250 per module; Outer Ear Inc processor, \$1500; Comex 675 II Bleepmate program audio dump, \$1000. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Orban 8100A FM Optimod. K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

Orban 8000A, vgc w/manual & some factory spare parts, \$1750/BO. R Scott, RSS Leasing, 1210 Crenshaw, Eugene OR 97401. 503-343-0118.

Marti CLA-40H AM/FM limiters, vgc, (2), \$200 ea or \$300/both, or BO. 203-357-7847.

Orban 9000A, \$2000. G Smith, WDUJ, POB 10, Gainesville GA 30503. 404-532-9921.

UREI LA5, similar to LA4, w/rack mt, \$250. E Helvey, Ed Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Orban 8000A, \$700. R McKay, KXRB, 3205 S Meadow, Sioux Falls SD. 605-361-0300.

CRL APP400 audio prep proc, SEP400A 4 band unit, PMC300A peak mod controller, avail in Aug, in use 5 yrs, working, BO. J Hill, WPTW, 1625 Covington Ave, Piqua OH 45356. 513-773-3513.

Harris MSP-90 AGC stereo \$900. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

CRL SMP-800 excel cond, \$1000; CRL SPP-800, excel cond, \$1000; CRL APP-400, excel cond, \$800. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Aphex Compellor, like new. T Jordan, WFNC, POB 35297, Fayetteville NC 28303. 919-864-5222.

UREI 1178 6 mos old, perfect cond, \$600. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Harris MSP-90 FM limiter stereo, \$900. F Grundstein, WRHU, Hofstra Univ, Hempstead NY 11565. 212-415-2616.

CBS Audimax limiter, works fine, \$200; CBS 4450A stereo Audimax, works fine, \$400. M Dailey, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

Altec 438A/436C compressor line amps, (2) 438A, (1) 436C, mike in, \$125 ea. W Slaten, 424 Grant Ave, Scotch Plains NJ 07076. 201-322-7269.

Dorrough 610 digital tri-band processor, \$2100/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

RCA BA6A tube limiter, \$500. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

Optimod 9100 stereo, in service, 2 yrs old, works fine, \$5000. Eng Dept, POB 3131, Modesto CA 95353. 209-523-7756.

Fairchild Conax 600 mono, \$275; Gates Stay-Well M5167, \$250. L Oliver, 212-874-0274/7660 (PM).

Audimax 2RZ AGC, \$150. B Van Prooyen, WYJR, 1055 28th St SW, Wyoming WI 49509. 616-532-1168.

Want to Buy

FM stereo limiter/processors, tri-band pref, repairable cond okay. B De Felice, De Felice Consulting, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

Teletronic LA2A compressor; Fairchild 660, 670 compressor. D Kocher, 1901 Hanover Ave, Allentown PA 18103. 215-776-1455.

Orban FM Optimod gd working used unit. J Young, WYTM, POB 717, Fayetteville TN 37334. 615-433-1531.

UREI/Teletronics LA-2A or Fairchild tube limiters. R Bledsoe, Bledsoe Assoc, 118 Stephanie Pl, Goodlettsville TN 37072. 615-859-4189.

Audimax CBS 4450, stereo. D Proctor, WCPE, POB 828, Wake Forest NC 27587. 919-556-5178.

MICROPHONES

Want to Sell

Neumann U-47NV (2) excel cond, consecutive S/Ns. R Vogt, Vogt Quality Rec, Box 302, Needham MA 02192. 617-444-8687.

Telex CS61 (2) combo headphone/mic, gd cond, \$50. B Wilson, WEWO, POB 529, Laurinburg NC 28352. 919-276-2911.

AKG C414EB (2) recently refurbished, like new, \$1100 for both. R Quan, Foxfur Stds, 2204 Siesta Ln, Santa Rosa CA 95404. 707-528-9269.

EV RE, mint cond, \$250; MB Pearlless S20 mics w/PS, mint cond, \$500 for pair incl P/S. J Diamond, Blue Diamond Studios, Box 102C, Chubbic Rd RD1, Canonsburg PA 15317. 412-746-2540.

AKG 451EB (2) brand new, \$300 ea; AKG CK-22 Omni Capsule, brand new, \$100. J Diamond, Blue Diamond Studios, Box 102C, Chubbic Rd RD1, Canonsburg PA 15317. 412-746-2540.

E-V 665 mics (2), dynamic cardioid, \$199/pr. J Sunier, Audiophile Audition, 21 Stetson Ave, Kentfield CA 94904. 415-457-2741.

Shure 556A, orig, gd cond, \$150/BO. D Guidry, Sound Concepts, 1113 Jackson St, Alexandria LA 71301. 318-473-4170.

Crown PZM w/E-V 2 chan phantom PS, new, \$250. D Guidry, Sound Concepts, 1113 Jackson St, Alexandria LA 71301. 318-473-4170.

Sennheiser ME20; ME40; ME80 plus K3V, sell separate or as package. S Rosenthal, Rosenthal Prod, 3145 Geary Blvd Ste 344, San Fran CA 94118. 415-865-1035.

Sennheiser MKH816 P48, \$700. S Smith, Chicago Audio Works, 1005 W Webster Ave, Chicago IL 60614. 312-327-5533.

Milab DC-63 condenser, 44 patterns, gd cond (4), \$550. F Horton, Horton Systems, 1268 Chesapeake Dr, Lilburn GA 30247. 404-923-5825.

Panasonic WM1300, 1500 & 1600 series bdc-grade assortment. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Schoeps MK-3 (2) omnidirectional capsules, \$195; Sony ECM-989 stereo mic system, \$275; Neumann SM-69 stereo mic system, \$1695; (2) Neumann EA-47 elastic suspension for Neumann U 47fct, \$85; Neumann Z-240 M-S stereo matrix xfmr, \$395/pr. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Shure 300 (2) ribbon bidirectional mics, \$115; Sennheiser MKH 416 P48 shotgun mic, \$525; Shure 50AC telephone coupler mic, \$20; Neumann N48K AC PS, \$250. C Richardson, Richardson Recdg, 1938 Baltimore Annapolis Blvd, Annapolis MD 21401. 301-757-3733.

Crown PZM (2) lavalier mics, mint cond, never used. S Pizzi, Connie Goldman Prod, 3034 M St NW, Wash DC 20007. 202-822-2483.

Superscope EC12B (6) electret condenser, lapel mics, gd cond, \$22 ea/all 6 for \$120. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Neumann U47, \$800. E Luciani, Natl Rec, 480 W 42nd St, NY NY 10036. 212-279-2000.

E-V RE-16 w/holder, windscreen & metal case, vgc, \$125 plus ship. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Neumann U47 power supply & stand, \$3250. L Oliver, 212-874-0274/7660 (PM).

E-V CO90 (5) lavaliers, BO. C Springer, KLMR, POB 890, Lamar CO 81052. 303-336-2206.

Altec (WE) lip stick condensers (3) w/cable & holder & amp, \$150 ea. SA Cisler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

Altec 21B Coke Bottle tube mic w/electr complete, gd cond, not working, \$150. N Carlson, Mobile Snd Group, 721 W Melrose, Chicago IL 60657. 312-871-7459.

Neumann U67 w/PS, new tube & capsule, immaculate, \$1500. N Jameson, Jameson Assoc, 1254 Hopkins Terr, Atlanta GA 30324. 404-633-4308.

E-V 635 w/stand clamp, gd cond, \$50. S Hoffmann, Cameron Univ Theatre, 2800 W Gore, Lawton OK 73505. 405-581-2428.

Want to Buy

RCA 77DX mic, working or not. ETS Record, POB 932, Honolulu HI 96808.

RCA 44DX. T Schnitt, Schnitt Assoc, 1327 Destination Ln, Virginia Beach VA 23454. 804-496-0099.

Neumann mics, all models, any cond, working or not, access also. S Rosenthal, Rosenthal Prod, 3145 Geary Blvd Ste 344, San Fran CA 94118. 415-865-1035.

Shure SM5B, Sennheiser 441. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

MISCELLANEOUS

Want to Sell

MPA Industries K-55 speed gun, perfect for race coverage, \$650. D Murray, WPRQ, POB WPRQ, Kingsport TN 37663. 615-239-4745.

Fifty years of catalogs, Allied, Lafayette, Radio Wire TV, G-R, H-P, Tek, World Radio, McGee, Olson, Radio-Masters, General Radio Experimenter, Dumont Oscillographer, SASE for list. F. Yonker, 7 Old Farms Rd, Saddle River NJ 07458.

Keppco 19" rack mount regulated power supply, variable 0-50 V at 5 A, mint cond, \$135/BO. P Davis, Davis Radio, POB 615, Manasquan NJ 08736. 201-974-2180.

AP news wire paper, 8" wide, 12 rolls per box, 10 boxes avail, \$15 per box plus frt. D Smith, KKLK, Box 460, Rapid City SD 57709. 605-343-6161.

RCA, GE, Tamaphone portable & mobile misc gear. J Hayes, Programming Plus, Box 90486, San Diego CA 92109. 619-272-7587.

Steel racks, (6) 6' open, \$40 ea. R Skelly, 103 Brandywine Ct, Bricktown NJ 08724. 201-840-8136.

Metal audio rack, 67" high, 61" of rack space, has back door, black, BO. B Franklin, Franklin Assoc, POB 110194, Birmingham AL 35211. 205-787-0756.

WE 111C audio transformers, (5), gd cond, \$25 ea. N Beatty, Bdct Tech Assoc, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

Adhesive-Backed Lettering computer generated for labeling, advertising, call letters, etc. Many colors, typesizes & heights from 1/2" to 12". Send for free brochure. Kelly Graphics, 4720 Montgomery St, Annandale VA 22003.

Equip rack, BO. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Trompeter J13-75 gold video jacks & other series jacks, call for list. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Gates/Harris plate transformer for BC5P2 5 kW AM xmr, sell or trade, gd cond. C Freinwald, KNBQ, POB 11000, Tacoma WA 98411. 206-383-9700.

ITT 14 phone interoffice comm system w/amps, \$475 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Patch panels (25), tip ring, sleeve, normalled top to bottom, 3 dbl rows of 12 pairs or 24 single jacks, ideal for stereo, wire wrap, \$50, solder type \$35 plus ship, all in vgc. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Radio Shack 64K color computer & TP-10 40 column printer, w/word processing program, \$150 plus ship. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Jack strip, 52 RTS, dbl closed-circuit jacks, all grounds normalled, gd cond, \$100; UTC xfmrs: A21 500/500 ohms, A22 50,200,500/50,200,500 ohms, A24 15K/500,333,200,125,50 ohm, A39 600,150/2K,500 ohms, \$20 ea/all 6 for \$100; UTC A33 20 dB magnetic shields, \$10 for both; (2) EV 502 line xfmrs, \$12.50 ea/\$20 for both; Shure A86A line xfmr, \$12.50. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Elgin ERC 19522-1 telco answering machine, like new, BO. M Edwards, KSP, Box 137, Maple Glen PA 19002.

Record-A-Call 560, not remoted, vgc, \$60 ea plus ship; CC BRA telco answering unit, new, never used, \$70 plus ship. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Centronic 588 132 column printer w/serial interface & manuals, \$100 plus ship. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

ASR-33T send & receive teletype w/punch tape maker/reader, numerous rolls of paper, punch tape, ribbons, worked when removed last year; 3M Secretary, Alpha II photocopier, needs work, BO. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

Want to Buy

WE 111C repeat coils, gd cond, \$25. B Umberger, WNL, 51 S Main Ave, Clearwater FL 33575. 813-446-0957.

Plate transformer for 300 W FM xmr, 220 single phase, 5000 V sec (approx). R Wright, WLLX, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-2916.

Variable vacuum caps, Henry Radio lin amp 2 kW, copper weld wire for HF ant, ant hardware. NDXE Eng, Box 569, Opelika AL 36801. 205-749-1898.

Jingles, looking to trade PAMS/JAM, also looking for original boxed. 203-357-7647.

Roton 1B1 blower CX33A3G for Sintronic. G Erway, KBOG, Rt 2 Box 268, Cordell OK 73632. 405-832-5332.

MONITORS

Want to Sell

RCA BW74 FM stereo monitor, \$300. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

McMartin TBM 3500 FM mod mon, 88.3 MHz, gd cond, w/manual, \$100 plus ship. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

McMartin TBM4500A excel cond, just taken out of service, \$600. G McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

Belar AMM1 AM mod monitor, \$575/BO plus ship/trade for FM processor. B De Felice, De Felice Consulting, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

Harris 75-80 gd cond, on 92.1 w/manual, \$750/BO; Harris 77-80 mono, gd cond, on 92.1, w/manual, \$450; Harris RF amp on 92.1, gd cond, w/manual, \$300. P Wolf, WVHG, 329 S Main St, Labelle FL 33935. 813-574-5548.

Want to Buy

McMartin TBM4000 FM mod multiplex monitor at 89.3 MHz, \$200. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Belar RFA-1 FM RF amp, 2 yrs old, \$300. G McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

Stereo mod monitor in gd cond. H Haley, KATX, POB 1236, Livingston TX 77351. 409-327-8916.

Belar RFA-1 FM RF amp, 2 yrs old, \$300. G McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

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MOVIE . . . WTB

Want to Buy

C-mount, 16mm, prime lenses, all makes 16mm Molex camera bodies, Molex underwater housing & lettering for titling. H Deans, Deans Prod, 170 Grand St, White Plains NY 10601. 914-949-5920.

RECEIVERS & TRANSCEIVERS

Want to Sell

Shortwave receiver, BC-348Q, 200-500 kHz, 1.5-18 MHz, \$35; RCA CMV-1A, crystal controlled FM xmit/rcvr, \$35. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Regency 450 MHz FM 2-way, 1 HT & 1 mobile, crystals for 450.55, vgc, \$600 for all or \$350 for HT & \$370 for mobile. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

Want to Buy

Antique tube type shortwave receivers for demo & display purposes, no junk, working only. NDXE, Box 569, Opelika AL 36801. 205-749-1898.

VHF transceiver, 145.01 MHz, crystal control pref. T Webb, WXXQ, Hc87, Box 1085, Whitesburg KY 41858. 606-633-4434.

REMOTE & MICROWAVE EQUIP.

Want to Sell

S-A DAT-32, trade 7.5 kHz audio card for 15 kHz audio card. S Wildeman, KLG, 1221 Fort St, Buffalo WY 82834. 307-684-2584.

Chevy 1975 G30 ENG van, equipped w/45' mast, 4kW gen., new tires, ball joints, breaks, no rust, runs great, \$4700. Paul Grzebek, Hy James, 24166 Haggerty Rd, Farmington Hills MI 48024. 313-471-0027.

Will-Burt 45' pneumatic mast, model 8-45PAVX, \$3200. Paul Grzebek, Hy James, 24166 Haggerty Rd, Farmington Hills MI 48024. 313-471-0027.

Cybernet 12V remote pick-up 2-way radios (4), like new, \$250 ea. R Sherwood, WPSL, 9344 S US 1, Port St Lucie FL 34952. 305-335-8800.

Gabriel microwave dish, 10', no mount, \$100. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

TFT 7601 remote control, in use, works fine, \$1500/BO. S Holladay, KABF, 1501 Arch St, Little Rock AR 72202. 501-372-6119.

ITC FB-1 phone interface (4), brand new, \$120 ea or \$400 for all. D Murray, WPRO, POB WPRO, Kingsport TN 37663. 615-239-4745.

Andrew LJT-50A 10-1000' rolls, new, \$3/ft. R Wurst, Wurstex Tower, POB 227, Gainesville TX 76240. 817-665-0485.

Gentner VRC-1000, 16 chan dial-up R/C system (2), w/battery back-up & interfaces, one never used, other used for 2 months during studio move, \$3000 new one/\$2500 used one, or \$5000/both. S Boucher, KQKQ, 1001 Farnam, Omaha NE 68102. 402-342-2000.

Moseley remote control wirelay panel for FM subcarrier use, older model, gd cond, sell or trade. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

Fairchild Data Dart 384 satellite recr & down converter, setup for ABC, CBS & NBC, \$2750. T Zuk, KIAM, Box 474, Nenana AK 99760. 907-832-5426.

Moseley MRC 1 w/autolog option & teletype 43 printer, BO. D Solinsko, WSYR, 2 Clinton Sq, Syracuse NY 13202. 315-472-9797.

Marti STL8 xmit, R200-950 rcvr, dual STL, working when removed, sell or trade for any composite STL. P Rebmman, WVFM, Box 827, Lakeland FL 33802. 813-682-4191.

Moseley TRC15 in gd cond, Hallikainen & Friends digital field charge, BO. K Lincoln, WIZN, Stevens House Box 123, Vergennes VT 05491. 802-877-6800.

Micro Controls subcarrier gen tuned to 23 kHz, in service less than a year, \$500. W Stockdell, KDYG, Box 1713, Big Spring TX 79721. 915-263-7326.

MRP-1 ABC talk radio cue decoder w/printer card, \$750. R Ericson, KMA, Box 960, Shenandoah IA 57601. 712-246-5270.

Want to Buy

RPT 15 or RPT-2 RPU system. B Zellmer, KRZD, POB 2224, Greeley CO 80632. 303-351-8354.

TSL system, Moseley pref, 450 MHz band. J Howell, Howelle Audio, POB 6184, Kingman AZ 86401. 602-753-3054.

Marti RPU wanted. CD Gray, WROX, 125 3rd St, Clarksdale MS 38714. 601-627-7343.

Wegener interface, receiver, demod LNA to receiver Transtar formats, have S-A digital rec, demod, fun cards for CBS, WBC, ABC, Mutual, will work a trade. B Hoisington, SMC Automation Southeast, POB 1776, Andalusia AL 36420. 205-222-8849 (1-6 PM).

STATIONS

Want to Sell

CP, FM radio station, sell or trade. G Lack, 205 N Second St, Thayer MO 65791. 417-264-7266. (M-Th)

Profitable businesses for sale by owner, established/successful, gd terms, owner financing. West & Midwestern states. Affiliated Business Consultants, Paul Grillos, Colorado Springs, CO. 303-630-8188.

Atlanta area, 1 kW DT AM, appl made to go 2.5 kW, approx 4 acre tower site, recently renovated 1500 sq ft, off bldg in 1/4 acre bus dist, new bldt & prod equip & more. D Brown, WSPZ, 8470 Hospital Dr, Douglasville GA 30134. 404-920-1520.

FM 65 kW, 1 kW daytimer in Texas 125K cash, assume note at \$800/mo. Call 806-259-3701 aft 7 PM.

AM/FM combo in North Texas, Class C FM, \$125K cash. 806-259-3701, aft 7PM.

Want to Buy

MBE interested in CP or starter AM or FM in Oregon. N Parke, Parke-Reyes Co, POB 1583, Portland OR 97207. 503-293-0353.

FM CP you can't build? Don't want? Running out of time? I may be interested. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

AM or FM or combo station wanted in East or SE, positive cash flow or break even w/growth room, must finance at least 50%. L Manning, Manning Bdct Assoc, POB 81, Westhampton NY 11977.

STEREO GENERATORS

Want to Sell

Harris MS15R stereo gen, \$1000 or trade for Orban 8000 Optimod. B Umberger, WNLT, 51 S Main Ave, Clearwater FL 33575. 813-446-0957.

Moseley SCG-9, like new, \$500. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Wilkinson stereo gen, new, not used, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Want to Buy

Kahn stereo gen. NDXE Eng, Box 589, Opelika AL 36801. 205-749-1898.

Motorola AM stereo system, gd cond. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

SWITCHERS (VIDEO)

Want to Sell

Panasonic WJ-5000P color SEG, 2 buss, 5-in, 9 wires, 19" EIA, requires ext drive 7 sync (no blk burst), excel cond, no manual, \$135. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

TAPES, CARTS REELS

Want to Sell

BPI pop vocals, 45 reels. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

Fidelipac Master carts (1000), mostly 3-5 min, vgc & tape quality, large lots only \$1.50 ea, BO on entire lot. S Schneider, WBMX, 408 S Oak Park, Oak Park IL 60302. 312-524-3240.

3M-Scotch 206, 208 & Ampex 632 1/4" on 5", 7" & 101/2" reels-repro. Also available Ampex 406, 456, 3M 250 & Agfa 469 2" audio tape w/no splices & with one splice. Also available Ampex 406 & 456 1" audio tape with no splices. Call for prices. Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572. 1-800-331-3191 or in NYS 516-678-4414.

3M tape & access, new, 206 1/4", \$9 & \$7; 207 1/4", \$12 & \$10; 226 1", \$45; reels 1 x 10.5 box \$7; leader & splicing tape 1/2" & 1", \$6. India Navigation, 177 Franklin St, NY NY 10013. 212-219-3670.

Capitol AA3 (22) 3.5 min carts, brand new, \$2 ea. P Christenson, WIVY, 3101 University Blvd S, Jacksonville FL 32216. 904-721-9111.

Carts, clean & in gd cond, misc lengths & types, approx 600 Fids, M-C, AZ, etc, buy all or you pick. BO. B Stoehr, WQBQ, POB K, Leesburg FL 32749. 904-787-1410.

Fidelipac Master carts, large selection of red & gold M Guthrie, 540 Reo St, Tampa FL 33609. 813-855-5642.

Hundreds of gd used 7" reel tapes, BO on any quantity. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Aristocarts, 8-1/2 min, numerous, all new, BO. J Emmel, Emke Media Enter, POB 401, Olyphant PA 18411. 717-383-1118.

NAB reels, 10-1/2" metal, 1/4", all in gd cond (1-10) \$1.50, (10-100) \$1.25, (100 plus) \$1.00. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Nostalgic radio commercials on 5" reels, approx 100, \$100. M Kamtorowitz, WPOB, 50 Knickerbocker Rd, Plainview NY 11803. 516-822-6915.

Fidelipac gray, HOLN tape (350) all w/AC stereo music various lengths, buy all or some. M Andrews, KFMD, POB 5003, Des Moines IA 50306. 515-282-1033.

Want to Buy

Aristocart wanted for rebuilding, will pay 25' ea. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelius OR 97113. 503-357-6120.

Rock and/or Country oldies from 50's & 60's record library, no cassettes, must be in gd cond. B Coleman, WIST, POB 460, Lobehville TN 37097. 615-593-2294.

Goon Shows, any format for non-broadcast use. C Koefis, Requoyssance, 2820 Raymond Ct, Falls Church VA 22042. 703-237-2590.

Old musical ET libraries, 16" arms, RCA or WE universal pickup cartridges. SA Cisler, 2405 Hermitage Way, Louisville KY 40222. 502-458-7420 aft 11 AM.

TAX DEDUCT. EQUIP.

Eng student desiring donation of bdct equip (anything), EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Video prod equip, esp 3/4" editors, cameras, lights. G Urban, Wholesome Prod, 314 W 52nd St, NY NY 10019.

New non-profit church station needs complete FM facility to begin bdctg, need xmitr, 5 kW or less, STL, antenna, 8100A Optimod, TTs, console, R-R's, cart machines. C Sepp, Church Life Comm, 536 Grand Ave, Schofield WI 54476. 715-355-5151.

Non comm FM seeks tax deductible donations of low power xmitrs & exciters. D Sparano, WBCR, Siena College, Loudonville NY 12211. 518-783-2990.

Helix or hard line, 400', 1/2" or 7/8" 50 ohm for 2 meter amateur repeater. D Pichard, Oakdale Rd, McComb MS 39648. 601-684-3654.

Tax exempt foundation requires video prod equip, especially 3/4" editors, cameras, lights. Wholesome Prod, 314 W 52nd St, NY NY 10019.

TEST EQUIPMENT

Want to Sell

Rust AL-100 autolog xmitr chart recorder w/AP-12 alarm panel, \$100. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Sound Technology 1700B distortion analyzer, \$1000; Sound Technology 1000A FM generator, \$750. G Bell, GV Bell & Assoc., POB 1762, San Mateo CA 94401. 415-366-5240.

Bird water cooled, 7.5 kW RF dummy load w/water pump, \$350. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

Potomac Inst FIM-21 field intensity meter, excel cond, \$1500; G-R 1606A RF bridge, gd cond, \$800; G-R 1211-C unit osc w/WPS, covers 0.5-50 MHz, gd cond, \$125; Bird elements for 1-5/8" line section, 10KB1 10 kW element & 500B1 500 W element, gd cond, \$15 ea. N Beaty, Bdct Tech Assoc, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

Potomac 2 tower antenna monitor, AM-19 (204), excel cond, sell or trade for studio and/or RF equip. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

H-P 330B dist analyzer, \$300. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.



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Any company or station can run "Help Wanted" ads at the flat rate of \$18 per listing per month (25 words max). Payment must accompany insert; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$2. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for display rates.

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Any individual can run a "Position Wanted" ad, FREE of charge (25 words max.), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$2 fee which must be paid with the listing (there will be NO invoicing). Responses will be forwarded to the listee, unopened.

Check as appropriate: Help Wanted With Box Number
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Address _____
City _____ State _____ Zip _____
Telephone _____

BROADCAST EQUIPMENT EXCHANGE
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FALLS CHURCH VA 22041



Broadcast Equipment Exchange

TEST ... WTS

Sync gens, BO: Tek waveform monitors, BO. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Potomac FM21 mint cond, \$1500. D Murray, WPRQ, POB 5715, Kingsport TN 37663. 615-239-4745.

Heath IM-58 dist analyzer, gd cond, w/manual, \$125; Heath SG-18A audio gen, gd cond, w/manual, Heath assembled, sine/square, \$125; Ramsey CT-125 freq counter, gd cond, w/audio probe, \$150. P Wolf, Wolf Engineering, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

Elcom Eng Model 300, standard freq rec & mon system, \$300. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Waveforms 452A, trans measure set, \$100; Yaesu Musen YC-355d, freq counter, nixie-tube, 35 MHz/30-200 MHz, \$100. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

Heath IM-4110 freq counter, gd cond, Heath assembled, \$150. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Matec exponential gen, \$275 plus UPS; Delray 1 48 VDC power supply, \$60 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

EICO 460 scope, \$50. M Persons, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

HP DC differential voltmeter & ratio meter, \$260 plus UPS; Erdac 1200A transient recorder, \$475 plus UPS; Weston Rotek RMS DC converter, \$280 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Federal 101-C field strength meter, operates on cigarette lighter option. JB Crawley, WLBK, POB 185, Campbellsville KY 42718. 502-465-8884.

H-P 332A dist analyser, RF detector input, \$300/BO. J Groh, Howe Tech Corp, 2300 Central Ave #E, Boulder CO 80301. 303-444-4693.

Tek 514AD scope w/cart, \$500. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Tek R140 NTSC test signal gen & sync gen, new 678. G Boldenow, KJRG, 316-284-2535.

Datapulse 120 pulse gen, HP-3340A DVM, Eico 470 scope, BO, J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Want to Buy

McMartin TX300 FM mod monitor calibrator &/or manual or copy. R Meyers, Benchmark Comm, 4700 SW 75th Ave, Miami FL 33155. 305-376-2128.

TRANSMITTERS

Want to Sell

LPB carrier current, 20 W AM at 1610 kHz crystal controlled, BO. K Kraska, WDBN, 1719 Kingsley Ave, Akron OH 44313. 216-869-9640.

SUPER-GEN

This high-performance FM Stereo Generator has selectable pre-emphasis, overshoot-controlled lowpass filters, digital pilot/subcarrier synthesis and built-in overmod protection. CBS/NAB's "FMX" system is available as a plug-in option.



RCA BT-F-5B, 5 kW FM, some spares & manual, \$5000; Gates TE-1 FM exciter, mono, w/spare audio, mod/osc, AFC modules, 7 transistor kit, \$500. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

CCA 10 kW FM, solid & reliable. P Anderson, KZBQ, POB 97, Pocatello ID 83204. 208-234-1290.

OVER 100 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FMs: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

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214-276-9725

CCA 10DS 10 W exciter, \$450; Adler 100 W RA-7 translator, \$600. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TTU12 12 kW UHF, chan 49, w/spare xmt for parts, \$20,000. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

RCA TTU 12 kW on chan 49, w/spare xmt for parts, \$20,000/BO. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.



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San Diego, CA 92101
619-239-8462
Telex 229882LJMUR

QEI 675 20 W FM exciter, excel cond. B Wood, WNEG, 100 Blvd, Toccoa GA 30577. 404-886-0032.

Gates BC1G, 1390 AM, w/all manuals & recent proofs, replaced by Aug '86 w/5 kW, \$2000/BO. P Fretwell, KBBO, POB 9188, Yakima WA 98909. 509-248-1390.

RCA BTA-1R, 1 kW AM, \$2500. D Miller, WNOE, 529 Bienville, New Orleans LA 70130. 504-529-1212.

LPB 5 W AM, couplers available, BO. R Furby, 3647 Tudor Way, Albany OR 97321. 503-928-4857.

Powerpak SMX-40, 40 W exciters, factory tuned & tested, fast service, brand new, \$2000 ea. J Phillips, All American Bct, 414 Washington, Defiance OH 43512. 419-782-8591.

Harris/Gates BFE10G3 FM 10 W stereo exciter, 90.3 MHz & Gates FMC-1A single section FM antenna, \$2000. M Rahoff, WMSC, Montclair State College, Student Center Annex, Montclair NJ 07043. 718-591-0002.

Wilkinson FM 1500E FM xmt, new, crated, BO; Gates FM 1-G FM xmt, used, in service, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

RCA BTA5H 5 kW AM, gd cond, manual & spare parts, 550 kHz. G Smith, WDUN, POB 10, Gainesville GA 30503. 404-532-9921.

Wilkinson FME-10 exciter, good cond, in use, BO; QEI 675 exciter, new, never used, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Harris FM20HZ 20 kW w/filter & PS, orig, gd shape, BO. B Wood, WNEG, 100 Blvd, Toccoa GA 30577. 404-886-0032.

Collins 300J 250 W AM, old but vgc, must move, \$400. D Doelitzsch, WDDD, 1 Broadcast Ctr, Marion IL 62959. 618-997-8123.

Gates Vanguard 1 for parts. M Young, KBRIK, Box 97, Brookings SD 57006. 605-692-1430

RCA BTA 50F, excel cond, recently out of service, you remove & ship, \$18,000. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

BE FM30A nearly new, 93.3 MHz, BO. C Springer, KLMR, POB 880, Lamar CO 81052. 303-336-2206.

Stallatron FX2 stereo, 200 mW output, \$150. J Titus, Trus Assoc, 566 Briarcliff Rd, Pittsburgh PA 15221. 412-243-1674.

RCA BTE-10C FM exciter, \$75/BO. A Soroka, WJRO, POB 159, Glen Burnie MD 21061. 301-761-9220.

Gates/Harris BT-100H; M-6652 chan 8 100 W TV xmt (2), clean repairable, \$6500/both. M Murphy, 11621 Valle Vista Rd, Lakeside CA 92040. 619-561-2726.

Gates BC-250GY-1 1520 kHz, gd standby xmt, BO. P Stage, WKVI, Box 12, Knox IN 46534. 219-772-6241.

Sintronix SI-F-25 27.5 kW FM, remove from svc late June w/spare parts, BO over \$12K. G Brandenburg, WKQQ, POB 100, Lexington KY 40590. 606-252-6694.

Harris BC1H 1 kW 1450 AM, excel cond, BO. B Mishkind, KFKX, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3797.

RCA BTA 5F 5 kW AM, excel cond, recently out of service, you ship & remove, \$10,000. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

GE BF2A 3 kW FM, new CSI exciter, vgc, lots of spares, BO. S Callahan, WF1T, 1120 Pinalias Bay Way #103, Tierra Verde FL 33715. 813-866-2478.

RCA BTA-5F mod transformer, new in crate, \$600 plus ship. G Heidenfeldt, 2880 Lake Rd, Wilson NY 14172. 716-751-6187.

Want to Buy

FM translator, tunable to 92.1 MHz. K Browall, KTRZ, Box 808, Riverton WY 82501. 307-856-2922.

FM translator, any model. R Wright, WLLX, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-2916.

RCA BTA1R1 or 1R2 AM. R Eugene, Radio Citadelle, 610 W 141 St, Apt 5A, NY NY 10031. 212-862-1298.

Tepco or TTC, 10 W dual-output translator, used. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

FM translator & solid state FM xmt. R Peters, Lahaina Bct Co, POB 10712, Lahaina HI 96761.

Late model 5 kW AM xmt, any make. H Haley, KATX, POB 1236, Livingston TX 77351. 409-327-8916.

Carrier current equip, transmitters & couplers & RF amps. P Remaker, WQHS, 3905 Spruce, Phila PA 19104. 215-898-9553.

Spare TE3 exciter or parts. D Sparano, WBCR, Siena College, Loudonville NY 12211. 518-783-2990.

Harris MW10 AM xmt or similar. H McDonald, KKMT, Box 710, Ennis MT 59729. 406-682-7171.

AM 1 kW prefer RCA 1MX or Collins 20V2 or 20V3, fixer uppers OK. B Dodge, WTJJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

Xmt, 1 kW, preferably use 4-400 & 5-500 tubes. R Lopez, RF Specialty Prod, 4214 San Pedro, San Antonio TX 78212. 512-736-6116.

Operating manual for a AEL 10 kW xmt. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

High band VHF, 100 W to 5 kW, any make or model, driver to higher powered xmt OK. J Powley, WILM, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

TUBES

Want to Sell

VA221H klystron for radar, tested OK, \$75; 5AHP7A CRT for scope, \$15. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 57301. 712-262-1240.

4CX5000-R tested, \$600; 5762 tested, \$300, both full emission. J Cunningham, Radio YS-DA, Rt 2 Box 113 B, Stonewall OK 74871. 405-265-4496.

TURNTABLES

Want to Sell

Gray 16" transcription arms, (3), \$75; Gates M6244 transistor equalized preamps (2), \$150. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

QRK 12C w/Micro-Trak tonearm, \$150/BO. L Houck, Rollin Recdg, 210 Altgelt, San Antonio TX 78201. 512-736-5483.

Technics SP15 w/base, \$500. H Quinton, BRT Recd, 275 E Oakland Pk Blvd, Ft Lauderdale FL 33312. 305-925-7117.

Harris CB1200, Micro-Trak arms, gd cond, \$150 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33909. 813-574-5548.

Ruasco Studio Pro Model B, 2-speed, made by QRK w/Gray Micro-Trak tone arms, no cartridges. K Deans, Rollins College, 1000 Holt Ave, Winter Park FL 32789. 305-646-2479.

Shure BC70 (2) cartridges, brand new, 3 styli with each, \$35 ea. C Daniel, KNCB, POB 1072, Vivian LA 71082. 318-375-3279.

Ruasco TT, gd shape, blue in color, \$75. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

QRK 3 speed, Micro-Trak 303 tonearms (2), \$140 ea. B Wolfe, WMPC, Box 104, Lapeer MI 48446. 313-664-6211.

Henry Eng remote TT controllers, (2) new cond, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Technics SL-1200 stereo TTs (2) one with one w/ phono cartridge, vgc, BO. G Gerard, WIHS, Box 117, Middletown CT 06457. 203-346-3846.

Scully record cutting lathe transcript model J w/Westrex model 2B recording head, amp, preamp & elect. S Barnard, Imperial Int, POB 548, Kankakee IL 60901. 815-933-7735.

Want to Buy

Technics SL1500 in gd cond. K Thomas, KTYK, 115 W Broadway Ste 501, Ardmore OK 73401. 405-226-7777.

VIDEO PRODUCTION EQUIPMENT

Want to Sell

ICM CG7000P character gen, like new, \$1800. H Donnell, Creative Video Prod, 211 Windsor St, Reading PA 19601. 215-378-0994.

Panasonic 9" color monitors, \$225; Panasonic twin B&W monitors, \$295; Sony RM-430 editor, \$395; video prod special effects switchers, \$795; video patch panels, BO. C Haynes, Haynes Comm, POB 39206. 601-948-1515.

Sony AC148 power supply (3) in mint cond, \$100. J Diamond, Blue Diamond Studios, Box 102C, Chubbic Rd RD1, Canonsburg PA 15317. 412-746-2540.

RCA TFS-121 frame sync, w/video compressor, remote control & manual, BO. J Smith, On Mark Eng, 11925 Woodland, Olathe KS 66061. 913-764-4226.

Knox K-60 character gen, 4 pgs memory, flasher, generates characters over video, gd cond, \$450. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

Faroudja Record 1 image processor w/comb filter & pilot tone, excel cond, \$795. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Cohu sync generator w/Modern Video Eng B&W to color adapter. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Crosspoint 6008B sync gen system, 4 independently phase adjustable pulse amps, gd cond, \$895. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Harris 690 frame sync TBC w/9 bit processor, corrects 3/4, 1/2 & 1", gd cond, \$5495. D Brennan, Custom Video Labs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Microtime 2525 TBC, \$9000/BO. B Krangle, ISL, 680 Haines NW, Albuquerque NM 87102. 505-842-1419.

BTX 4600 3 machine system, sound effects, controller sync & gen, gd cond, \$3000. J Rose, Century 3, 651 Boylston St, Boston MA 02215. 617-277-0041.

RCA tripod, dolly, & pan antenna tilt head, studio unit, \$500. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Peico pan tilt head w/Vicon solid state pan tilt & lens control, \$125. J Baltar, Maine Reel Comm, 207-623-1941.

Panasonic CT700M 7" color portable monitor w/audio, O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Telestrator 600, effects gen, operational other than cracked grid plate, gd for parts or refurb, w/manuals, \$600/BO. JG Von Vleck, Vlech, 2833 Beechtree La, Woodbridge VA 22191. 703-221-6984.

Want to Buy

Transfer service for old A-format 1" video reel to VHS, originally recorded on Ampex 7000. W Watrous, Watrous Prod, 1038 Citrus Ave, Sarasota FL 33577. 813-955-4000.

VIDEO TAPE RECORDERS

Want to Sell

Sony U-matic recorder, w/camera, \$500. R Smith, WGSB, POB 406, Summersville GA 404-857-5815.

NEC VC-9207 3/4" VCR players, like new, \$795; JVC 5200U 3/4" VCR player, like new, \$895; JVC 4400U 3/4" VCR portable recorder, \$795; Sony VO2860 3/4" recorders, \$1250; 3/4" video tapes, BO; 1" video tape recorder, \$995. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

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Panasonic 9240 source deck, \$2775; Panasonic 9600 editor, gd cond, \$3500. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

Panasonic NW9500 3/4" record reproduce, \$900 plus UPS. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

JVC 5000U 3/4" player, new in sealed box, never used, \$750. B Falkenstein, TriGod Ministries, 3447 Arbor St, Phila PA 19134. 215-739-6599.

Sony SLP-300 Betamax video PB decks (2) w/RM-300 auto search remote control, like new, \$150 ea plus ship. R Korbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

JVC 3/4" 606V VCR, vgc, w/manual, original box, \$800. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

IVC 1" portable VCR, \$400 plus UPS. J Baltar, Maine Reel Comm, 207-623-1941.

Want to Buy

Sony SL0383, Beta 1 video recorder. J Smith, On Mark Eng, 11925 Woodland, Olathe KS 66061. 913-764-4226.

Ampex HS-100, IVC 9000 & RCA TR100A. H Henson, Henson Prod, 4569 Havencrest Rd, Winston-Salem NC 27106. 919-924-8717.

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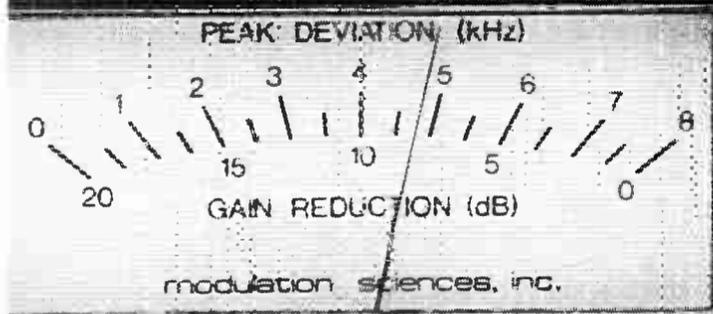
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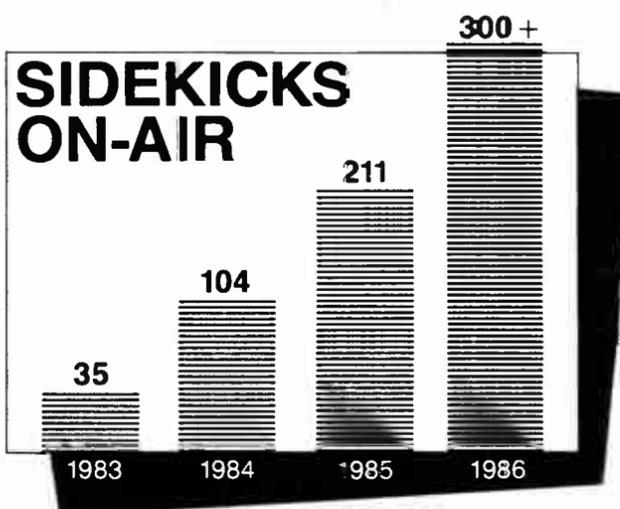
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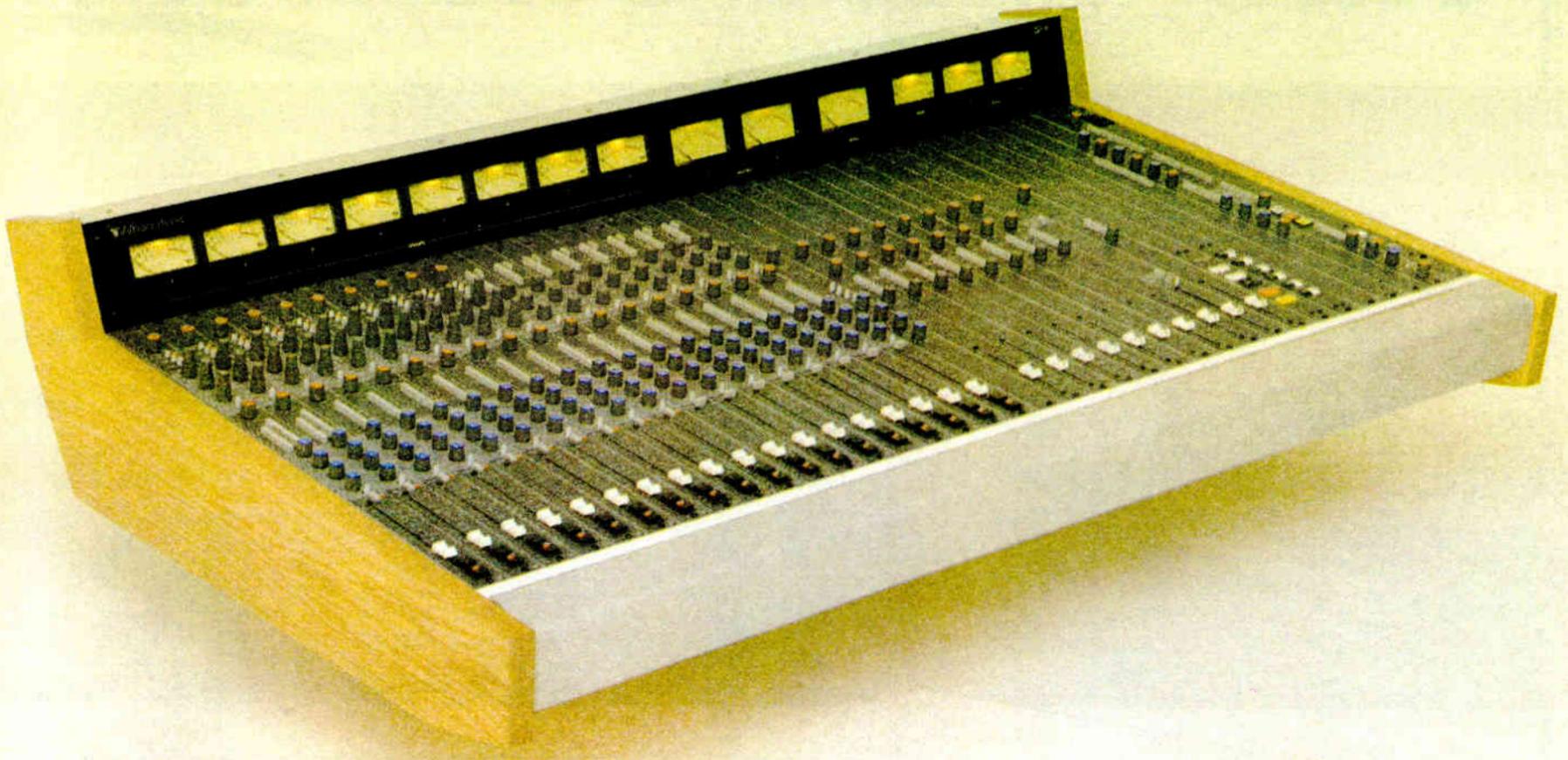
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