

CLASS A'S SEEK POWER BOOST  
BY DAVID HUGHES  
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October 1, 1987

Volume 11, Number 19

## Class A's Seek Power Boost

by David Hughes

**Asbury Park NJ . . .** A group of New Jersey Class A FM stations has asked the FCC to raise the current 3 kW Class A power limit to the 6 kW, or the equivalent, level.

The proposal was a hot item at the recent Radio '87 show, as proponents were concerned about whether the NAB, whose FM radio members also include Class B and C owners, would lend its support to the plan.

The New Jersey Class A FM Broadcasters Association, composed of 14 Class A stations, filed the plan 1 September with the FCC.

This is the second time the group has asked the Commission for such a power hike.

Last year, in comments filed on an FM allocations plan to allow Class A stations

to upgrade to Class B's and C's, the New Jersey association, as well as other firms such as Clear Channel Communications, filed comments urging a blanket power increase for Class A's.

However, the Commission failed to rule on the Class A hike saying that the request was "outside the scope" of that particular proceeding.

### Latest request

The new action takes the form of a petition for rulemaking for coverage relief for Class A stations.

As a result of what it calls "overly-

restrictive Commission policies and urban growth, Class A FM stations throughout the country find themselves increasingly handicapped in their ability to serve their communities and compete with other higher-powered stations," according to the New Jersey Class A organization.

It maintained that a 6 kW or equivalent height-power combination could take place at "the vast majority of Class A stations without any increase in overlap to other FM stations."

"In those relatively few cases where overlap would exist," the NJ petition in-

dicated that the FCC should "allow power increases subject to a showing by the Class A station that the increase would be consistent with one or more public interest considerations."

The filing indicated that Class A's face two major handicaps, the first being "Commission policy favoring stations with more powerful facilities over Class A's." The group claimed that power and height requirements for Class A's, when compared to B's and C's, often "exhibit gross disparities."

In some areas, the petition continued, Class A's of 3 kW at 100 m coexist with Class C's of 100 kW at 600 m, and the FCC allows greater interference protection to Class B's.

The second handicap, it indicated, was a "dramatic urbanization" in which the population base literally outgrows the Class A's coverage area.

As a result, many Class A's are "able to cover less and less of their service areas with a quality signal," the New Jersey group said. "This is a result not only of urban and suburban expansion but also increased building density in core areas."

### FCC action criticized

The Class A organization criticized the FCC action last year allowing Class A stations to upgrade to Class B and Class C. Previously, 20 FM channels were reserved solely for Class A operations.

"Unfortunately," the New Jersey petition continued, "it appears that few, if any, of (the) petitioner's members—or other Class A stations around the country—will be able to take advantage of this relief: spacings simply will not permit it."

It added that "fewer than 10% of FM stations nationwide may be eligible for this option."

The 6 kW power hike proposal would provide relief to "most, if not all, Class A licensees," the petition indicated. "Moreover, it avoids the large capital expenditures associated with class upgrades."

"Instead of being required to purchase a new, higher-powered transmitter, or to construct a taller tower, the Class A licensee opting for the power/height increase proposed may be able to make a simple adjustment to the power control on its existing transmitter, or install a higher gain antenna on its existing tower," the New Jersey group added.

### Radio '87 developments

A meeting of Class A stations was held 11 September during the Radio '87 show to lobby support for the plan in a grass roots effort.

During the meeting Class A owners were encouraged to write to the FCC and to members of Congress in support of

## AM Stereo Comment Coming

**Washington DC . . .** The FCC is planning to release a long awaited "statement" about AM stereo on 21 October.

At press time in mid-September, Bill Hassinger, the engineering assistant to the chief of the Mass Media Bureau, told RW that the Commission will issue a single, all-inclusive statement at the FCC commissioners' October meeting, tentatively slated for the 21st.

The statement, he said, will cover the range of AM stereo issues including the recent National Telecommunications and Information Administration (NTIA) report, released in August, which concluded that multisystem technology is not a solution for AM stereo.

According to Hassinger, the FCC will also address two pending petitions—one filed by Texar in September 1986 asking the Commission to select a single AM stereo standard, and the other filed by Press Broadcasting in November 1986 asking the FCC to require that multi-mode circuits be included in AM stereo receivers.

"The FCC will comment on the NTIA study, as well as the whole (AM stereo) situation," he said. However, Hassinger would not divulge the contents of the planned statement.

Indications are that the FCC will acknowledge, in some way, that a de facto AM stereo standard—C-QUAM—has been reached, but go no further toward officially sanctioning the standard, sources say.

(continued on page 3)



Radio '87 drew a record attendance to the Anaheim Convention Center. Complete coverage begins on page 9.

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Circle Reader Service 21 on Page 24

# Westwood Streamlines Networks

by Alex Zavistovich

**Culver City CA . . .** Following the completion of the sale of NBC's radio networks to Westwood One, a number of layoffs have taken place, which Westwood officials attribute to "streamlining" of the business.

However, despite personnel cutbacks at NBC Radio, affiliates of the radio network are reportedly enthusiastic about the transaction.

On 25 August, Westwood culminated a deal it entered into on 20 July, purchasing the NBC Radio networks. With its purchase, the NBC Radio Networks join Mutual Broadcasting in Westwood's increasing radio holdings.

Under the terms of the agreement with NBC, Westwood One will pay \$50 million and issue NBC five-year warrants to buy one million shares of Westwood One common stock, at \$36.40 per share.

In turn, Westwood has taken possession of the three NBC radio networks—The Source, Talknet and NBC Radio Network—and NBC Radio Entertainment, a long-form program operation.

According to an NBC spokesperson, the NBC Radio Networks will have a 20-year news supply and license agreement with NBC News and exclusive US radio broadcast right to the 1988 summer Olympic games in Seoul.

Westwood One President Bill Battison maintained that NBC Radio affiliates' reactions to the acquisition have been "almost 100% positive."

"Everyone realizes that NBC Radio has for a long time been the flea on the tail of a dog called TV, riding in the back of a truck carrying lightbulbs," Battison said, referring to NBC Radio's poor-cousin status at GE-owned NBC.

Battison added that "most NBC affiliates are excited about having Westwood One as a resource for them." He noted that, during the Radio '87 Convention in Anaheim, there seemed to be no negative responses to the purchase by Westwood.

Westwood One Chairman Norman

Pattiz told RW in July that the acquisition would result in "consolidation" in several areas of NBC Radio, but assured that Westwood was "not going in for a wholesale bloodbath." Nevertheless, a number of staff reductions were made in the transaction, including the release of several NBC veterans.

One of the first changes to occur was the combination of the newly-acquired NBC radio properties with Mutual Broadcasting and the Westwood One Radio Networks. As part of that consolidation, the NBC Radio News bureau in Washington has been relocated to the Mutual Broadcasting headquarters in Alexandria, VA.

Reportedly, although NBC and Mutual will share a common headquarters, the two news operations will remain separate. However, some reporters in Washington will also be shared by Mutual and NBC, and four of NBC's Washington-based correspondents have been released.

Among those NBC reporters laid off is Russ Ward, who had worked for NBC news for approximately 34 years.

Another staff cut at NBC Radio travelled as far up the corporate ladder as general manager. Willard Lochridge, formerly GM and VP of The Source and NBC Radio Entertainment has been replaced by Steve Soule, who had previously served as the networks' VP/Sales. Other executive positions at NBC have largely remained intact.

At press time, still undecided is the fate of some 86 members of the National Association of Broadcast Employees and Technicians (NABET) who had been working for NBC Radio. By some accounts, Westwood One opted against succeeding NBC in a contract with NABET.

NABET's status in the sale of the NBC radio properties has been of great concern to the union, which has been on strike against NBC since 29 June. The two sides are in dispute over a new contract proposal, implemented unilaterally by NBC, which followed the 31 March

expiration of a previous master contract.

Battison explained that NABET has a contract with NBC, not with Westwood. No contract was in effect when Westwood purchased the NBC radio properties, he added.

NABET's members in NBC Radio are "still employees of NBC," Battison pointed out. "Anyone who wants to join us has to resign from NBC," he said.

Westwood One has "no immediate plans" for further consolidations, Battison stressed. "Right now we're looking at replacing some systems," he said, "but there are no more people involved."

Battison also added that, within two or three quarters, Westwood expects to break even with the NBC Radio holdings, which by some reports lost \$9 million in 1986.

"Our whole business is providing services to our affiliates that they want and need," he said. "It doesn't make sense to let a business like this lose money; if we do what (the affiliates) want, and do it well, we'll win," Battison commented.

For additional information, contact Jim Brown or Bill Battison at Westwood One: 213-204-5000.

## FCC Clips

### Abuses in licensing, allocations

The FCC is requesting comments on proposed methods of stopping abuses in the broadcast licensing and frequency allocation processes.

The concern is about parties who may be using petitions to deny those of other applicants or allocation counterproposals to extort cash from other applicants.

Some individuals or groups, the FCC said, use the petitions to "extract some financial consideration from an applicant" rather than to raise questions of an applicant's fitness to be a licensee.

A petition to deny license renewal could cost a licensee most or all of its investment in building and operating a broadcast facility, and even a brief delay could be expensive, the Commission explained. To avoid such expenses, an applicant may decide to pay to have a petition withdrawn.

The FCC is considering instituting a rule which would prohibit an applicant from paying more money to a petitioner than was spent in preparing and prosecuting the petition to deny.

In the case of frequency allocations, the Commission tentatively stated that parties filing counterproposals without the intention of seeking a license could be liable to a fine or forfeiture.

At press time, a comment period had not been set.

FCC docket is MM 87-265. For additional information, contact Mark Solberg at the FCC's Mass Media Bureau: 202-632-7792.

### EBS activation reports

Following the last Emergency Broadcast System (EBS) News Release, issued 23 March 1987, 592 EBS activation reports have been received by the FCC.

The reports, submitted by 137 stations, cover situations ranging from natural disasters such as flash floods and tornadoes to man-made hazards, including toxic gas leaks, chemical fires and a siren alert error at a nuclear power plant.

KGNC, an AM/FM combo in Amarillo, TX, used the EBS most frequently since March, activating the system 70 times.

The FCC, the Federal Emergency Management Agency, the National Weather Service and the National Industry Advisory Committee instituted the EBS state and local program in 1976. Since then, 8,589 activation reports have been received.

The Commission noted that the actual number may be "considerably" more than that figure, because broadcast stations are not required to file a report when they activate the EBS.

In early August, the FCC sent 130 state and local draft EBS plans to areas in the US without final plans. Edward Minkel, FCC Defense Director, anticipated all state and territory plans and 582 local operational area plans to be completed by the end of the year.

For more information, contact the FCC news media information office at 202-254-7674.

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# Kahn Stations Remain Loyal

by Alex Zavistovich

Washington DC ... Many AM stereo broadcasters who have chosen the Kahn/Hazeltine ISB transmission system remain convinced of the system's technical superiority, and disagree with a recent study rejecting multisystem receiver technology.

A 12 August study by the National Telecommunications and Information Administration (NTIA) found that multisystem AM receivers were not a practical method for promoting the growth of AM stereo.

The NTIA also noted market dominance of Motorola's C-QUAM system over ISB, and recommended the FCC protect the C-QUAM pilot tone.

On the surface, the agency's report did not bode well for Kahn's stereo system. With Kahn-compatible receivers vastly outnumbered in the market by C-QUAM receivers, an endorsement of multisystem technology might have prompted some broadcasters to choose the ISB stereo system.

## Supporters loyal

However, most Kahn loyalists have been undeterred by the NTIA study. With the exception of those who question the future of AM stereo in general, many still believe ISB is the superior system choice.

Exploration of the multisystem receiver option was proposed by the NTIA in February as a possible solution to what

the agency called a "stalemate" in AM stereo.

The study found that, although such receivers would not degrade the reception of the Kahn and Motorola systems, implementation delays, economic considerations and an international climate



*Most Kahn loyalists have been undeterred by the NTIA study.*

geared towards a single standard made the multisystem option impractical.

"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," the NTIA wrote. The study held that an "apparent lack" of Kahn receivers made protection of the ISB pilot tone "problematic."

Still, the NTIA report left 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."

## Support of Kahn

Floyd Daisey, CE of Baltimore's WFBR, was one of numerous broadcasters who seemed unswayed by the lack of support

shown by NTIA of the Kahn ISB system. WFBR has had a Kahn system in operation since 1975.

According to Daisey, the NTIA's findings do not change his support of the Kahn transmission system.

"It (ISB) is the only way to go," Daisey

audible telemetry" might be the agency's concern, but stressed that the NTIA's recommendation was "vague."

The NTIA findings have not shaken WQXR's support of the Kahn system, Squire said.

"With our particular situation, Motorola would not work," he stated. Motorola's C-QUAM system produces intolerable platform motion because of WQXR's "frequency and susceptibility to phasing and skywave skipping," Squire said.

Additionally, Squire held that nothing was to be gained from a single AM stereo standard. Multisystem feasibility has been proved technically, he said.

"If a person has a choice of either one or the other, a single system should not be an issue," Squire maintained. "Both can coexist."

## Multisystem not impractical

Bill Krause, manager of Technical Operations for WNBC in New York, said the station implemented Kahn's ISB AM stereo in 1982. He noted the Kahn system works well, although he noted that, in WNBC's current oldies/talk format, "there's nothing to promote in stereo."

Like most others contacted by RW, Krause questioned whether a multisystem option is as impractical as the NTIA indicated.

*(continued on page 4)*

## Statement on AM Stereo

*(continued from page 1)*

An FCC public notice on AM stereo had been planned earlier this year, however it was delayed because of the NTIA report, which was not released until August.

At the March NAB show, then Mass Media Bureau Chief Jim McKinney, who has since left to assume a White House communications post, unofficially came out in favor of Motorola's C-QUAM system. C-QUAM leads the competing Kahn-Hazeltine ISB system in the number of stations that have selected it.

In other news that bolstered C-QUAM, just before the NAB show, Canada selected C-QUAM as its official national standard and required all Kahn stations to switch to C-QUAM or go back to mono by March 1988. Brazil and Australia

had selected C-QUAM previously.

Despite McKinney's remarks at the March show, Hassinger had said that any formal Commission statement regarding whether a de facto standard had been reached would await the release of the NTIA multimode report.

The August release of the NTIA conclusion that multimode was technically but not economically feasible, and a request to protect the C-QUAM pilot tone has left the way clear for a statement from the FCC.

Such a statement would be the Commission's first new action on AM stereo since it came out in favor of the so-called "marketplace decision" five years ago—a decision it is not expected to overturn.

For more information, contact Bill Hassinger at the FCC: 202-632-6460.

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# Stations Loyal Despite Study

(continued from page 3)

He maintained that having a single standard is not necessarily superior to multisystem technology, and expressed doubt about the likelihood of such a standard coming about in the US.

"I don't know whether broadcasters are ever going to get together on a single system," he said.

WMAL, Washington DC, Maintenance Engineer Rick King said, judged on its own merits the Kahn ISB system is "very good. If there were any receivers out there, we'd be very satisfied with it."

The ISB system "compared favorably" to C-QUAM systems employed by other stations in the DC market, King said. However, with station processing and other variables, it would be "impossible to say that one system stood out over the other," he commented.

King was downbeat about the future of AM stereo, however. He said the NTIA's study will have no affect at all on the technology because, "for all intents and purposes, AM stereo is dead."

"The fact that more stations use C-QUAM than Kahn really makes no difference," he explained, "since even that number is very small compared with the total number of AM stations."

Despite these problems, King stressed the AM format is "still exciting to broadcasters," particularly in light of technical advances such as the preemphasis/de-emphasis standard proposed by the National Radio Systems Committee.

"If receiver manufacturers step into line, I think AM stereo may follow," he said.

## Some advantages over C-QUAM

NewCity Communications' VP/Engineering John Marino said company management "originally felt that Kahn's system had some advantages over C-QUAM—it (ISB) worked better than C-QUAM under skywave conditions."

NewCity owns four Kahn ISB stereo stations—WFTQ-Worcester, MA, WSYR-

Syracuse, NY, WDBO-Orlando, FL, and WZZK-Birmingham, AL. Since coming out in favor of the Kahn system, however, the company has become concerned by the lack of receivers for the Kahn system, Marino said.

Two C-QUAM AM stereo stations have recently been acquired by NewCity, Marino said. KRMG-Tulsa, OK and KKYY-San Antonio, TX, both use the Motorola AM stereo system.

Although Marino maintained that the Kahn system "may be technically superior," he acknowledged that C-QUAM is "in more widespread use," a situation which has caused a standoff in the industry. The AM stereo issue, he said, "needs something to bring it off of dead center."

Conversations with broadcasters indicate that the AM broadcast industry is confused over which system to use, and may have "given up on AM stereo," he added.

Marino questioned whether the

NTIA's investigation "has done anything to bolster either system." Receiver manufacturers with whom Marino has spoken have indicated that the study may have come too late.

“*If there were any receivers out there, we'd be very satisfied with it.*”

“Receiver manufacturers have made a commitment to produce C-QUAM radios and see no reason to go multisystem,” Marino continued. “They’ve made their decision—either it works this time, or they’re going to give up on AM stereo altogether.”

Of those Kahn broadcasters contacted by RW, the majority supported the ISB system as being technically superior to C-QUAM. Most also said that, if they had it to do over again, they would again choose the Kahn system for stereo transmission.

Still, WFBR's Daisey was disappointed by the lack of Kahn-capable receivers on the market. He noted that, in a recently published electronics catalog, only one AM stereo receiver was carried—a C-QUAM-only automobile receiver.

WFBR has also recently added the Kahn POWERside to its transmission gear. The unit boosts sideband signals for improved sound in mono radios.

"It's pointless to be broadcasting in AM stereo if there are no receivers out there," Daisey said.

For additional information, contact John Marino at 203-333-4800. Contact Floyd Daisey at 301-685-1300, Herb Squire at 212-556-1144, Bill Krause at 212-664-6666, or Rick King at 202-686-3100.

## Canada AMs Switch to C-QUAM

by David Hughes

Ottawa ONT ... Most of the Kahn-Hazeltine AM stereo stations in Canada have made the switch to Motorola's C-QUAM system, following that nation's selection, last March, of C-QUAM as its sole standard.

Canada's Department of Communications (DOC), reported in mid-September that seven of the nine stations that had been using the Kahn-Hazeltine ISB system when the March 1987 ruling took place have since converted to C-QUAM.

The DOC figures agree with those supplied by Motorola.

Canada set 31 March 1988 as the date Kahn-Hazeltine stations are to have switched to C-QUAM or cease broadcasting in stereo.

Figures, current as of 1986, indicated

that about 50, or about 12%, of Canada's 435 AM stations had gone stereo, with 42 selecting C-QUAM and eight or nine going with the Kahn-Hazeltine system.

### Moffat switch

While the DOC would not provide a list of stations that have made the switch, a list provided by Motorola includes six AMs owned by Moffat Communications.

According to Moffat Technical Director George Buzunis, the firm's stations were converted from Kahn-Hazeltine to C-QUAM during August and September. The stations include: CISS (formerly CKXL) Calgary; CHED, Edmonton; CKLG, Vancouver; CHAM, Hamilton; CHAB, Moose Jaw; and CKY Winnipeg.

"I have mixed feelings about the switch," said Buzunis. "It was good that (the DOC) selected a final standard, but

I have questions about how they went about it."

"But, we had no choice in the matter. It was either switch to C-QUAM or stop broadcasting in stereo," he added.

Buzunis maintained that he receives little input from listeners who receive the stations with stereo receivers. Most of the AM stereo listeners, he jokingly speculated, are the CEs at his and other radio stations.

On a note of optimism for AM stereo, Buzunis also explained that Canadian cable TV regulations require cable systems to relay AM stereo stations to subscribers in stereo on the cable FM band.

In some cases, stations provide direct feeds to the cable systems, and in other cases, the AM stereo signal is received over-the-air, Buzunis said.

In another conversion, CFTR, Toronto, made the switch from Kahn to C-QUAM in March, immediately after the DOC ruling, according to Kirk Nesbitt, CE at the 50 kW station.

Nesbitt said the station had been studying the switch to C-QUAM for a year and was not surprised when the DOC selected C-QUAM.

"Everyone could see it coming," said Nesbitt. "A single system is the only pragmatic way of getting along." He added that he had had "little concern" about which system won.

### Hazeltine complaint

In a related matter, the DOC's Ron Begley indicated that legal hearings will be held in October on a challenge to its AM stereo decision that was filed by Hazeltine 30 March.

Hazeltine had filed an "originating notice" with Canada's federal court indicating that it plans to challenge the DOC ruling.

Begley said that the DOC "has put forward a motion to quash the action."

Most sources indicate that the Hazeltine challenge, especially in that it comes from a US-based firm, will have no effect on the Canadian AM stereo decision.

For more information contact Ron Begley at the DOC, 613-990-4820.

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## OPINION

# Readers' Forum

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## RW's tenth

Dear RW:

Congratulations from Royce International Broadcasting Company upon RW's tenth publication anniversary.

During the decade, RW has become increasingly apparent in the effective communication of technical and marketing concepts among members of the broadcasting fraternity.

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On the occasion of the RW anniversary, we noted your request for a photocopy of the initial edition of *Broadcast Equipment Exchange*.

We are pleased to report that we have retained that edition for our files, and that a photocopy thereof is enclosed with this letter.

May your good fortune multiply with coming decades of publication.

Edward R. Stolz, President  
Royce International Broadcasting Co.  
Sacramento, CA

*Editor's note: Royce's photocopy of our first issue as Broadcast Equipment Exchange was a nice surprise, and a first edition Radio World mug is on its way. Any more takers?*

## Not always pole-mounted

Dear RW:

In response to the article by W. C. Alexander on FM directional antennas in the 15 August edition of RW, I must correct one statement. Directionals are not always pole mounted as Mr. Alexander stated.

Two of our FM stations are directional. WMAG in Greensboro, NC uses a Harris

FMH type antenna side mounted at 1500' on a TV tower.

WWMG in Charlotte, uses a Harris 1063-4CP-DA panel type antenna mounted at 1718' on a television tower.

Obviously the manufacturer designed these antennas to work on the existing structures and to conform to our radiation limits.

Both antennas work very well but due to structural limitations the patterns required a great deal of work to meet the FCC limits.

I agree with Mr. Alexander that FM DAs are a great way to solve short-spacing problems, but you are not always limited to pole mounting.

Carl W. Davis, VP of Engineering  
The Voyager Group  
Raleigh, NC

## MIDI studio

Dear RW:

I've been running a home MIDI studio for over a year now and would like to hear of your experiences (good or bad) in composing, arranging and creating MIDI'd radio production work.

Would any station now utilizing—or planning to utilize—a MIDI based production studio please contact my station, WHMP, P.O. Box 268, Northampton MA 01061.

Your input is most welcome and I would like to exchange tips and pointers.

Alan R. Peterson, Producer  
WHMP-FM  
Northampton MA

It's not often that all factions of an industry get together to agree on one issue with only a minimum of opposition.

But that's the case with the NRSC AM pre/demphasis standard supported by major broadcasters, trade associations and receiver manufacturers.

Now a complementary draft transmission standard has been approved, and it should easily ride out the six-month comment period to become a voluntary standard too.

Stations that have converted to the NRSC standard are already reporting benefits. Plus there is irrefutable evidence that second adjacent stations which adopt the standard will decrease the interference which plagues the AM band.

In light of all this good news is a move, with apparent NAB support, to petition the FCC to make the voluntary standard mandatory. The arguments in favor are persuasive.

## Time For FCC Rule

First, it would send a clear message to receiver manufacturers that with a standard in place, AM is ready for high fidelity wideband radios.

Equally important is the second adjacent interference factor. Even if 90% of all AM stations convert to the standard, the remaining 10% could negate that effort if they are causing interference to those who do convert.

But supporters of such a move should be aware that making a voluntary standard mandatory may cause opposition to surface that had been previously held in check.

Station owners may not wish to be forced into footing the bill for new equipment that they feel they don't need. Owners, programmers and engineers may also feel restricted by the 10 kHz cutoff filter, once the label "voluntary" is removed.

And since the standard came about as a compromise of many differing positions, some of those differences will again come up during the comment period the FCC would set for such a rulemaking.

A petition for rulemaking should leave intact the term "interim" on the NRSC standard (and the five year review which accompanies it) so that its effectiveness in the future isn't limited by any short-sightedness of the present.

The NRSC standard can be presented as a way to reduce interference to the AM band through a change of occupied band specifications. Thus it becomes an integral part of AM's technical improvement, and it stands a better chance of getting Commission approval given the current deregulatory climate.

The standard represents the brightest hope so far for AM's future and an FCC rule mandating it would guarantee its success.

—RW

# Digital Should Look to Radio

by Rob Meuser

**Hamilton Ont** . . . The era of digital audio technology is here.

But the limited ability of large companies to move swiftly coupled with the inability of the American legal system to do much more than make lawyers wealthier is restricting the growth of an incredibly powerful technology.

First, the use or threatened use of legislation is restricting or possibly eliminating the ability of Americans to obtain R-DAT.

Because certain well-vested interests are better served by holding the status quo than by dealing with the challenges of the future, both broadcasters and the public are being deprived of the opportunity to develop this new technology.

Meanwhile the rest of the world chuckles in amusement and picks up on the lost opportunities.

Imagine if today's legal precedents had been applied to the introduction of early automobiles or airplanes with their ability to terrify both man and beast.

Rob Meuser runs International Broadcast Support Services, an international consulting firm. He can be reached via MCI mail #325-3672 or by calling 416-692-3330.

Imagine how lawyers would rush in to protect blacksmiths and livery stables from certain extinction.

Progress is both revolutionary as well as evolutionary—even in nature nothing stands still.

## Japanese uncertainty

In Canada and most of Europe, R-DAT equipment is going into the marketplace. As you read this, R-DAT equipment is sitting on the shelves in Tokyo, Singapore and select European dealers.

## Guest Editorial

So buy a plane ticket and fly to one of these lovely vacation spots and get your own R-DAT before the forces of evil get to US customs too!

Possibly because of the uncertain marketplace, Japanese manufacturers do not seem to have a clue about the needs of radio broadcasters, or are apparently otherwise disinterested.

A prime example is Sony, who has had tremendous success with both television and professional audio.

I have gone through the experience of trying to communicate to the Sony cor-

porate structure the small amount of modifications necessary to make an existing consumer R-DAT machine properly interfaceable with broadcast control systems (some ROM changes and minor hardware modifications).

I was informed that their product set for the next three years did not include a "radio" type machine.

Their first emphasis is on a field portable machine and some pro audio playbacks.

## Radio's needs

While field portable stereo recording might be nice for TV or films, it does not compete with multitracks for live music recording for radio.

I do not know of many stations that would place \$7000 portable machines in the news part of their operation, just to get 96 dB SNR for an on the street interview.

Features such as electronic editing, full use of subcodes, RS 232 control, and the ability read basic machine functions via RS 232 were all not currently under consideration by the manufacturer.

Those features are what makes a radio machine.

It is understandable that large compa-

(continued on page 31)

## Radio World

Vol 11 October 1, 1987 No 19



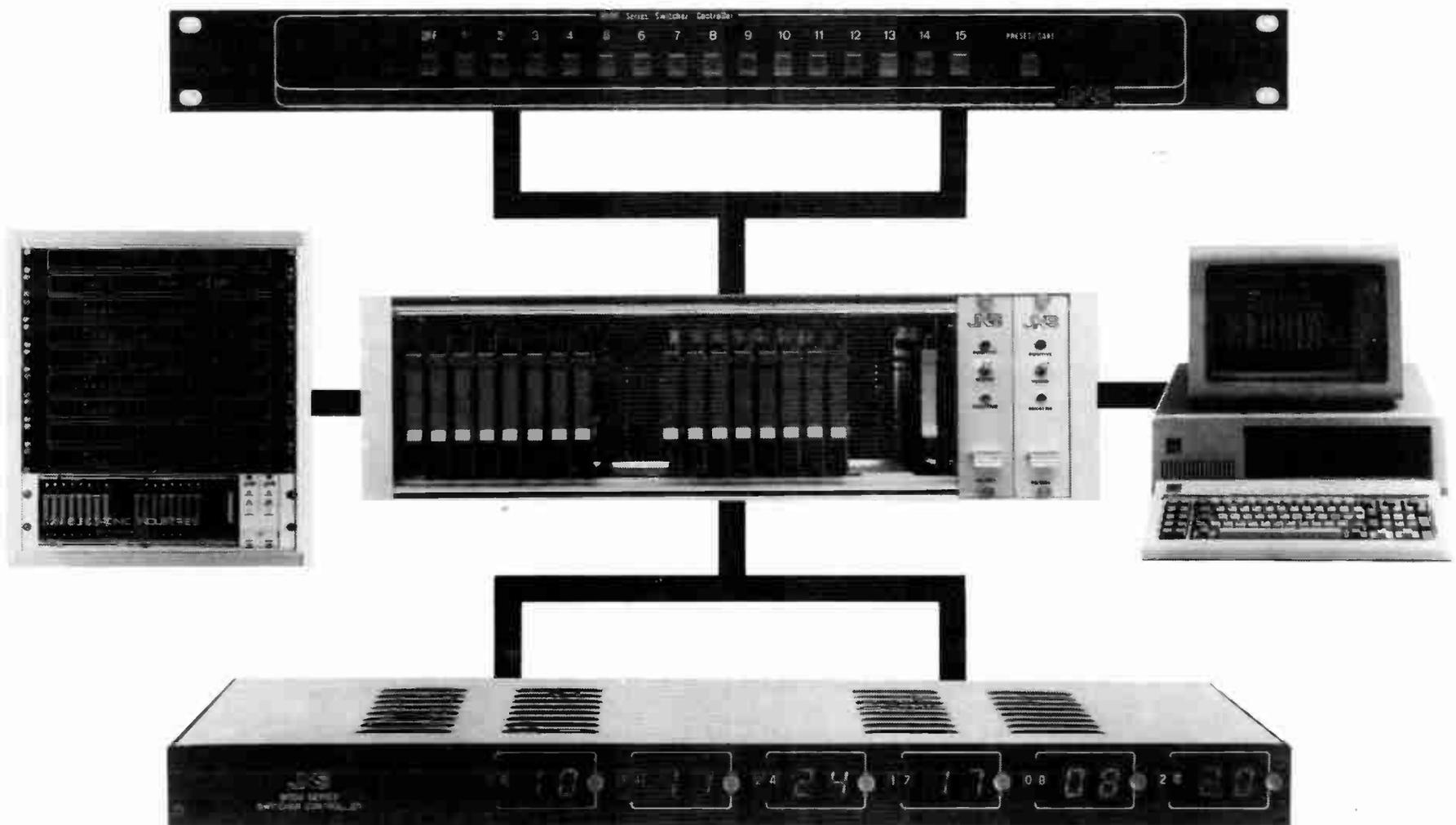
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# Class A Filing Seeks Support

(continued from page 1)

the proposal, and to support it as well with financial contributions.

"We are the providers, as Class A's, of local service. We have to have the opportunity to reach that audience," said Bob McAllan, president of Press Broad-

“ “  
*“Most stations would see a 40% increase in their coverage area.”*  
 ” ”

casting acting as the meeting's chairman.

"This is an inexpensive way for Class A's to share in a power increase," he continued. "Most stations would see a 40% increase in their coverage area, in terms of square miles."

Questions surfaced about whether the NAB, whose radio members also include Class B's and C's who may not want to see more powerful Class A's, would support the plan.

McAllan said he had several discussions at the show with NAB Engineer Mike Rau who indicated that NAB support for the plan would be possible.

However, McAllan affirmed, the New Jersey group will actively campaign for the blanket hike regardless of the NAB's decision regarding support.

L. Lowry Mays, president of Clear Channel Communications, whose CE John Furr did much of the engineering work for the New Jersey group's petition,

said supporters of the plan would have to appeal to those Class A's that are doing fine now, but may find they could use the (power) boost several years down the road.

## FM subcommittee involved

The Class A power hike has also been discussed at previous meetings of the NAB FM Transmission Subcommittee, which has been looking at the issue of increased interference and clutter on FM, and has used the colorful phrase the "AMization of the FM band" as a result to be avoided.

Subcommittee Chairman John Marino, of NewCity Communications, said the Class A hike was scheduled to be discussed at the next meeting which was slated, at press time, for 23 September in Washington DC.

"If it (the blanket increase) can be done without interference, then it would be a good thing," he said. He did not say whether the subcommittee would support the plan.

At the Radio '87 show, Clear Channel's Mays commented: "We are likely not to be supported by NAB because we are outnumbered on this among NAB members by those who don't want more competition." He continued, "We're going to have to fight this battle ourselves."

However, Rau responded, "It is possible to get NAB support, you're not that far from that right now. This would move a lot faster with NAB support."

McAllan added that the New Jersey group "would willingly accept the NAB's support, but we intend to move forth on this with or without it."

Rau stressed that the NAB is still

formulating its policy, but since about half of its FM members are probably Class A's, he maintained, "There is no way NAB would actively oppose the petition."

The worst case, he said, would be that the NAB would remain neutral on the issue, although a more likely possibility would be to support a modified version of the Class A's petition.

Specifically, Rau explained, the NAB is worried about increased interference to Class B's and C's, and would have trouble supporting a proposal which allows any contour overlap or negotiated interference between stations, which the Class A petition includes in some cases.

He said the FM transmission subcommittee would be working to find some modifications to the Class A petition, so it could get NAB support.

For more information on the plan contact is Washington DC attorney William Keane, who represents the New Jersey Class A Broadcasters, at 202-861-7800.

# Daytimers Have a Longer Wait

by David Hughes

Washington DC ... Daytimers who were expecting that by this fall the FCC would authorize nighttime operations may have to wait a bit longer, perhaps into winter.

At press time, the FCC was examining the possibility of acting on the plan by the end of September to give nighttime powers to many daytimers on domestic clear and regional channels.

However, according to FCC Audio Services Division Chief Larry Eads, even if the FCC does get around to approv-

ing the plan in September, which was not a certainty, it would still have to inform both Canada and Mexico about the specific night powers.

That process, Eads said, involves up to a 60-day notification and comment period, which could delay the actual authorization of the night powers until November, at the earliest.

The night powers plan, unveiled by the FCC last May, would allow many daytimers—including those on Class I and Class III channels—to operate at night with up to a maximum of 500 W, provided such operation complies with

applicable interference protection requirements.

Eads said that some daytimer owners at the September Radio '87 show in Anaheim CA were disappointed that the night powers would not be able to be approved for use earlier, such as in September.

One of those daytimer owners is Jim Wychor, former president of the Daytimer Broadcasters Association (DBA), which eventually became the NAB Daytimers Committee.

"We all hoped that all the work would be done by September," said Wychor, who owns KWOA in Worthington, MN. He indicated he had heard that most of the delay on the issue was caused by the FCC's heavy workload on other issues, such as the continuing Docket 80-90 issue.

For more information on the plan, which is contained in FCC docket MM 87-131, contact Larry Eads at 202-632-6485.

# "Pirates" Won't Be Prosecuted

New York NY ... The two men who were arrested and charged with operating an illegal ship-based radio station five miles off the Long Island coast in late July will not be prosecuted.

At a 27 August session in federal court in New York, charges of operating an illegal station, a misdemeanor, and impeding the functions of the FCC, a felony, against Ivan Rothstein, 25, and Allan Weiner, 34, were dropped.

The two, who operated "RNI-Radio New York International," each could have faced a maximum five year prison term and \$250,000 in fines.

Even though their immediate legal problems were behind them, Rothstein and Weiner indicated that they had hoped their case would have posed a legal challenge to the FCC's policy of silencing off-shore broadcasters. They said they planned to put RNI back on the air.

Assistant US Attorney Matthew Fishbein was quoted as saying that if RNI resumed operations, the two pirate radio buffs would be prosecuted.

## July broadcasts

Coast Guard and FCC officials boarded "Sarah," a 200' Honduran-registered fishing ship 28 July and arrested Rothstein and Weiner, as well as a reporter for the *Village Voice*.

For several nights preceding their arrest, the two broadcast RNI on 1620 kHz, 103.1 MHz, as well as on shortwave and longwave frequencies. The 5 kW clear channel AM signal was heard throughout North America.

After FCC officials boarded the ship and dismantled the equipment. Rothstein and Weiner were arraigned in federal court.

Even though the ship was in international waters, the US received permission from Honduras to board the vessel.

Weiner, who was cited by the FCC in 1985 for broadcasting on unassigned frequencies, and in 1971 for operating a land-based pirate facility, was adamant that the FCC did not have the right to board his ship and shut down RNI.

## Illegal search?

He indicated that RNI was 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.

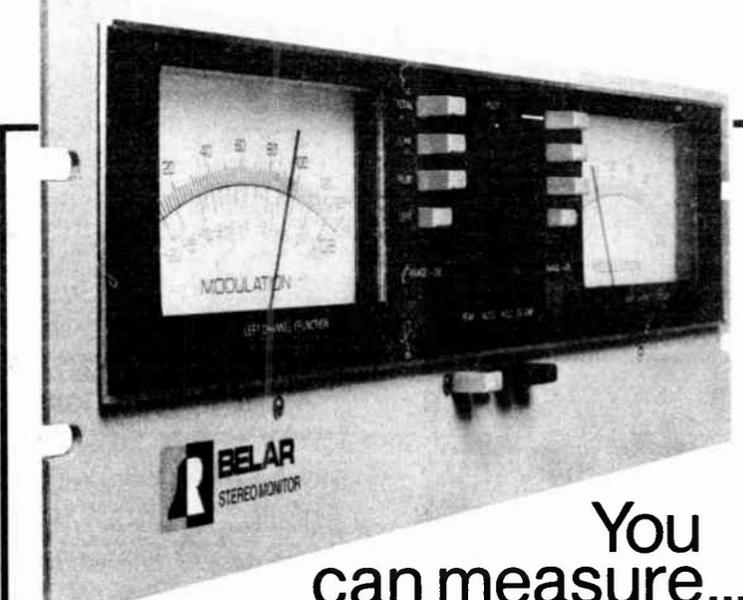
Weiner also contended that FCC officials damaged much of the equipment when they dismantled it, a point the FCC denied. The Commission did not confiscate gear because they could not get the ship's anchor up in order to tow it into port.

Approximately 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, Weiner maintained.

As of mid-September, the "Sarah" was in a Boston area port being repaired. Since the silencing of RNI, Rothstein and Weiner have also been invited to host a program on a legal station, WNYG in

Babylon, NY.

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.



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# Seattle Tower Dispute Settled

by Alex Zavistovich

**Seattle WA** . . . An ongoing dispute over a proposal to build a broadcast tower supporting three radio antennas and one TV antenna in the Cougar Mountain area of Seattle has been resolved, as citizens groups agreed to have the structure built.

KONG-TV, a UHF station in Seattle, reached a settlement with Cougar Mountain home owners over the station's proposal to build a larger antenna tower. The station's dispute with Monte and Joanne Lennox and the Cougar Mountain Residents Association had kept KONG in litigation and off the air

for two years.

As part of the settlement, KONG has agreed to undertake an interference monitoring study of households in the area to prove that the tower arrangement will not increase interference to consumer electronics.

Dan O'Brien, GM of KONG-TV, said a confidentiality clause in the agreement prohibited him from disclosing particulars, but he noted that the settlement was reached in mid-August.

#### New tower proposed

Over two years ago, KONG submitted a plan to replace a broadcast tower atop Cougar Mountain, an antenna site

southeast of Seattle, O'Brien said. Presently, a 200' guyed tower is located on the mountain, carrying three radio station antennas—KMPS, KZOK and KMGI.

KONG proposed substituting the guyed structure with a 300' self-supporting tower, O'Brien explained. The radio stations would be carried on a panel antenna below the top of the tower; the KONG antenna would be on a pylon on top.

According to O'Brien, the arrangement would improve the signal, increase efficiency of the radio and TV antennas and decrease ground level nonionizing electromagnetic radiation at the site.

Despite three independent engineering studies which found that the proposed modification would, in fact, decrease the ground radiation by as much as 90%, the Cougar Mountain Residents Association protested any change. The Lennoxes, whose property abuts the tower site, also made official complaints, O'Brien said.

Subsequently, the case was taken to court. KONG won twice in Superior Court, O'Brien noted, but both decisions were submitted to a US Court of Appeals. The matter was being cited by an appellate court when the settlement was reached, he commented.

Besides the interference survey which KONG must conduct, the only other requirements made of the station are "the normal things that come out of a hearing examiner's investigation or as part of the standard permit process," O'Brien said.

Parking spaces, fencing and the addition of hygienic facilities are among those requirements, he added.

Additionally, Richard Tell, formerly chief of the Electromagnetics Branch of the EPA's Office of Radiation Programs, calculated a worst-case power density for the site of "110  $\mu$ W 36 m from the tower base," O'Brien stated. The figure was calculated with all four antennas in operation at full power.

O'Brien said the station is bound by terms of the permit to maintain an ongoing measurement program to ensure that power stays within those limits.

#### Safety or interference?

Ostensibly, the residents' concerns about KONG's proposal stemmed from the possibility of harmful health effects produced by nonionizing radio frequency radiation. Experts in radiation were called by the citizens' group as witnesses in the case, O'Brien noted.

However, since the settlement stipulates that KONG must prove the antenna does not worsen consumer electronic performance, it's unclear whether the issue was one of safety or interference.

O'Brien commented, "I think they just did not want a tower." He speculated that RF radiation was chosen as the issue in court, partly because "it made for the best press."

In court, industry experts cited or used as witnesses disagreed on matters as fundamental as measuring procedures or the correct protection standards.

A "potpourri" of exposure standards exist for RF radiation, O'Brien pointed out, ranging from time-averaged to spatially-averaged guidelines. Experts were also at odds over how to use measuring devices to get the most accurate readings.

Those problems, coupled with a reluctance by the FCC to involve itself in the issue, left KONG "trying to prove to the people of Salem that you are not a witch," O'Brien said.

With a settlement achieved, O'Brien said KONG is "all set" to begin construction in early October. He anticipated that the station will be on the air "by the first of the year."

Spokespersons for the residential group and the Lennoxes could not be reached for comment.

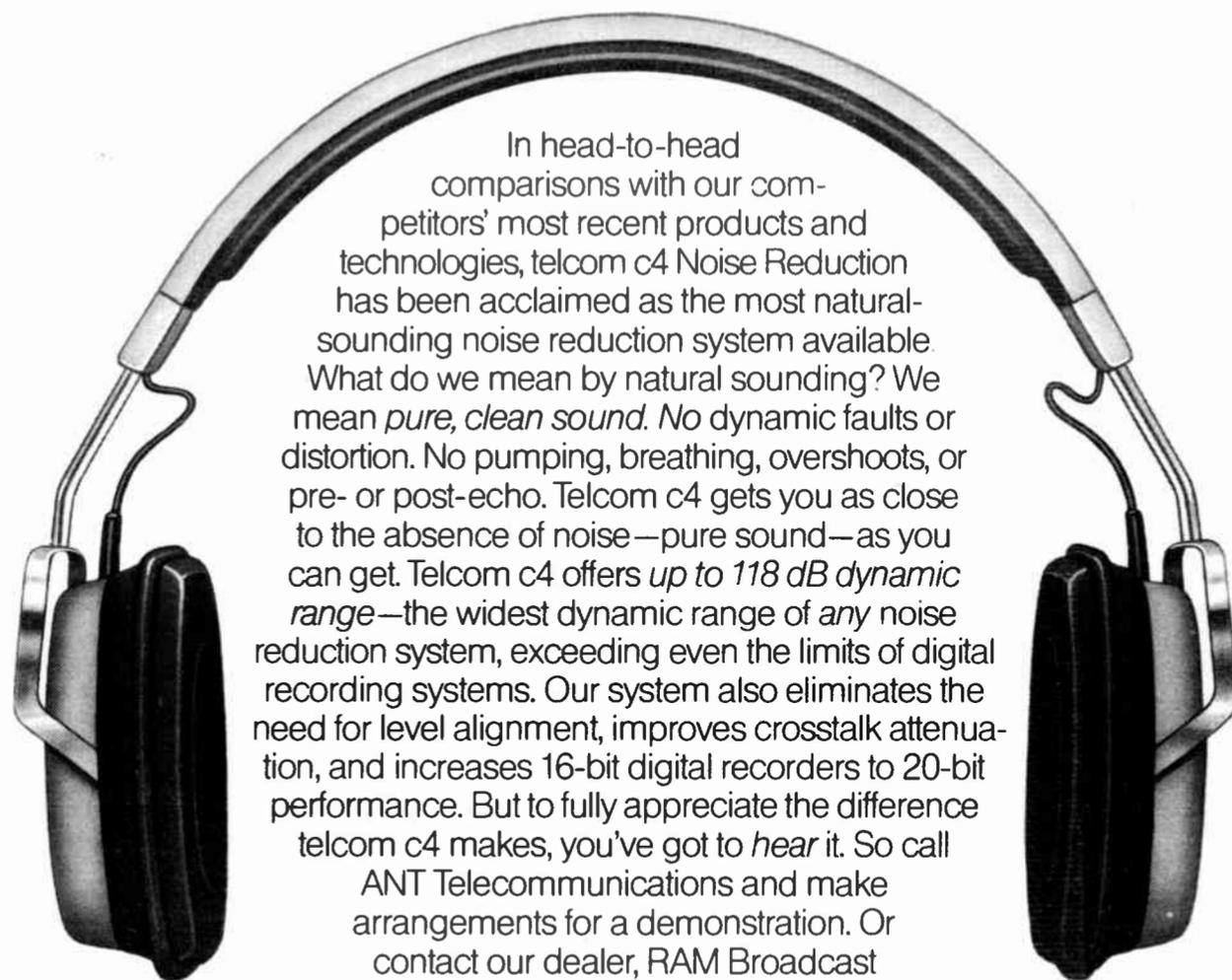
For additional information, contact Dan O'Brien at 206-292-1616.

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## Record Crowd Toasts Radio

Anaheim CA ... The NAB's Radio '87 drew a record attendance to a four-day meet filled with sessions, exhibits and a celebration of "America's love affair with radio."

The convention drew 5,722 exhibitors—more than 200 more than last year—and 148 exhibitors to the showcase floor.

There were more engineering sessions this year and attendance was fostered by three engineering seminars held concurrently with the convention.

The NAB's Directional Antenna seminar drew 53 attendees, and some 40 engineers showed up for a seminar on RF Radiation with an equal number attending one on implementing the NRSC standard.

The standard was the talk of the convention, and was demonstrated at the NAB's booth with about a half dozen prototype receivers.

Most sessions were fairly well attended, even two on Saturday afternoon—on FM Improvement and Communicating Skills for Engineers—held after the exhibit floor had closed.

Ten stations, including eight AMs, one



Radio '87's exhibit showcase featured equipment and services from 148 companies.

FM and a combo won the NAB's first-time Crystal Awards, for excellence in local achievement. The winners were chosen from 50 finalists across the nation.

At the Radio Award Luncheon, long-time rock and roller Dick Clark, a regular at the radio show, introduced veteran

CBS news correspondent Douglas Edwards as the 1987 Radio Award recipient.

Edwards looked back at his long broadcast career and acknowledged that "we live in an electronic age" and that "print will never again reign supreme."

A highlight of the sessions was one on Targeting Radio's Future. John Abel and Rick Ducey of the NAB spoke about current and upcoming trends in radio.

Abel concluded his presentation on what's ahead for radio with some specific suggestions for technical improvement.

He urged adoption of the NRSC standard for AM stations and expressed optimism about new antennas that are in the process of being developed by the NAB.

Abel also urged FM stations to install FMX. He further maintained that digital audio would see rapid growth and suggested stations install digital playback equipment.

He said that total automation would be a good future objective for stations, as well as full or partial computerization of station operations.

As a whole Radio '87 offered an upbeat look at where radio is heading, and at times reflected an appropriately carnival-like atmosphere in a locale where Disneyland is the main attraction.

## Digital Innovations Shine in Showcase

by Marlene Petska Lane

Anaheim CA ... Radio '87 confirmed the fact that broadcast audio product development more and more is being driven by the consumer audio industry. This fact was apparent in the digital products introduced on the exhibit floor, some of which caught broadcasters by surprise.

R-DAT is now a real force to be reckoned with. Consumer models are already finding their way into stations, and they haven't even been formally introduced into the US market.

On the exhibit floor, R-DAT was ready for station automation.

Concept Productions, a music syndicator, showed an automated R-DAT system called CAPS I (Computer Assisted Programming System).

Hardware and source equipment of the system, mounted within one equipment rack, includes nine Sony consumer DTC-1000ES R-DAT transports with all interface cables and Concept's DAT random access interface controller.

One PC compatible computer including dual disk drives, five dual channel source interface cards, one system output control card, one VU meter and monitor panel completes the hardware package. The CRT and keyboard are external to the rack.

Four of the R-DAT transports are used for digital music tapes on formats provided by Concept.

R-DAT cassettes can hold about two

hours worth of material. Three other R-DAT machines included in the system contain the station's commercials, jingles, PSAs and voice tracks.

Another transport can be used for additional commercials or for network news time-shifting; the ninth transport contains Concept's custom voice track tapes (supplied weekly). All transports have full random access to the 99 cuts available on each tape.

The system, which will be ready for delivery by November 1, carries a price of \$22,000.

Concept is also working on a live-assist system which will be out next spring.

Systemation has also gone digital in its new X-7D automation system, which can be used as a live, live-assist or totally automated system.

The X-7D can control as many different sources as needed, both digital and analog, and is remote-ready. The system exhibited used either consumer 8mm or R-DAT transports with a Commodore 64 PC, but Systemation will offer any format stations want.

The Systemation X-7D/R-DAT connection allows full digital-to-digital dubbing with first generation quality. Thus stations may dub their compact disc collection to R-DAT using the X-7D for random access.

Each digital cassette can hold up to 150 songs or several hundred spots. Each is randomly selectable from the keyboard. Through a modem, the system can be

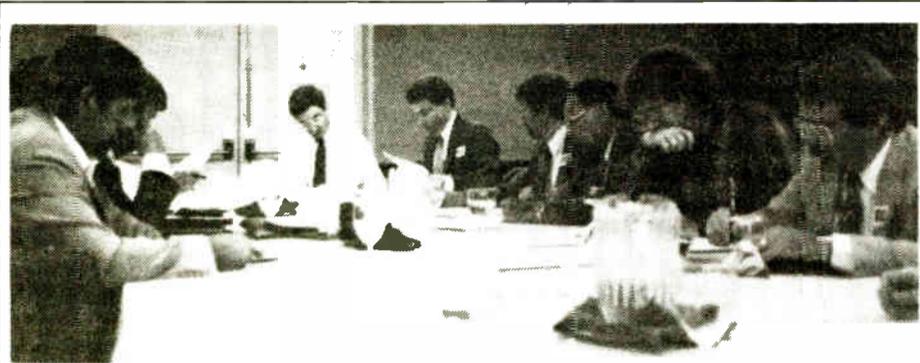
(continued on page 12)



From the exhibit floor (clockwise): Motorola's new C-QUAM exciter; NAB demonstration of NRSC standard; Harrison's new Air-790 console; Steve Bellinger presents Systemation's X-7D automation system; Shure introduced the PDP 1000 pro CD player; Radio Design Lab's Pod-U-Lar console; Paul Schafer with his Beta digital audio system.

RADIO '87

# NRSC Approves Draft RF Mask



NRSC members ponder release of a voluntary emissions standard at their meeting during Radio '87.

by Judith Gross

Anaheim CA ... The NRSC has approved a draft voluntary standard to reduce RF emissions as a complement to the preemphasis standard already adopted by many AM stations.

In addition, the group has paved the way for a request to the FCC to make the NRSC standard mandatory.

At a meeting just prior to the Radio '87 convention here, members of the NRSC approved a draft of the so-called "RF mask" standard—so named because it

would mask unwanted out-of-band emissions.

The group set a six month comment period on the standard in order to receive input from stations and transmitter manufacturers.

**Complementary standard**

The draft standard includes the same 10 kHz cutoff point as the preemphasis standard approved the same time last year, which took effect in January.

In addition, it provides a peak specification for spectrum beyond the 10 kHz cutoff, including program material and all ancillary or data communications.

According to the draft standard, the signal of a station complying with the NRSC standard should be 25 dB down from 10 to 20 kHz, 35 dB down from 20 to 30 kHz, 35 dB plus 1 dB/kHz down from 30 to 75 kHz, and 80 dB down above 75 kHz.

The RF mask was designed to address emissions, especially those of older transmitters which may cause a station's signal to exceed the NRSC standard at the point of transmission.

The standard is tighter than FCC regulations and has been drafted with an eye toward the future. The -80 dB beyond 75 kHz was included to accommodate new transmitters of the future which will give cleaner signals.

**Measuring splatter**

NRSC members agreed the new standard will control splatter, yet most stations will fall within its limitations.

The standard goes on to specify the type of measurement and testing procedure which will insure compliance, including use of USASI noise and a spectrum analyzer.

The group is also working on a "splatter monitor" which more precisely measures out of band emissions.

Chris Payne of Motorola said an experimental splatter monitor is nearing completion. The Motorola prototype measures in-phase and quadrature modulation to -90 dB and looks at both sidebands simultaneously.

Payne said a station could use it to measure its own signal, or measure another station which may be causing interference. He said such a monitor could be used instead of a spectrum analyzer.

Once the prototype receives input from stations, the NRSC feels one or several manufacturers would develop it as a product to market.

**Benefits now**

The latest information the NRSC has estimates that some 600 stations have converted or are converting to the NRSC standard. Many are waiting for shipment of equipment from processing manufacturers.

NRSC member Bart Locanthi said he believed "25% of the market is enough to get receiver manufacturers to make radios/ones which incorporate the standard and give a wider frequency response than those currently in use.

Locanthi asked committee members, "Is 25% feasible?"

Most felt that a quarter of the AM stations—about 1200—was not an un-

(continued on next page)

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## RADIO '87

# Emissions Standard Approved

(continued from previous page) realistic number of NRSC conversions to expect by the middle or third quarter of next year.

In addition, the NRSC also released information to explain why stations which have converted to the standard are already reporting better sound quality, even on existing radios.

Stan Salek of CRL revealed tests on transmitters which show a reduction in intermodulation distortion (IMD) due to the 10 kHz filter cutoff in the new standard.

Salek tested three transmitters and showed that the majority of IMD occurs at a point past 10 kHz. By implementing the NRSC standard, a station eliminates the worst of the IMD products hitting the transmitter.

## FCC regulation?

While many AM stations are converting to the NRSC standard voluntarily, the committee is concerned about those stations which may decide not to.

NRSC subgroup chairman John Marino of NewCity Communications pointed out that the few who don't convert would "ruin it for those who do," since second adjacent interference benefits only result when both stations comply with the standard.

NAB Science and Technology VP Tom Keller said the NAB executive committee is very supportive of the NRSC standard and has asked for input from the NRSC about petitioning the FCC to make it a mandatory standard.

The consensus from those NRSC members present at the meeting was that a mandatory regulation would be a positive step.

"I think personally the time has come for the Commission to make it mandatory," Marino said, "there has not been a lot of negative reaction."

As a result of sentiment at the meeting, the NAB has been conducting a letter ballot of all NRSC members to see if there is support for a petition to make the NRSC standard an FCC rule.

If there is, it would be up to the NAB and the Electronic Industries Association to petition the FCC for a rulemaking.

On a related note the EIA, which also convenes the NRSC, has been balloting its members by mail to determine if the NRSC voluntary standard should be upgraded to an EIA recommended standard.

## AM issues next

Now that the NRSC has nearly finished its work on the pre/deemphasis and RF emissions standard, the group is expected to turn its attention to

other AM technical issues.

An FCC notice of inquiry on AM allocations is accepting comments, and many NRSC members have voiced concern about some of the issues raised.

NRSC members have given support to a plan to release a "report to the industry" on the current state of AM as part of comments to be filed on the notice.

NRSC coordinator Michael Rau said the subgroup will begin working on the

report in October and concentrate only on technical issues.

"We wouldn't worry about policy considerations," Rau explained, "just technical issues such as first and second adjacent channel ratios, skywave and groundwave propagation."

Rau said that with background work done by the NRSC in its recent work to develop voluntary preemphasis and RF emissions standards, most of the infor-

mation is available for such an effort.

He added that while the 17 December deadline for comments on the AM allocations issue is not far away, he feels the FCC might consider a report from the group important enough to allow an extension.

Rau said that with broad-based input and support from industry members for such a report, "it would be hard for the FCC to ignore it."

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## RADIO '87

# New Products Feature Digital

(continued from page 9)

programmed from remote locations.

One particularly attractive feature of the X-7D for on-air staff is the easily accessible background information that can be programmed into the system. With the touch of a key, talent can call up information on songs, artists, even advertisers.

A man who is considered by many to be "the father of automation," Paul Schafer, entered the world of digital with a system which uses yet another consumer digital format—Beta video.

Schafer International's booth garnered considerable attendee interest with its Schafer Digital System utilizing Beta format 1/2" VCRs and special Sony digital processors.

The digital output of a CD player or recorder is fed to the digital input of a digital audio processor that converts the digital information to "video." It is recorded onto a Beta cassette on a special VCR.

SMPTE time code is recorded on the linear audio track to provide an "address" to each song.

This information, as well as the exact length of the song is entered into the data base of the computer. Thus the ex-

act beginning of a song can be located to within 1/30 of a second.

During search the tape is not in contact with the heads, so excess head and tape wear is eliminated.

Each cassette can accommodate up to 10 hours of music, and cassettes may be recorded digitally by station personnel or obtained from a syndicator. Playlists can be created days or months in advance and changed up to the last minute.

The basic System 80 includes eight VCRs, two digital processors (for cross-fade and overlap ability), switching and control circuitry and interface, VCAs, NEC Powermate II computer and software at a price of \$29,990. The System 160, with 16 Sony VCRs, is available for \$49,990.

It's interesting to note that the digital systems, including the R-DAT and 8mm formats, also interface to analog sources such as cart machines or cart automation.

Another digital development was Shure's introduction of its prototype PDP1000 Professional Compact Disc Player.

Designed specifically for broadcasters with full 16-bit processing with oversam-

pling, it features auto cue and stop, random access programming, 15-track memory and balanced line outputs.

A complete skip and scan capability is available via the front-panel keypad.

The PDP1000 will be ready for delivery by 1988 and will be priced at \$1200.

CompuSonics, which had been developing a floppy disk store and playback unit, has improved its DSP-1500 recorder-player and is now also offering a control computer, an IBM clone, with software.

The company introduced the CS/PC 1000 IBM PC AT Clone, a personal color computer "ready to run" with the PC/Sonics remote control and audio databasing software built in. It will support two CompuSonics DSP 1500 Recorders/Reproducers.

The DSP-1500 records, plays and edits audio from any source onto a specially-formatted disk. But instead of the floppy disk the system had previously used, the CompuSonics now uses a Bernoulli box, or removable hard disk.

The company offers 7 Mbyte disks which can record two minutes, 14 Mbyte disks for four minutes or 20 Mbyte disks for seven and a half minutes of full frequency stereo.

The DSP 1500 is priced at \$5995, the CS/PC 1000 IBM PC AT Clone with PC/Sonics is priced at \$2995. A carton of 25 disks which includes four 7 Mbyte, nine 14 Mbyte and 12 of the 20 Mbyte cost \$695.

This year as last year, the Media Touch/Allied Broadcast Equipment booth, featuring the Touchstone computerized touchscreen controller remained full of interested GMs, PDs and CEs throughout the show.

Touchstone is a modularly expandable controller of all audio sources, traffic and billing information, commercial copy, news copy and verification procedures. It is integrated with an IBM compatible

PC and/or AT.

Several new consoles made their debut at Radio '87.

Harrison's Air 790, successor to the Air 7, features expanded logic for remote control, auto muting for monitoring, new switches (manufactured by Iwatsu) and sensing bus assignment on B inputs as well as A inputs.

Harrison will introduce a successor to its Pro 7, the Pro 790, later this fall.

LPB's Signature III series new 12-



Nick Solberg (R) demonstrates Concept's R-DAT automation system.

channel dual stereo console is the latest in the series of 6, 8 and 10 mixer duals, both mono and stereo.

Radio Design Labs' new approach to console design was embodied in its Pod-U-Lar Console System. The expandable audio console has no chassis or mainframe. There are two balanced or unbalanced stereo inputs per pod.

The system features rotary step type attenuators, sealed, mil spec input switches and digital metering featuring analog type sweep, peak reading and VU decay.

A hinged rear door provides access to all electronics and service is possible while the system is in use.

In RF developments, Motorola showed its new Model 1400 C-QUAM AM Stereo Exciter. It features LED power supply status indicators, functionally partitioned circuits, front accessible adjustments and front load circuit cards.

TTC showed its recently introduced FM-300J 300 W transmitter, suitable for emergency back-up operation. It is 100% solid state and requires no tuning.

Two first-time exhibitors established their presence at the Radio Show: Otari and Mitsubishi.

Otari showed up largely to promote its NAB format cart machine, the CTM-10, with record phase compensation and HX-Pro bias modulation.

Mitsubishi Pro Audio exhibited its digital storage system, the DAS-2. It's a digital audio system on Winchester disk aimed at radio stations. It stores and plays back digital audio at 10, 15 or 20 kHz.

Manufacturers as a whole expressed satisfaction with the show turnout and booth traffic.

Also well received is the apparently increasing perception that the show has become more equipment oriented. Several companies, including Nautel and Fidelipac, reported doing a "brisk business."

Marlene Petska Lane is RW's Buyers Guide editor.

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RADIO '87

# FMX Test Installations Begin

by Judith Gross

Anaheim CA ... Broadcast Technology Partners (BTP), the organization formed to develop the FMX stereo extension system for FM, has begun an installation program of FMX prototype exciters.

The latest news on the experimental system surfaced here during Radio '87, which included an FMX demo booth on the exhibit floor.

BTP is a partnership which includes CBS and the NAB through their respective subsidiaries CBS-FMX Stereo Inc, and NAB Technologies, and an investor group, FMX Associates, headquartered in Detroit.

Recently, some modifications have been made to the FMX system, which is a patented noise reduction system designed to increase a station's noise-free coverage area.

After some problems surfaced in initial tests, the phase of the FMX signal, which is transmitted in quadrature to the station's signal, was reversed.

Thomas Rucktenwald, VP of engineering for BTP also said the reentrant curve characteristic—the point at which the FMX signal falls back to coincide with the original signal—has been raised.

"This reduces the noise modulation where conditions of heavy noise are present," Rucktenwald explained.

He said one benefit of this change is that stations with heavily compressed audio, such as for Top 40 formats, would receive some benefit from the FMX system as well.

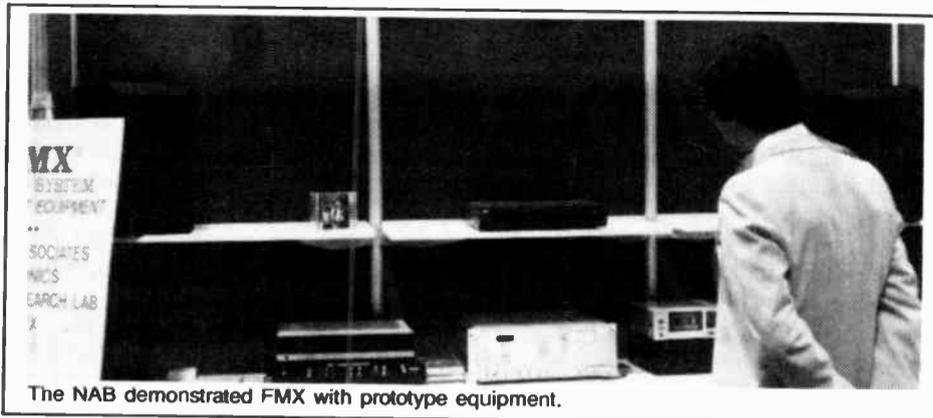
Previously, it was thought that FMX would only benefit stations that used little or no processing in their audio chains.

Rucktenwald said a program of installing FMX prototype exciters built by BTP, and FMX receivers, has already been started.

"We want to salt the earth with FMX stations," he explained, adding that BTP wants to try out the system with as many different types of stations as possible.

But Rucktenwald stressed that the installations will cease at some point, because "BTP has no desire to be in competition with industry manufacturers."

Currently, the four companies which initially expressed interest in manufacturing FMX exciters: Orban, Inovonics, CRL and Aphex, are conducting their own tests of the system.



The NAB demonstrated FMX with prototype equipment.

# RADIO Classics

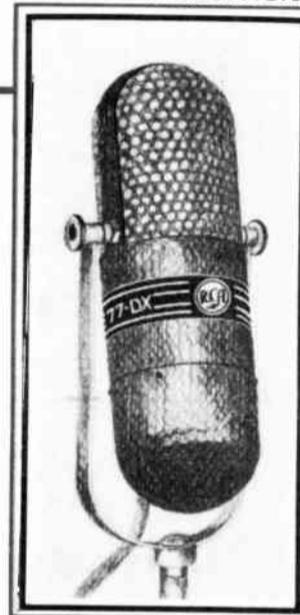
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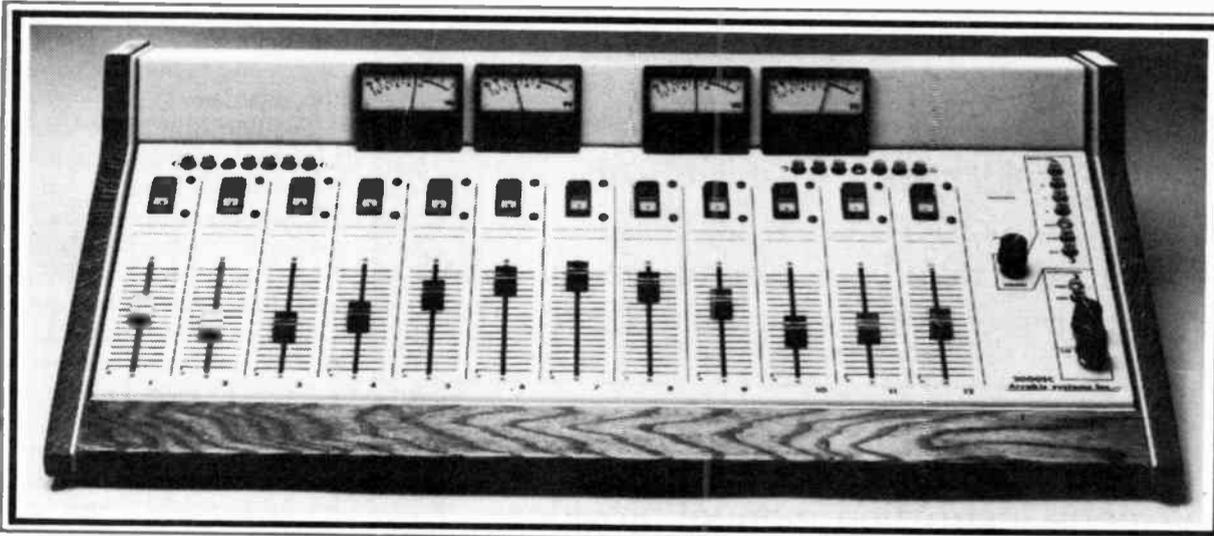


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## RADIO '87

## RFR Seminar Looks To Future

by Geary Morrill

Anaheim CA . . . The majority of radio facilities find themselves in compliance with the RF radiation limits now in place, but that's subject to change in the near future.

That's the news that greeted attendees at the RF Radiation Regulation Compliance Seminar, held September 12th in conjunction with Radio '87 here.

Representatives of the FCC, NAB, legal and engineering consultants and antenna manufacturers explained where broadcasters stand now, and what the

future may hold.

An initial overview and orientation was provided by Richard Tell of Tell Associates, whose new firm provides environmental assessment services and training relative to RF hazards.

Tell previously served as Chief of the Electromagnetics Branch, Office of Radiation Programs for the Environmental Protection Agency.

Robert Cleveland Jr. from the FCC's Office of Engineering and Technology outlined how present FCC policy and procedure was developed, and showed the existing ANSI guidelines.

John F.X. Browne, of John F.X. Browne and Associates then detailed evaluation of station compliance utilizing the "worst case" charts provided by the FCC in their RF radiation compliance bulletin.

He emphasized that a station should check by measurement if it appears that ANSI limits are being approached.

Tell then took the podium again, in a session covering RF measurement for compliance assessment.

He showed the various types of meters on the market for such measurement and explained inherent strengths and weaknesses for each type.

Situations were shown where measurements taken were well in excess of actual fields present, and Tell explained how this could occur. Emphasis was placed on using the right meter for the frequency ranges encountered.

Following a break for lunch, Cleveland returned to the podium in a discussion of corrective actions stations can take.

While these would normally consist of fencing and signage to ensure restricted access, they could take the form of modifications to antenna or tower, or in extreme cases, site relocation.

Robert Surette of Shiveley Labs showed radiation characteristics of existing FM antennas and work that is being done on altering interbay spacing to limit downward radiation levels.

This is normally accomplished with addition of bays to restore the antenna gain lost thru the reduced spacings.

Dane Ericksen of Hammett and Edison further discussed occupational exposure situations and what precautions should be taken.

The subject of "hot spots" of reradiation around guy lines and fencing was

brought up, as well as ambiguities in the current ANSI standard relating to their measurement.

Ericksen's firm has a petition for rulemaking before the Commission addressing the need for declaratory rulings in this and other areas of the present Section 1.1307(b) requirements.

Ken Keane of the law firm of Wilner & Scheiner, Washington, DC discussed a series of hypothetical cases involving station employees, third-party contractors and the general public to demonstrate station liabilities in each type of scenario.

Great emphasis was placed on licensee liability arising from potential "misrepresentation" in the self-certification of compliance on the Form 301 and license renewal process.

A station simply checking the compliance box without further investigation, and placing a statement in their policy book without further attempt to acquaint employees with its contents could be in great jeopardy.

Questions surrounding insurance considerations were also addressed.

Barry Umansky, Deputy General Counsel for the NAB, wrapped the session up with discussion of the Electromagnetic Energy Policy Alliance, an industry organization attempting to effect uniform regulation of RF radiation.

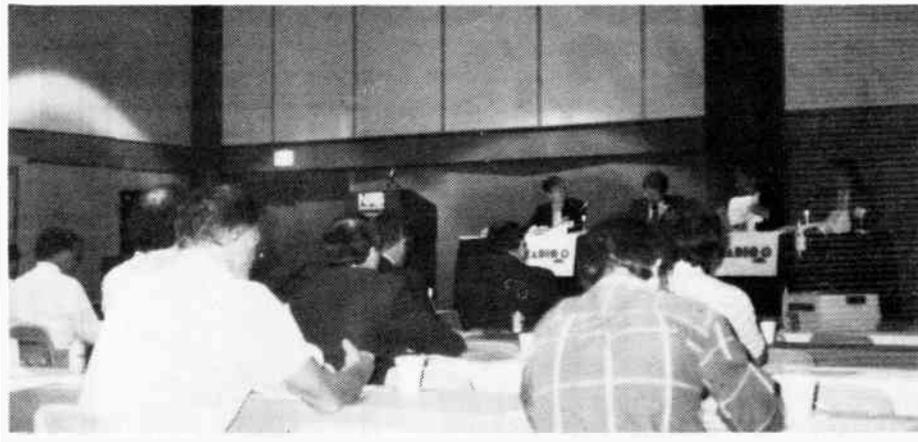
During the question and answer session that followed, the review of the ANSI C95.1-1982 standards were discussed in greater detail.

The review, slated for later this year, holds the potential for reduction of the existing limits to approximately 1/5 of their current levels for general public exposure, and could have an adverse affect on even more stations if adopted.

Geary Morrill is Director of Engineering for Mid West Family Stations and a frequent contributor to RW.

## NRSC Seminar

Engineers learn how to implement the NRSC standard for audio processing from (left to right) Michael Rau of the NAB, Glenn Clark of Texar, Stan Salek of CRL, and Bob Orban of Orban Associates.



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## Focus On DA Issues

by Tom Osenkowsky

Anaheim CA . . . They just keep getting bigger and better, the conventions and the seminars.

The 19th Annual Directional Antenna Seminar sponsored by the NAB, held September 8-10 to coincide with Radio '87, was no exception.

Fifty-three attendees from as far away as Australia and Puerto Rico were exposed to topics such as broadbanding, DA maintenance, reradiation, proof-of-performance, how-to's, and a myriad of discussions related to the everyday upkeep and optimization of DAs.

According to NAB Science and Technology engineer Michael Rau, the coupling of Radio '87 to the seminar was a great success.

Supplementing the classroom lectures, where each lecture topic was presented by an experienced consulting engineer, attendees were rotated among three hands-on workshops where they could ask questions about to their own systems.

On hand was FCC AM Branch Engineer John Sadler who discussed partial proofs, procedures and preparation.

Classroom materials supplied to each attendee included looseleaf bound flip charts for future reference, topographic map, ruler and protractor (as well as a

Smith chart), for plotting impedances for broadbanding purposes.

A synopsis of major topics covered include:

- Vector analysis of fields—how to determine which phasor controls affect what radials.

- Plotting of impedances on a Smith chart and plotting radials and coordinates on a topo map.

- Broadbanding—can your array be broadbanded and how to do it yourself.

- Reradiation—how to identify and cure reradiating parasitic structures.

- Networks, sample systems, impedances and instrumentation in a nuts and bolts discussion that tells you the tricks of the trade and how to save both time and money.

- Proof-of-performance—what the FCC requires and how to do it right.

There are tentative plans to continue holding the well-attended DA seminar during the NAB's radio show.

With the DA seminar traveling with the Radio Convention, engineers across the continent (and beyond) have a golden opportunity to learn about DAs.

The seminar and the convention can help attract more engineering attendees to both.

Tom Osenkowsky is a regular RW columnist.

RADIO '87

# AM Faces Electrical Interference

by Michael Callaghan

Anaheim CA ... If AM radio is going to stand a fighting chance, it's imperative that measures be taken to reduce interference as much as possible.

While interference from other stations is often unavoidable, static from power lines and electrical equipment can be controlled. This control was the topic of the session on Removing Electrical Interference.

Current Technology's Barry Epstein spoke on a number of important issues, including the effect of "dirty power" and what it can do to AM radio, and the need for conditioners to temper the 6000 V spikes coming in the power line.

Also of concern is the new SF6 "super-fast" switches the utilities use that interrupt the power for "only" two cycles when they work.

He pointed out that during that two cycle siesta, computer power supplies can "ring" and produce high frequency outputs remarkably close (but not close enough) to the system clock frequency.

Epstein took the National Electrical Code to task as not being good enough. When it was written, the power companies were feeding a much different type of load than they have now.

Jim Zoulek from the FCC's Long Beach office commented on the role his office plays in interference complaints. Typically power line RF noise problems are cured by the power company.

When complaints are caused by other than power lines, the process starts with a form filled out by the person suffering the problem.

The FCC sends a couple of letters to the person responsible, and if that fails, the enforcement section may get involved, with a lot more clout and the power to levy fines if needed.

Mike Rau from the NAB's Science and

Technology Department pointed out that AM Improvement includes the reduction of electrical interference.

Rau said there aren't enough standards limiting interference levels. Enforcement of standards would command the installation of the necessary traps and filters at the time of manufacture, where it would be much less costly than the present "sniff and fix" situation.

He also pointed out that the NAB and the FCC are both keeping a close eye on the RF lighting issue.

Recent attention aims at controlling

emissions from devices using RF oscillators to excite fluorescent lamps, and producing a lot of unwanted carriers in the process. A Notice of Proposed Rulemaking is still undecided, even after two years of FCC study.

Rau also passed out copies of an NAB study entitled, "What Does The Public Do When They Experience Signal Interference?"

The study covered many different locations where interference was heard, causes and any action taken.

In not one case, according to the study,

was the FCC summoned. Instead 76% tried fine-tuning the station, 73% put up with the interference and, 61% (here comes the program directors greatest fear) changed the station.

The bottom line is that as audiences become more accustomed to the virtually static-free environment of FM, the need to remove as much static and other interference from the AM band becomes critical.

Power companies, equipment manufacturers and regulating agencies all have to work together to help achieve this objective.

Mike Callaghan is CE of KIIS-FM, Los Angeles, and was a participant on the panel on Removing Electrical Interference.

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## RADIO '87

# The Future of Synchronous AM

by Geary Morrill

**Anaheim CA** . . . Attendees at a technical session on Synchronous AM Transmission found out that benefits of the technology may well be outweighed by the expenses incurred to implement this experimental operation.

Many smaller broadcasters in attendance at the symposium, looking for a cost-effective way to improve deficiencies in their AM patterns short of re-locating their main sites, seemed taken aback by the magnitude of economy presented.

## High price tag

A case in point was the 300 W non-D daytime, 500 W DA nighttime synchronous operation in East Las Vegas, Nevada to supplement 10 kW day, 1 kW night DA-2 primary coverage on 870 kHz from Laughlin, some 60 miles away.

According to Slim Sulyma of Advanced Broadcast Consultants (the consultant to Laughlin Roughrider), the licensee has spent in the neighborhood of \$600,000 to implement the experimental technology.

Initially Laughlin hoped to syn-

chronize carriers precisely, but has settled for independently operating tolerance oscillators due to difficulties experienced in "locking" the carrier frequency of the satellite to the main.

Questions concerning AM stereo operation remain to be answered as well, due to the need for phase as well as frequency coherency for such operation to succeed.

Some encouragement was found in the fact that the area of interference be-

tween the two sites—where signal strength from both transmitters approached a unity level—is not as large as theory would indicate.

Once the carrier from the dominant site roughly doubles the "interference" transmitter level, that signal is fully listenable.

Due to the unpopulated area between the experimental synchronous sites, this area is of little concern. In a more populous area of the country, however, this

could become a much greater factor.

Al Resnick of CapCities, another panelist on the symposium, explained how a simple synchronous solution for WLS-AM in Chicago was scrapped once a \$60,000 initial price tag was placed on it.

## Guidelines needed

While the technology has been utilized elsewhere in the world, and even in the Northeast US for some time, Wally Johnson, of Moffet, Larson and Johnson, who moderated the panel, indicated that much remains to be resolved regarding FCC guidelines for eventually establishing licensing procedures for such operations.

It is unclear whether such facilities should be limited to supplement inadequate coverage within a station's existing market, or allowed to exist as "satellite" TV operations have for years.

Questions regarding current duopoly restrictions and interference contours remain to be addressed as well, according to Johnson.

The Commission is soliciting comments on the issues, technical and legal, brought up by the proposed and existing synchronous experimental operations.

*Geary Morrill is Director of Engineering for Mid West Family stations.*

## Cart Machines

A panel on new cart machine technology, where analog tape was pronounced alive and well, was typical of the variety of engineering sessions offered. Left to right are Jack Williams of Pacific Recorders & Engineering, Art Constantine of Fidelipac, Judith Gross of **Radio World**, Tom Becker of ITC/3M, Moderator Jim Loupas and Tim Bealor of Broadcast Electronics.



# NRSC Leads Session

by Tom McGinley

**Anaheim CA** . . . It had been several years since the NAB held a panel on audio processing.

The Radio '87 panel was composed of representatives from four of the leading manufacturers of audio processing equipment.

Present were Bob Orban of Orban Associates, Glenn Clark of Texar, Stan Salek of Circuit Research Labs (CRL), and Eric Small of Modulation Sciences.

The dominant topic of discussion was the new NRSC standard for preemphasis, which was recognized by the panel as probably the most important recent technical breakthrough for AM broadcasters.

The consensus was that if a majority of AM stations get on the bandwagon and implement the transmission standard in their processing chains, adjacent channel interference will substantially diminish on the band.

This, in turn, will allow receiver manufacturers to build and market high fidelity wideband AM radios.

## Individual approaches

Orban, Clark and Salek each briefly described their company's particular approach to implementing the proper preemphasis curve and stopband filter characteristics in each NRSC add-on unit or retrofit card.

Salek also showed sample curves from tests he had performed on transmitters, showing that distortion performance will benefit by stopping the audio response at 10 kHz (see related NRSC story, this issue).

Clark emphasized the importance of regularly checking the transmission distortion and response performance of the AM transmitter, especially with tube-type units.

Unlike FM, AM transmitters age and deteriorate much more quickly causing a degraded on-air sound.

## Stereo image

Small, the lone panel member who has not been involved in the development of the NRSC standard, addressed other processing issues.

He briefly discussed the advantage of processing improvements in the spatial domain, rather than the loudness domain.

For AM stereo transmission, he explained how use of his new StereoMaxx spatial image enhancer will transmit a wider stereo image, while leaving the mono sum signal or mono sources such as straight voice totally unaffected.

But the session continued to be dominated by talk about NRSC.

## Product available

Orban, Clark and Salek mentioned that their companies are now shipping their NRSC equipment to stations.

Two other manufacturers not represented on the panel, Inovonics and Energy-Onix, are also reportedly shipping NRSC equipment.

A show of hands of the approximately 60 session attendees indicated that many AM stations have either already installed NRSC equipment or plan to in the very near future.

Panel members agreed that the standard should be made a mandatory FCC regulation, rather than just continuing as a voluntary standard.

Michael Rau of the NAB's Science and Technology department told the attendees that such an effort was currently being considered (see related NRSC story).

*Tom McGinley is currently director of engineering for First Media and was the moderator for the Radio '87 Audio Processing Session.*

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**OCTOBER 16-19, 1987**

# Variables of FM Antenna Design

by W.C. Alexander

Part II of IV

Dallas TX ... In the last installment, we discussed items relating to terrain and obstructions that have an effect on the signal and influence antenna design.

In this part we'll examine some of the technical variables of FM antennas.

An FM antenna, mounted on the vertical face or leg of a tower, will radiate more than half its energy above the horizon and into space. This is wasted energy.

Beam tilt, or the tilting of the main lobe of the antenna by mechanical or electrical means can be used to put the main lobe of the antenna either at or below the radio horizon.

## Calculating the tilt

The distance to the radio horizon in miles is roughly the square root of twice the height of the antenna. Some trigonometry is required to calculate the depression angle to the radio horizon.

In some cases you may need to tilt the beam down even more to place the main

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

lobe directly on the principle community.

Typical beam tilts are in the order of 0.5 to 0.75 degrees down. It should be noted that beam tilting lowers the gain of an antenna.

In the days of old, beam tilt was accomplished by mechanically tilting the antenna down somewhat.

Present day technology accomplishes beam tilting electrically by delaying the

“

*Until recently little choice was available for higher ERP levels.*

currents to the lower antenna bays and advancing the currents to the upper bays.

All this is normally accommodated in the design of the power divider.

## Antenna gain vs TPO

Different engineers have different opinions of what combination of transmitter power and antenna gain is appropriate for a given ERP.

Until recently little choice was available for higher ERP levels since the

highest power FM transmitters on the market were 40 kW.

With line losses considered, a power gain of 3 or more was required to produce a 100 kW ERP. This required at least a six-bay antenna.

Fortunately transmitter manufacturers have made great strides in the development of FM transmitters with power outputs on the order of 60 kW allowing a

much wider range of antennas that can be used for a given ERP. This is particularly important in areas where FAA restrictions limit the height of towers and a shorter antenna must be used to put the center of radiation at or above the required level.

As a rule the more bays an antenna has the narrower its main lobe will be. This is an important consideration when it comes to planning for signal penetration in areas where shadowing and multipath are likely to occur (which includes almost all urban areas).

Generally speaking the lower the antenna gain and higher the TPO for a given ERP the greater the energy that is actually radiated.

Consequently lower gain antennas seem to fill better and produce less multipath than those with higher gains for a given ERP.

Typically for a 10 bay antenna the first null will occur at approximately 5.5° below the horizon, and the second null at 10.5°.

Using trigonometry, one can calculate that the first null would strike the ground at a distance of approximately two miles away, and the second at one mile, assuming a tower height of 1000' over uniform terrain.

The relative field will fall to near zero in these nulls, and therefore it is important to consider what lies in these null areas.

Electrical null fill can be employed to give a percentage of fill in these nulls,

typically 10 to 20 percent.

Normally, only the first null is compensated for, because the second null is so close to the transmitter site it is usually not a factor.

## Added benefits

Perhaps more important than providing coverage in the areas where the nulls strike the ground is the effect that null fill has on the overall vertical plane pattern of the antenna.

Filling the first null will tend to broaden the main lobe and therefore more energy is concentrated in that main lobe, where you want it. This has a very desirable effect on multipath.

Adding null fill to an antenna is accomplished by feeding more power to the upper half of a center fed antenna. As with beam tilting, it does lower the gain of the antenna.

Any time a signal from two different directions or paths reaches the receiver multipath interference occurs.

Most people who live in the asphalt jungle are well acquainted with multipath and its associated chopping and chirping.

## Shadowing effects

Shadowing, which occurs when an obstruction in the path blocks the signal to the receiver, can work with multipath to make a signal unlistenable.

The worst case scenario would be a station outside of town with its tower on a mountain, another lower ridge halfway to town and another mountain on the other side of the city.

Shadowing is going to occur in the parts of the city hidden by the lower ridge, and multipath is going to occur over most of the city because of the direct signal from the tower mixing with the reflected signal from the opposite mountain.

Situations like this require special consideration in the design, utilizing uncommon amounts of beam tilt and careful selection of the transmitter site.

Multipath can be either source induced or obstruction induced.

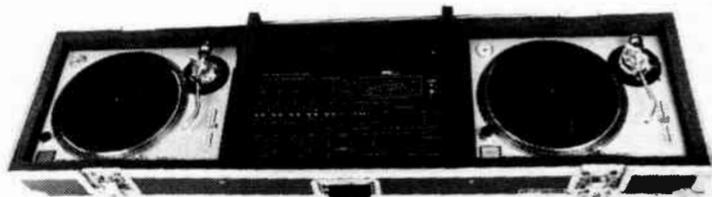
Obstruction induced multipath is difficult to get around, but careful transmitter site selection and attention to antenna gain and first null fill will help.

Source induced multipath comes from IM products and sideband distortions, usually generated in the antenna itself but sometimes from sources such as another nearby FM antenna with selective filters in the transmission line.

In the next installment we'll take a look at the various types of antennas available, some of their individual characteristics, advantages and disadvantages.

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## Null fill

In its vertical plane radiation pattern every FM antenna exhibits a main lobe and a series of minor lobes.

The dips between these lobes are the nulls because the radiation drops to near zero in these very sharp areas.

Typically for a 10 bay antenna the first null will occur at approximately 5.5° below the horizon, and the second null at 10.5°.

Using trigonometry, one can calculate that the first null would strike the ground at a distance of approximately two miles away, and the second at one mile, assuming a tower height of 1000' over uniform terrain.

The relative field will fall to near zero in these nulls, and therefore it is important to consider what lies in these null areas.

Electrical null fill can be employed to give a percentage of fill in these nulls,

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# NABET, NBC Talks Start Again

Alex Zavistovich

Washington DC . . . At press time, talks were scheduled to resume September 22 between the National Association of Broadcast Employees and Technicians (NABET) and NBC. Although details of the new round of talks were unavailable, the discussions pick up on a session which failed earlier in the month.

On 1 September, talks had been suspended between negotiating committees of the two parties, reportedly with no progress made. The negotiations had begun in Washington DC on 25 August, with the participation of the Federal Mediation and Conciliation Service (FMCS).

NABET has been on strike against NBC since 29 June, when the network unilaterally implemented a final contract offer which the union had found unacceptable. Some insiders had expected the late August talks to have resolved the dispute—whether the current round will bring an end to the strike is unknown.

According to NABET International Representative John Krieger, in early September the two sides were still apart on basic issues such as the status of non-union employees.

Krieger had blamed NBC for breaking off the last round. He noted the network was "holding firm" on a number of issues, including contract language enabling non-union employees to cover sports and news for NBC, which "could cost the union between 150 and 200 jobs."

Krieger said that NBC VP/Labor Relations Day Krolik, a member of the NBC negotiating committee, told NABET he had "no authority" to change the language. NBC's reluctance to bargain on those issues, Krieger maintained, was preventing a resolution to the contract dispute.

Krolik told RW that "progress had been made" in Washington, and that fewer issues are separating the parties than had been previously. However, he said discussions were adjourned by the

FMCS after it became clear the groups were "not in a posture to advance talks any further."

However, the talks have resumed. At press time, neither Krolik nor Krieger could be contacted to discuss the talks slated for late September.

Some sources had relayed rumors that, in the past round of discussions, the negotiating teams were planning on "talking until they (came) up with something." The sources had expected the union and the network to come to an agreement before the Papal tour of the US in late summer.

As late as the first week of September, Krieger and Krolik had said no talks were planned.

(continued on page 26)



Striking NABET members and supporters rally in Washington, D.C.

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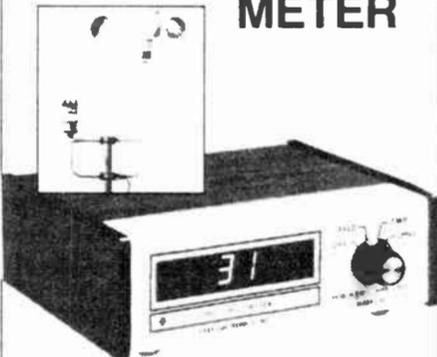


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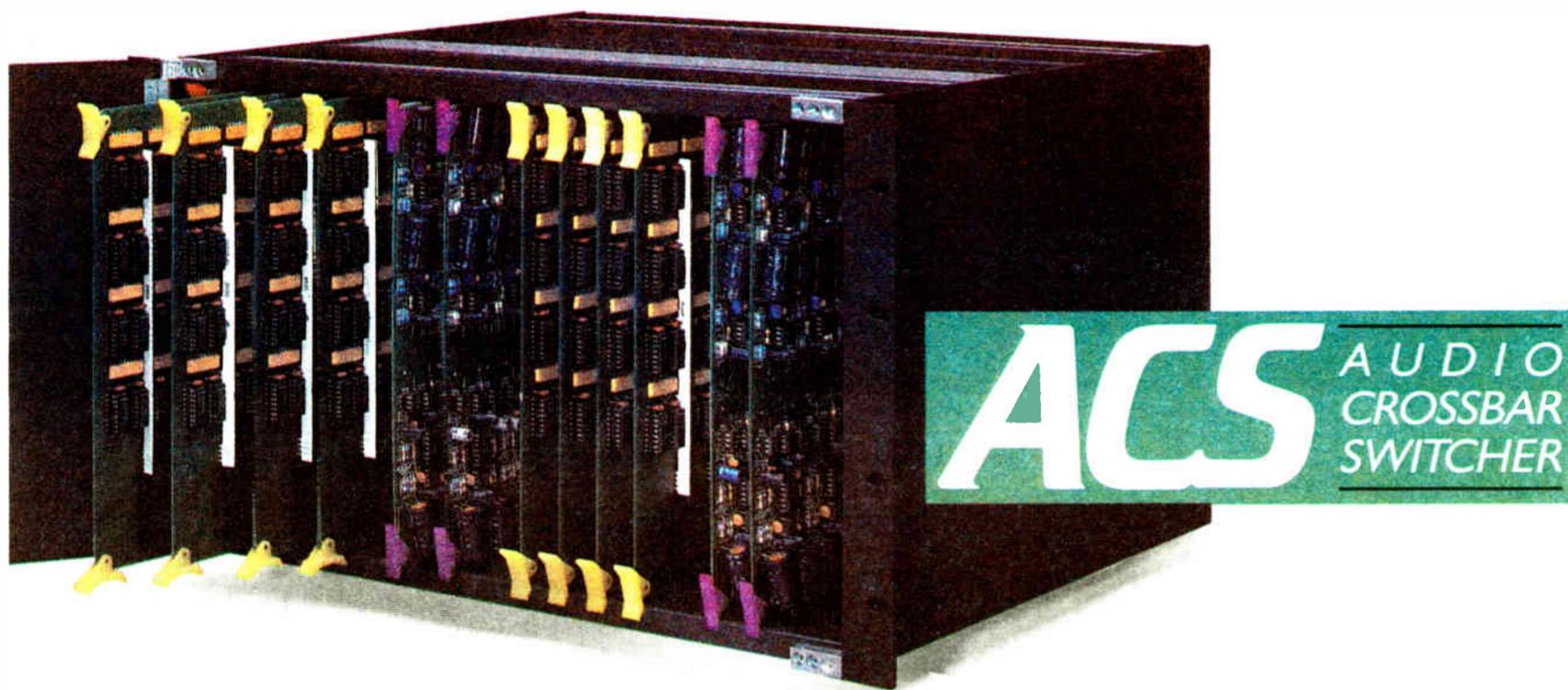


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# Riding Out A Lightning Strike

by John "Q" Shepler

**Rockford IL . . .** It's one of those muggy August afternoons, the dog-days.

Tim Mullin, CE, is about to have an early supper before heading to the station.

He stands in front of the open refrigerator door trying to choose the best of the leftovers. The cold from the fridge feels so good he hates to make a decision.

A moment later, Tim hears a crack of thunder in the distance. He decides to grab half a sub and hit the road before he gets caught in a downpour.

Tim peels into the station parking lot just as the first big drops hit his windshield. With an orange soda in one hand he scrambles across the lot and through the front door.

Pausing to catch his breath he can hear Jerry White, the intern, cueing up a new automation tape.

## Lightning strike

The outside light has disappeared in a matter of a few minutes. The booms of thunder preceded by the ripping of lightning bolts are getting more and more frequent.

## Q-Tips

Suddenly the lights in the station are off. The taped music moans to a stop. Before Tim knows it the lights pop back on but the sound doesn't return.

There is only a faint hissing in the monitor speaker. Tim heads to the equipment racks where Jerry is already working the remote control.

The meters are dead. No plate and no filaments. Jerry stabs at the buttons again and again. No luck. He turns to Tim with a help-me stare.

Tim charges through the back door and out 300 feet to the transmitter building. It's dead quiet inside.

The exhaust fan as well as the transmitter is shutdown. The air hangs heavy and Tim can smell some funny odors, like plastic melting.

Tim glances at the breaker box. The main is tripped as well as the transmitter breaker. He kicks the main back on and the fluorescent lights flicker to life.

The exhaust fan also starts to spin and the louvers creak open. The radio used as an air monitor is hissing loudly.

## Precious seconds

Instinctively Tim pops the fasteners on the final cavity. As he sets the cover aside the smell increases.

Now there are some burning insulation smells mixed in. His heart sinks into his stomach.

Like all dedicated engineers Tim has a professional conscience that tugs at him.

It takes the form of a loud clock ticking away the seconds of lost air-time. Tim feels the sweep hand counting up those lost seconds, then minutes. His pulse is racing. What to do?

His right arm lurches toward the open cavity. Then it freezes mid-air. The

shorting stick! Those caps may still be charged.

The stick is way around the back of the transmitter in the lower cabinet. Too far away. He looks around for his largest screwdriver and finds it on the bench.

Armed, Tim makes another stab toward the cavity. Once again his arm freezes before the screwdriver penetrates the opening.

Tim waits a second and glances over his shoulder, pausing just long enough to become conscious of what is going

on outside.

The sounds of thunder and lightning rage even closer.

He thinks about the clock ticking away those precious minutes. Then he thinks about what might happen if he crawled into that transmitter during an electrical storm. His decision is made.

Tim eyes the muddy path to the main building and makes a dash toward a blurry spot that must be the back door. Soaked and shaken he collapses into a kitchen chair.

Jerry slides into the eating area and wants to know what's happening.

"Not much," Tim replies. "Too nasty out there."

An hour passes before the heavy stuff lets up. The lights in the station flash, the sky lights up and the crashes of thunder almost overlap each other.

The GM calls from a campground 40 miles away. He too had caught the fury of the storm and was just now willing to touch a pay phone.

*(continued on page 22)*



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*John Shepler is an engineering manager, broadcast consultant, writer, & regular RW columnist. He can be reached at 815-654-0145.*

\* (suggested list)

# When a Storm Hits the Station

(continued from page 21)

Had the station taken a hit? How bad? He gets quiet when Tim ticks off the few problems he had noticed while at the transmitter.

"Ok, do what you can, guys," the GM says, and hangs up.

Another hour passes before the electrical part of the storm moves off to the horizon. Tim decides to take a calculated risk and get this baby back on the air.

Back in the transmitter building, he resets the main breaker again. This time however, he pulls the back door off the transmitter and unhooks the grounding stick.

Swinging it around, Tim touches the stick to anything that even looks like it might carry more than 24 V.

## Close call

Satisfied, he goes back around to the front of the transmitter and peeks into the final cavity.

There are long black scorch marks at the top of the cavity and down the plumbing. Tim's jaw drops. It isn't the damage.

There was damage before. It's the knowledge that had his fingers been wrapped around those tuning components in the last couple of hours, there wouldn't be much left of this CE.

He quickly surveys the situation. The cavity is damaged, the final is certainly blown and the high voltage supply has a few problems. And another line of thunderstorms is approaching from

the west.

Tim remembers the emergency setup they used last year when the new antenna was being installed.

The old three-bay is still hanging on that telephone pole just outside. But would the exciter get up and run?

Tim resets the breaker for the equipment rack next to the transmitter. Lights and meters start to jump. The mod monitor is up, and the exciter looks like it might be OK.

He flips off the breaker and nervously swaps the old antenna for the transmitter drive on the exciter output. On with the breaker once more and a quick check of the output reading. OK, back in business.

Tim calls Jerry on the house phone and tells him to get cracking with whatever weather information they can provide to their limited service area.

Somewhat relieved that he had at least given the station a small voice, Tim heads back to the studio to wait out the rest of the storms. At his desk in the shop, he pours over the transmitter schematics.

He is certain that some components were goners, but he needs a test strategy for the other areas. He settles on a plan of progressively bringing the transmitter to life.

First he'd get the breakers to stay on by isolating the power supplies. Then he'd get the low voltage up followed, hopefully, by the high voltage. The final amplifier would be the biggest challenge.

He'd save that one for last.

He calls Bill Peters, a friend and CE of a similar station 20 miles south. If he can get Bill's assistance, they might stand a chance.

Bill is his best hope, not just because they're friends and would help each other out, but because Bill has the same model transmitter and a stock of spare parts.

Tim is in luck. Bill's station was spared the brunt of the lightning attack and is still on the air. They agree to meet just after midnight with Bill's van loaded with parts and Tim providing the pop and pizza.

## Makeshift solution

About 12:15, Bill backs his van down the gravel path to the transmitter building and the two engineers set about their work. The rain has stopped.

They disconnect the power supplies from the rest of the transmitter circuits, and then reset the breakers.

There is still a short. Tim lifts the secondary leads of the high voltage transformer. Now the breakers hold. Low voltage—OK.

The damage to the high voltage section consists of a blown rectifier stack and a filter choke shorted from case to ground. That accounts for the insulation smell.

Bill has an extra stack but no choke. They settle for insulating the choke on drinking glasses for the time being. High voltage ON and holding!

Now the ugly job. Bill pulls the final

and set it aside. They check the socket.

Except for some discoloration, it doesn't look bad. How about the plate insulator? It ohmed out ok, but that's no guarantee. Would she run? Not yet—still a short to ground.

The problem is isolated to a high voltage doorknob capacitor cracked down the middle. Some plastic standoff insulators also look and smell fried, but are still intact.

Bill has a collection of high voltage caps, but not the exact replacement. Since this is only for bypass they pick something close and find hardware to match.

The two engineers put the covers back on the transmitter and start the warm-up cycle. First filaments—let Bill's rebuilt final warm up a little. Then plates.

Incredibly, they're up and running. The final tuning needs touching up, but at least there's no arcing.

Tim also resets the exciter tuning from the changes needed for running directly into the old antenna. What a relief, they're back on.

Tim grins at Bill. "Thanks, pal, I owe ya one."

"No problem," replies his buddy, gathering up his remaining parts collection. "But it looks like the strike that knocked you off came through the power lines. I didn't see real damage to the tuning components.

"You ought to talk the old man into some surge protection. Might let you ride out the next one. Besides, who wants to be out here poking around during a thunderstorm?"

"That's for sure," Tim sighs. "Who knows what could happen?"

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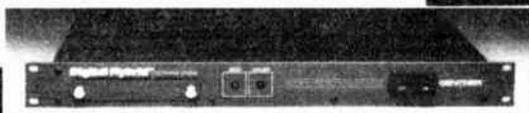
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# Be Your Station's Cheerleader

by Tim McCartney

**Boise ID** ... Have you ever heard a radio station in which the announcers bad-mouthed management—on the air?

I have worked at two such stations and was only too happy to see these announcers be forced into rapid career changes.

It seems to go without saying that you don't criticize your employer in front of the clientele. But yet it happens.

An airline pilot recently publicly passed the buck for delays to "those air traffic controllers."

This sort of behavior does nothing to boost confidence in the airline industry. And the situation is even more true in an entertainment medium such as radio.

Why would someone be so openly hostile on the air? The reasons I saw during cases of abuse included revenge, format change, loss of power, free speech and superiority.

In the case of revenge, the announcer thought he deserved a promotion, didn't get it and sought appropriate revenge on station management.

In fact this announcer truly had the skills to be promoted if only he would have been willing to move to another market.

For personal reasons relocation was ruled out. The result was a double-bridge-burning behind him.

## Format change

One station I knew had changed formats and the announcer perceived her role as intolerably diminished. She was upset that such drastic changes could be made by upper management without her counsel.

She felt it her civic duty to expose management directly to its current listenership in some futile hope of reversing the format decisions.

After all, her ego had been inflated over the years by her regular on-air post.

Her listeners had contributed to a rationalization which said that her approach to that format alone made the world turn.

We cannot realistically expect an announcer in such a position to broaden this tunnel vision.

She saw her own personal role as far more important than the greater good of the organization. Once such a person is identified, dismissal is the only alternative.

## Loss of power

At one station the on-air complaints centered around the new format. But it was all a coverup for the true concern: loss of power.

The in-crowd had lost its ability to get its own kind on the staff, and had no influence in programming or station direction.

Being publicly angry about losing control isn't likely to win much public support. So their anger was masqueraded in the form of concern over program changes.

Some people despise losing power. One announcer brought in wood boards to barricade himself in the control room.

*Tim McCartney is CE of KBSU, Boise State University. 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.*

in order to advise his listeners about the inappropriateness of the upcoming format changes.

While he was at it, he lamented over the sadness that he would not be part of the new team.

Do these people think management are imbeciles? We simply pulled the plug on his little prank, put the production studio on the air, and showed him the door.

## Free speech

Some folks view the first amendment as totally without limitation.

One announcer—a law student—said station management had no right to curtail his free speech rights when it limited his social commentary during

a jazz show.

We must assume that he wasn't a very good student of law. We know that he wasn't a very good radio programmer or employee.

Then there are the announcers who simply know it all. They smack of the "church lady" character on NBC's *Saturday Night Live* who is "just a little bit superior."

They view management as thick-headed thugs with mafia ties who are incapable of comprehending that "Lynyrd Skynyrd lives on, man!"

Their preoccupation with music often overrules any practical tendencies they may otherwise demonstrate.

After her radio days had ended over the loss of power, one announcer carried

her campaign to a retail establishment.

As manager of a local record store she was directly hostile to customers who, she would eventually learn, supported the new format. She lost hundreds of dollars of record sales in the process.

All of this was great news to her competition which got all the extra business as a result. Strike one up for capitalism!

## Cheerleading is appropriate

It's the responsibility of all radio employees, including engineers, to "talk up their station."

If anything can be learned from the behavior of the bizarre announcers recounted here, it is that being a staunch supporter of your station truly is appropriate and expected behavior.

It helps business. It strengthens the engineer's role in the station. And, it is the engineer's responsibility.

Be your station's #1 fan!

# Harris Pay Cuts Are Reinstated

by Alex Zavistovich

**Quincy IL** ... Citing successful cost-cutting measures and an increase in sales over the past months, Quincy-based Harris Broadcast Division plans to reinstate full employee salaries, following across-the-board pay cuts implemented earlier this year.

At press time, pay level reinstatement was to take place 26 September. The entire Quincy headquarters—approximately 350 people—will be affected by the action, according to Harris Broadcast Division spokesperson Martha Rapp.

An across-the-board reduction of 10% in employee salaries was made by the company in May, as the product of restructuring of the broadcast division. Harris had attributed the pay cuts to a lean sales period in the industry in general for broadcast transmitters and related products.

Accompanying the salary reductions, Harris laid off eighty workers. The lay-off followed a "voluntary" reduction of another eighty workers earlier in the year.

At the time, Jim Murphy, spokesperson for Harris Corporation, stressed the pay cuts at Quincy were "temporary," and would be reviewed in the early fall, after a reassessment of the business climate.

Following Harris' announcement of reinstatement of the pay levels, division VP/Sales and Service Gene Edwards said "good progress" had been made in business.

"We've become more effective in television sales, and have experienced a definite pick-up in international business," Edwards commented. He added that, although the market for domestic radio is "soft," the company plans to "redouble" its efforts to improve sales in that area.

According to Harris, "far-reaching" programs to increase competitiveness were instituted during the restructuring of the Broadcast Division.

Among these were cost-cutting measures such as team manufacturing, in which the company's audio products are built by project teams or "cells," rather than by conventional methods.

Another program born of the restructuring was the "refinement of advanced marketing and product introduction strategies." Rapp declined to provide any of the strategies developed, but noted



Some 350 Harris employees at the firm's Quincy headquarters had salaries reinstated

that the program was "closely coordinated with market research."

New engineering programs have also been instituted at the division. According to Harris, these engineering strategies aided in the completion of the DX-10 solid-state digital 10 kW AM transmitter "at less than projected cost."

Edwards said that Harris will "continue with programs designed to reduce costs and provide products broadcasters need and want."

"Reinstatement of salaries comes at a time when we are convinced that the Division is on the right track," he commented.

Rapp added, however, that the company has no plans to rehire the employees released earlier this year. Those employees, she said, were cut as part of the broadcast division efforts to "streamline" its operations.

For additional information, contact Martha Rapp at 217-222-8200.

## The numbers tell the story.

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WWMG(2)
- Columbia, SC  
WDPN(2)
- Danville, VA  
WDVA(2)
- Durham, NC  
WDCG(2)  
WDNC  
WDXU(2)  
WFXC
- Falls Church, VA  
WFAX
- Fayetteville, NC  
WFSS
- Gastonia, NC  
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- Goldsboro, NC  
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WPTF  
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WRAL-TV(3)  
WRAL(6)  
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Capitol Broad-  
casting (10)  
(Group locations  
not shown)
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WRVA(3)  
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# FM Plan May Add Interference

by John Kean

## Part II

Falls Church VA ... This is the second part of our look into the FCC's recent Notice of Inquiry in Docket No. 87-121.

This docket considers the use of directional transmitting antennas and some form of signal contour protection to allow greater flexibility in the location of commercial FM transmitter sites.

The first part provided background on the present allocation rules. This final part explores the basis of the FCC's present allotment system and projects some estimates of interference for minimum separation.

### Stereo vs mono

The FCC's FM allocations technical standards are based, to a large degree, on a co-channel signal-to-interference (S/I) ratio of 20 dB. This ratio was established approximately 40 years ago when the only FM transmission mode was monophonic.

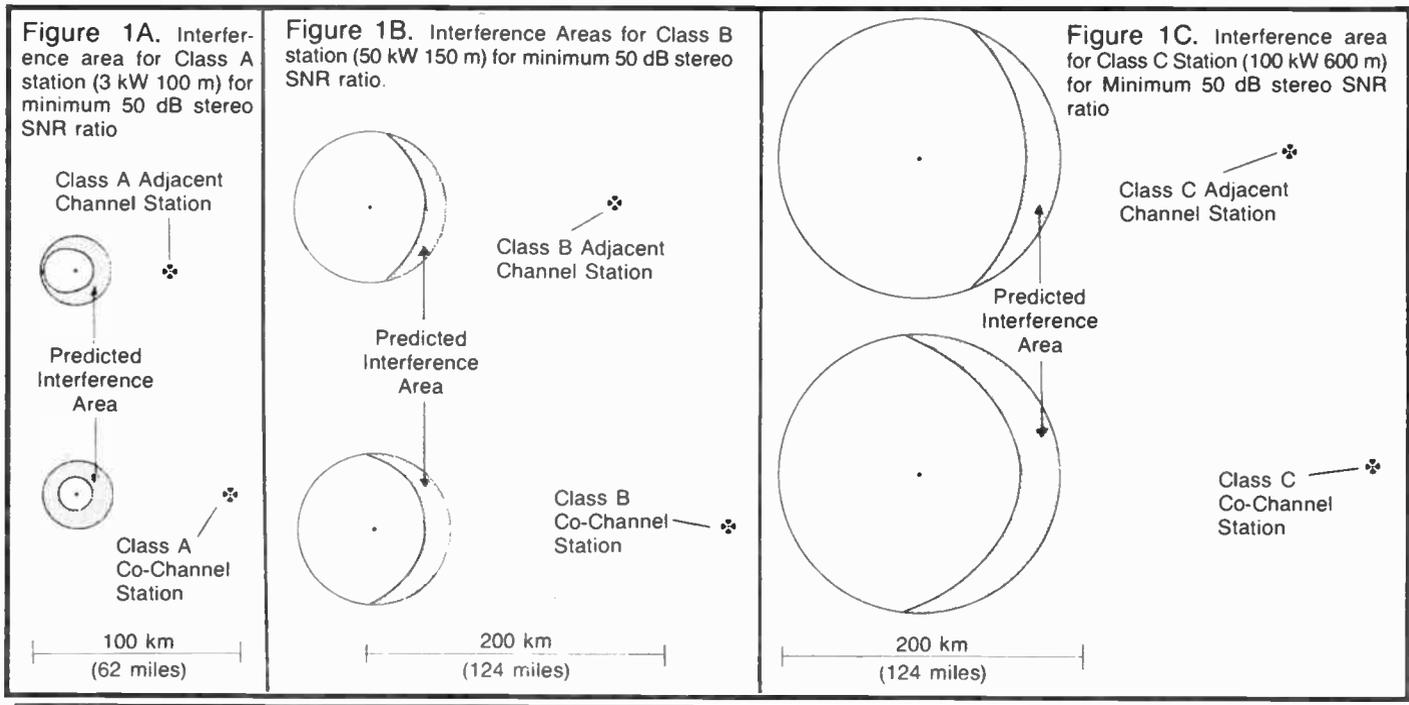
A 20 dB co-channel S/I ratio results in an audio SNR of approximately 50 dB for monophonic reception. For adjacent channel operation, a 6 dB RF S/I ratio was also expected to result in a 50 dB AF SNR.

For stereophonic transmission the interference ratios are considerably different.

Tests conducted for the National Radio Systems Committee concluded that a 50 dB stereo SNR of 50 dB requires a 40 dB RF S/I ratio for co-channel stations, and a 25 dB RF S/I for adjacent channel stations.

These values represented the mean for measurements of 17 receivers ranging

*John Kean is a senior engineer with Moffet, Larson & Johnson Inc., a Washington, DC area-based consulting firm. Previously he was a senior engineer with Jules Cohen and a senior engineer for National Public Radio. He can be reached at 703-824-5660.*



from low cost to high cost models.

Recent tests have characterized a 50 dB SNR degraded by interfering signals as "perceptible but not annoying" for most radio programming.

In the same tests, a 30 dB AF SNR was generally characterized as "annoying".

Since stereo sound is the FM transmission standard today, many receivers have neither manual nor automatic means to override the stereo mode when interference occurs.

The common international standard for FM stereo broadcasting supports this finding. The CCIR believes a 50 dB stereophonic SNR ratio is necessary to provide a quality FM broadcasting service.

### Capture radio

Little or no improvement has occurred in pertinent aspects of FM receiver performance since the adoption of the FCC's adjacent and co-channel allocations policy.

One exception is capture ratio per-

formance (a measure of an FM receiver's ability to suppress a weaker undesired signal), which has improved significantly in the past 40 years.

The capture effect of an FM receiver is determined by the modulation index of the FM system being received, but this index is low for broadcast FM stereo.

The modulation index is the quotient of the peak deviation divided by the highest modulating frequency.

For mono FM this is  $75/15=5$ ; for stereo FM the modulation index is  $(75-7.5)/53=1.3$  (where 7.5 kHz is deducted for stereo pilot injection).

Because stereo FM has a relatively low modulation index, the broadcast receivers have a minimal ability to capture the stronger signal and suppress interfering signals.

FM receiver adjacent channel performance ( $\pm 200$  kHz) has generally not improved in the last few decades.

### Wider radios

The demand for high fidelity equipment with low audio distortion and wide stereo separation has encouraged development of receivers with rather wide and flat filter characteristics.

However, broadening a receiver's response across the desired channel reduces its ability to select against adjacent channel interference.

(On the other hand, second and third adjacent channel selectivity of average receivers has improved, but this change is not exploited in the present proceeding.)

The diagrams of Figure 1 were prepared to illustrate the areas of interference that are predicted to result to three classes of adjacent and co-channel separations: A-to-A, B-to-B and C-to-C classes. (Of course, many other interclass combinations are possible).

The separations are the minimum distances allowed under present rules and are roughly equivalent to the contour protection methods suggested in the Commission's Notice of Inquiry.

The diagrams are based on the maximum facilities for each class and minimum separation distances described in Part 1 of this article (see *Tradeoffs in FM Revamp Plan* 15 September RW).

The outer circles depict the 60 dBu (1 mV/m) contour for each class of station. Omnidirectional transmitting antennas (continued on next page)

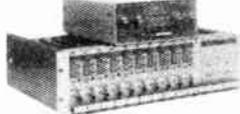


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007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
013	033	053	073	093
014	034	054	074	094
015	035	055	075	095
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# Revamp Plan Cause For Concern

(continued from previous page) and uniform terrain are assumed for both the desired and interfering station.

The distance scale is the same for each class so that service areas may be compared.

The shaded zone depicts the locations where the ratio of desired F(50,50) to interfering F(50,10) field strengths are 40 dB and 25 dB for co-channel and adjacent channel operation, respectively.

As discussed earlier, these ratios would result in a stereo SNR of less than 50 dB for the desired station. (Note that in the case of Class A stations interference sweeps fully around the site of the desired transmitter!)

In viewing the diagrams, bear in mind that the S/I ratios at a point on the 60 dBu contour nearest the interfering station are listed for maximum facilities in the previous article.

For each class, the ratio exceeds 20 dB, which results in a mono SNR of better than 50 dB, but a stereo SNR of less than 30 dB.

### Using DAs

If a directional transmitting antenna was employed by the interfering stations in combination with simple contour protection methodology, greater interference could occur to all classes

of stations.

Remember that the closest interfering contour from a nondirectional station can be assumed to be an arc which is nearly tangent to the protected contour at only one point.

With directional antennas the ERP of the new (interfering) station can be controlled across an arc which fits this contour around part of the protected contour.

Although the required S/I ratio would not be exceeded anywhere along the 60 dBu contour, the area of the interference crescent would increase because its edges would extend further around the desired station's service area.

The service areas for maximum operations in each of the three sample classes is listed in Table 1. The interference areas are also listed, along with the percent-

age of service area receiving interference.

It should be noted that the interference areas depicted in Figure 1 and listed in Table 1 are the locations where the probability of interference exists to more than 50% of the locations for more than 10% of the time.

Clearly interference does not occur at all locations within the predicted zone, and it is expected that interference can occur in some locations outside the zone.

There are more statistically thorough means of describing this interference to service, but these methods are beyond the scope of this article.

### Limiting factors

Why do such large interference areas always occur between adjacent and co-channel operations?

In reality there are factors which limit

the actual interference.

As discussed previously, the majority of stations operate at greater than minimum spacings due to the random separation of communities chosen in the allotment proceedings.

Also, some stations operate with less than maximum facilities, reducing their own area receiving interference, as well as interference caused to other stations.

A more complex factor which reduces the interference in some cases is terrain shielding. Mountains, hills and ridges effectively reduce interference between some FM stations.

However, these terrain features are not considered by a table of separations or by a contour protection method employing the F(50,10) field strength curves.

On the other hand, extraordinarily flat terrain results in greater than expected interference but this land characteristic is overlooked as well. In those cases, greater interference results between stations on adjacent and co-channels.

### Potential for problems

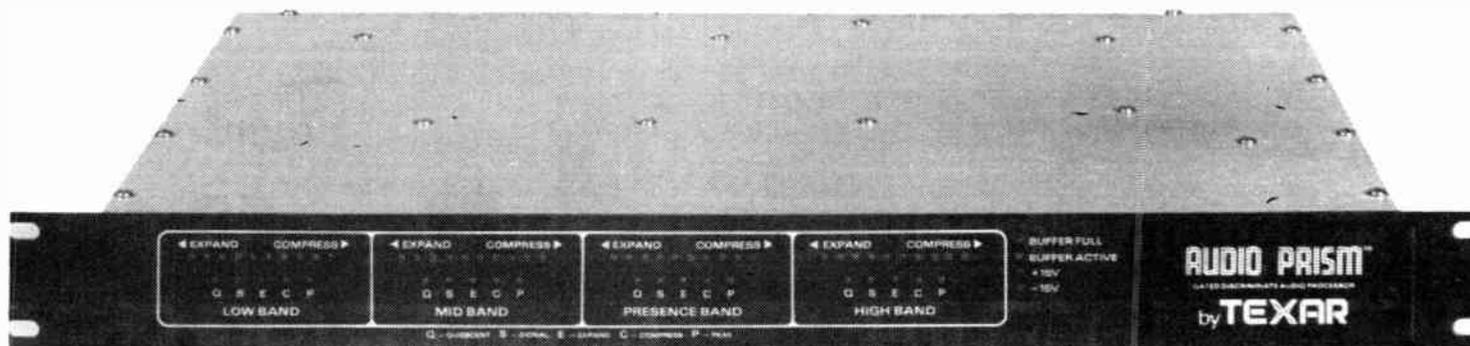
We have seen that the present allotment system is based on distance separations which are in turn based on S/I ratios at the "protected" contour of at least 20 dB co-channel and 6 dB adja-

(continued on page 26)

Table 1. Examples of interference areas assuming minimum separation distances.

Facility Relation	Service Area (sq. km)	Interference Area			
		Co-Channel (sq. km)	(%)	Adjacent Channel (sq. km)	(%)
A to A	1,855	1,430	77	1,040	56
B to B	8,332	1,730	21	1,220	15
C to C	26,436	5,200	20	3,210	12

## ALL CD BY THE END OF THE YEAR!



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

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

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

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

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

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

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

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

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# NBC Strike Talks Begin Again

(continued from page 19)

Even as the two sides met in the nation's capital, strike activity was continuing, as members of NABET and supporters from other unions—about 150 in all—rallied on 27 August in Washington DC, in a show of solidarity.

NABET supporters who gathered in DC's Lafayette Park were addressed by Lane Kirkland, president of the American Federal of Labor and Congress of International Organizations (AFL-CIO). Kirkland, while denouncing the "errant ways" of NBC, applauded ralliers for their participation in the strike activity.

"There is no greater example of the solidarity that is the source of all our hopes and aims than what we see day by day on the NBC picket line," Kirkland stressed.

As the rally took place, talks between the two parties were underway at the

FMCS headquarters in Washington. The first session was reportedly devoted to the sale of NBC's radio networks to Westwood One, a radio program distributor and owner of the Mutual radio network.

Westwood One completed the purchase of NBC's radio networks on 25 August for \$50 million and warrants to purchase one million shares of Westwood stock at \$36.40 per share.

According to a network spokesperson, the opening day of discussions was an "informal session" addressing how the sale of the radio properties would affect NABET members.

Further details of the discussions were not available at press time, although NABET reportedly withdrew its request for a four-day work week.

The late August return to negotiations by NABET and NBC had been prompted by an informal meeting of key officials

from both sides with John Cardinal O'Connor, of the Roman Catholic Archdiocese of New York.

Cardinal O'Connor said he was concerned about "his good friends and neighbors at NBC," as well as preserving the "dignity and worth" of the two parties.

Some insiders speculate, however, that the Cardinal may have been anxious to see an end to the labor dispute so that it would not interfere with coverage of

Pope John Paul II's visit to the US.

With no further negotiations planned, NABET's Krieger said the union is stepping up strike activity.

On 9 September, the NABET negotiating committee decided to request other unions and guilds working with NBC—including the Writer's Guild, the Director's Guild of America, and the International Brotherhood of Electrical Workers—to honor the NBC picket lines.

At press time, the other groups had not yet responded to the union request.

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

## McKinney Job Filled

by David Hughes

Washington DC . . . A replacement has been named to the job vacated by former FCC Mass Media Bureau Chief Jim McKinney.

Alex Felker, 38, who has been with the FCC 15 years, assumed the MMB's top spot 18 September.

Felker takes over from Bill Johnson, who had been acting MMB chief since McKinney resigned the position in June for a communications job at the White House. Johnson now returns to his previous job as MMB deputy chief.

Since he joined the FCC in 1972, Felker has performed a wide variety of Commission functions. He spent time in the Office of Plans and Policy and has handled common carrier, standards and field operations functions.

He has also served as deputy chief of MMB's Policy and Rules Division, and, in the past year, has advised commis-

sioner and now Commission Chairman Dennis Patrick on engineering issues.

Felker said he was chosen by Patrick to head the MMB because of his "strong policy background, as well as (his) significant experience as an engineer."

Felker declined comment on any policy issues, including a pending AM stereo statement due to be released 21 October, until he has spent some time in his new job.

"I'll reserve comment on any issues until I get my feet wet," he said.

In related news, at press time, there was still no formal word on the indication that Bradley Holmes, the 33-year-old chief of the MMB's Policy and Rules Division, would be the choice to fill the commissioner vacancy caused by Patrick's move to chairman, following Mark Fowler's resignation last spring.

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

## FM Plan Considerations

(continued from page 25)

cent channel.

For minimum separation these S/I ratios produce a minimum 50 dB monophonic SNR ratio within the protected contour. The same S/I ratios result in a stereo SNR ratio of less than 30 dB at some locations within the existing service area.

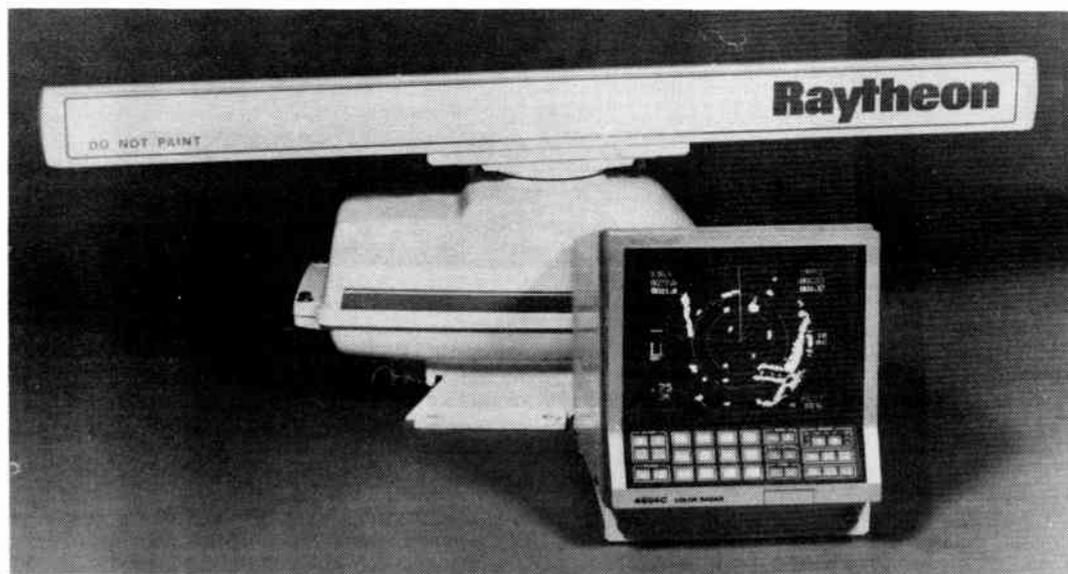
While the allotment system has assumed these levels of protection for decades, FM interference is less than the maximum permitted due to greater than average separation, less than maximum facilities and so on.

Contour protection methodology could increase interference between stations which are less separated than the present allotment rules allow.

This would be especially true in cases where terrain between the stations is flatter than is assumed by the standard field strength curves.

It's my opinion that consideration of terrain factors would be of significant benefit in protecting existing services from excessive interference, while permitting the flexibility of location possible with directional transmitting antennas.

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## CONTRACT ENGINEERING

# Marketing Your Contract Work

by Steve Conover

### Part II

**Hyattsville MD . . .** Now that you have taken care of setting up the legal and financial aspects of your contract engineering business, it's time to ask the all-important question:

"What's out there for work?"

The key is to research your market to find out if there is enough business in the real world to support you. Any first year business major can tell you this.

Expenses are paid in real money you have to earn yourself. So working capital is an important ingredient.

Invest some of your capital into a direct mail campaign. Start with an area of 100 to 150 miles radius of your business location.

You should highlight your experiences, rates that you will charge for services rendered, follow-up services if they are available and the rate you will charge for emergency services if that is the case with your business.

To find out what you need to know, you can include questions such as:

- Does the station employ a full time engineer?
- Is it currently being serviced by a contract engineer?
- Are the studios co-located at a transmitter site?
- Has the radio station frequently been knocked off the air because of storm related influences?

If a station directory year book is not available to you, a public library is the next best source to locate stations.

Use a state road map with a service ring (100 to 150 mile radius) drawn around your home.

At the library you should find the telephone directories for each of the towns within the circle—simply look up any listings for radio stations.

The questions in your direct mail campaign are simple "yes" or "no" questions aimed at trying to get the general manager or owner to answer you, and not throw the mailing away as so much junk mail.

### Purpose for research

Your questions are asking for the information you must have to understand just what the prospective client has for a broadcasting plant.

You also need sufficient information for you to be able to hold a somewhat intelligent conversation and give reasonable price quotations when you make your first contact.

The basic purpose for the market study is to find out just how many clients exist within the service area of your business and how many of those possible clients are interested enough in your business to respond to your research.

Your ultimate purpose is to find out how many of those that do respond will become paying clients.

If you feel that you are not capable of

*Steve Conover has been a corporate engineer in Omaha, NE, and is a former contract engineer. He is currently residing in Maryland and can be reached at 301-559-7224.*

handling market research, you may want to consider a local business college for assistance with the project.

Many times students are required as a class project to do a market survey.

It may be possible for you to contact a professor teaching a marketing course to recommend a student or students that are capable of handling your needs and at the same time provide experience for you and the students.

### Using the information

After completing the market study you'll know the potential number of clients you have to work with.

From your own study of your personal monthly expenses and business expenses, you can calculate an approximate hourly rate to charge for services.

As an example, if your business and personal monthly expenses are \$2,000 and you have eight clients available and expect to work an average of 12 hours per month per client, then \$2,000/96 hour comes out to slightly more than a \$20 per hour rate.

Simple, yes? No. The hourly rate as calculated above is the gross rate before taxes. That figure may have to be raised by as much as 40% or to about \$30 per hour.

An important fact to keep in mind is: never vary your rates from one client to another simply because a client pressures you to consider a lower figure.

Once you have started this practice, you will have started with a shaky foundation. Now you have compromised your receivables.

On the other hand, don't price yourself too high, either.

It is better to start at a lower rate of charge for services based upon your market survey and develop a steady rate of income from several good clients than to try and get rich quick off of a few clients.

Remember, even though these stations may be competitors for ratings and advertisers, the managers and owners still pass along information and a bad reputation is very hard to live down.

### Advertising

Along with the marketing is the advertising of your services.

Always keep your company name in the eyes of your clients and the eyes of those stations that did not respond to your first mailing.

Just because a manager threw away your questionnaire, don't forget the station.

Every 60 to 90 days mail a postcard out to the stations that did not respond to the market study and remind them that you are there and what you can do for their business.

As an aside, if your talents include two-way equipment repair include small town police, fire and sherriff departments in your original market research and follow-up mailings.

They have communications equipment and in some cases, recording equipment to record any and all emergency telephone calls.

Small clients, yes. But many small clients make for a broad base for income.

After completing the aforementioned

tasks, you will now have to sit down and establish a set of goals.

There are short term goals. These are what you want to accomplish in the first year of business.

Next comes medium term goals: what you want to accomplish in the first three to five years of business.

And finally long term goals: what you want to accomplish in the first five to ten years of business.

The most important goals will be the short to medium term goals you establish for yourself. It will be the first two to five years of business that will make the difference between suc-

cess and failure.

Statistically speaking, businesses typically fail within the first five years of existence. The majority occur because of poor management skills, under capitalization and poorly defined or vague goals.

Your goals will be the road map you use toward your personal success. Without goals any external pressure, event or influence will divert your attention from where your business should really be heading.

Above all, keep in mind that whether you wish to be small or large, be professional!

## HOLD THE PHONE!

### New Low-Cost Option Adds Dial-Up Capability To Advanced Micro-Dynamics TC-8 Transmitter Remote Control.

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And this is one dial-up remote that's unquestionably legal. FCC regulations require a designated positive control point, and that's what the TC-8 studio unit gives you — even when the dial-up remote is in use.

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# Radio's New Secret Weapon

# StereoMaxx

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

A Southwest top 10 market CE explained to us:

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

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

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

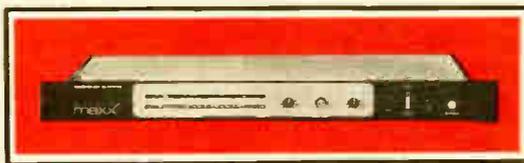
We're glad he said that. Enlarging the stereo image is one thing, but doing it without creating big hassles is quite another. A top 5 market CE put it this way:

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

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

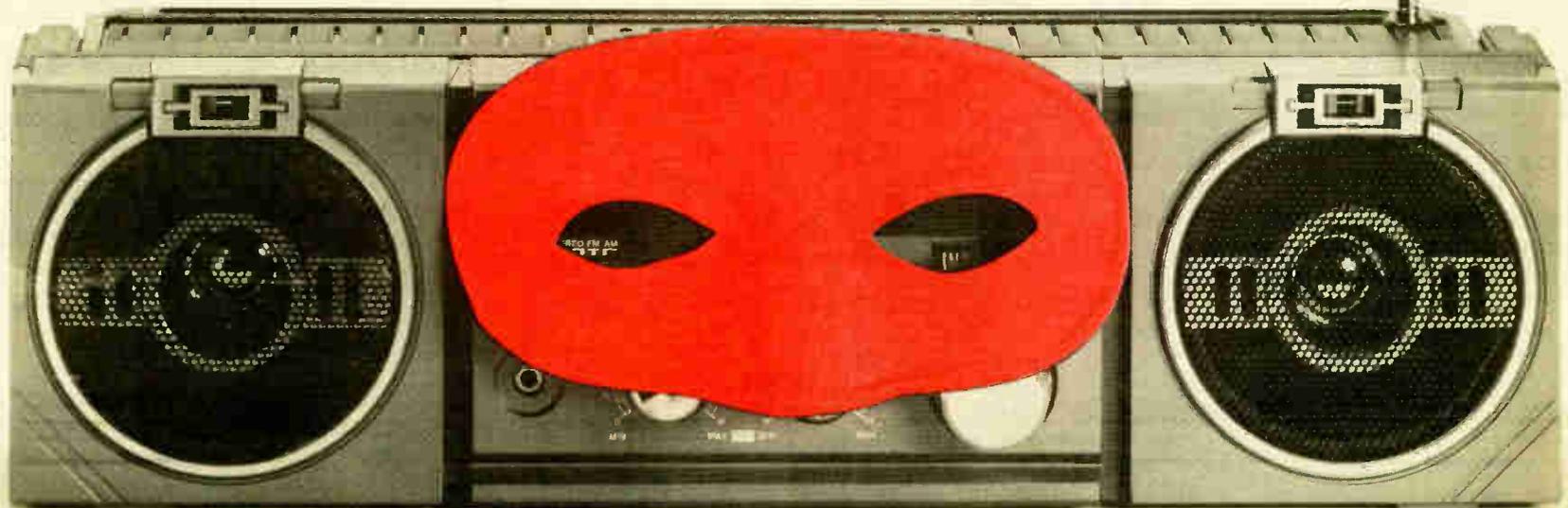
**"When I first heard about StereoMaxx, I thought it was a little expensive. But now you couldn't buy it back from us. Every song we play now has as much separation as the best produced stereo record or CD. Turning off StereoMaxx is like going back to mono."**

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# Did Fail Safe Really Go Away?

by Harold Hallikainen

**San Luis Obispo CA . . .** In the first two parts of this series, we've been slowly working our way through the FCC rules regarding the remote control of broadcast transmitters.

We'll continue the analysis this month with a look at what used to be called "fail safe".

The revision in the "fail safe" requirement of the rules has inspired some different approaches to remote control.

These include the use of dial-up control and monitoring of broadcast transmitters from traditional control points, such as the studio.

They also include the use of dial-up control and monitoring from non-traditional control points, such as an answering service, alarm company or station staff homes.

A third use is dial-up control and monitoring of affiliate broadcast transmitters by program network control centers

And finally there is access to transmitter control and monitoring from indefinite locations (wherever the chief operator happens to be at the moment).

I'll try to provide a more complete discussion of these issues over the next few months.

## On the record

Let's begin with a review of stated FCC rules to help determine the status of current policy.

According to 73.1410(d): "The remote control system must be designed so that malfunctions in the circuits between the control point and transmitter will not cause the transmitter to be inadvertently activated or to change operating modes or output power."

This is the current rule regarding what is to be done should the control portion of a remote control circuit fail. Let's compare this to the rule prior to 1 December 1984, 73.67(a)(2).

"The control circuits from the operating positions to the transmitter shall provide positive on and off control and shall be such that open circuits, grounds or other line faults will not actuate the transmitter and any fault causing loss of such control will automatically place the transmitter in an inoperative position."

This section applied to AM stations. Similar sections applied to FM, NCE FM and TV stations.

The requirements of the old 73.67(a)(2) were generally referred to as the "fail safe" requirement.

Most remote control equipment manufacturers provide a fail safe output that is released on loss of communications with the control point.

When 73.1410(d) replaced 73.67(a)(2), there was considerable discussion in the industry regarding the "elimination of the fail safe requirement".

This one rule change probably led to the introduction of "dial up" remote control, although I believe Delta had introduced dial-up parameter reporting prior to the rule change and had held off on dial-up control, feeling it was not legal.

A literal reading of the new rule would

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appear to indicate that a station need not stop transmitting on loss of a control circuit as had previously been required.

Instead the rule appears to only require that such a loss of the control circuit not change transmitter mode or power.

For example loss of the circuit should not cause the transmitter to go on the air or change to day power or pattern.

If an unintentional loss of the control circuit is not cause for immediate shut down, how about an intentional loss?

## Insight on Rules

Could the control circuit be established only when control or metering needed to be accomplished? This could save considerably on communications costs.

## Economy device

Many stations utilizing manual parameter checking spend about one minute every three hours communicating with the control and metering equipment at the transmitter.

If the circuit establishing this communications could be established only during the time it is used the circuits could be used for other purposes the remainder of the time.

Assuming one were to use circuits leased from a telephone company (whether wire line, microwave or a combination) portions of the circuit could be used by others between the times that the broadcast station is sending useful information over the control/metering circuit.

When you release the line from your call to the transmitter other telephone users are assigned the interoffice trunk circuits that you were using.

If a station is using a UHF P channel telemetry return link, dropping the carrier when no useful communications are being sent allows others to use the frequency.

It appears that with this interpretation of the rules—loss of the control circuit is *not* cause for immediate cessation of transmission—dial-up remote control was introduced to the broadcast industry.

## Purpose of the rule

To find the Commission's intent in writing this rule we can check the Federal Register Volume 49, Number 236, page 47606.

The comments section, paragraph three states: "Nearly all respondents stated that the primary difficulty with remote control operation under the present rules is the fail safe requirement."

"Currently, remote control operation of the transmitter must immediately cease if the control circuit is interrupted. Stations apparently experience occasional loss of service due to short term disruptions in control circuits."

The discussion section, paragraph five says: "The present remote control rules were derived from the transmitter duty operator rules which are, in turn, based on section 318 of the Communications Act of 1934, as amended."

"That statute requires that all broadcast stations be operated under the control of a licensed operator. The Act does not specify the duty location of the operator nor the necessary degree of control

of either the transmitter or other station technical functions.

"However, the Commission's rules now require a licensed operator to be on duty at the transmitter site or at a control point shown on the station license."

In paragraph seven, the Commission addresses short-term losses.

"The Commission shares the concern of the licensees in that short-term losses of control or telemetry should not be cause for immediate termination of operation."

"Accordingly, the new rules will permit continued operation following a loss of transmitter control, pending repair of the control circuits, as long as the station continues to operate properly."

"Loss of telemetry, on the other hand, means that the transmitter parameters cannot be monitored remotely."

"Therefore, the amended rules will require termination of use of remote control within three hours after detection of the telemetry failure. Although CBS recommended six hours, the majority of the commenters on this subject concurred with the proposed three hour period."

## Section 318

Finally, the oft mentioned section 318 of the Communications Act of 1934 (as amended), states, "The actual operation of all transmitting apparatus in any radio station for which a station license is required by this Act shall be carried on only by a person holding an operator's license issued hereunder . . ."

It goes on to state: "and no person shall

operate any such apparatus in such station except under and in accordance with an operator's license issued to him by the Commission . . ."

There is an italicized provision however: "That the Commission, if it shall find that the public interest, convenience or necessity will be served, thereby may waive or modify the foregoing provisions of this section for the operation of any station . . ."

There are four exceptions listed to this as follows:

- stations for which licensed operators are required by international agreement
- stations for which licensed operators are required for safety purposes
- stations engaged in broadcasting (other than those engaged primarily in the function of rebroadcasting the signals of broadcast stations)
- stations operated as common carriers on frequencies below thirty thousand kilocycles.

There is one further provision emphasized: "That the Commission shall have power to make special regulations governing the granting of licenses for the use of automatic radio devices and for the operation of such devices."

From this, it might appear that the "fail safe" requirement of the previous rules has been thrown out.

However, correspondence and discussions with the FCC seem to indicate otherwise.

Now that we've looked at the rules as stated, next month we'll look at "FCC policy."

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# On the Air From Puerto Vallarta

by Jeremy Burnham

## Part II

Los Angeles CA ... In Part I of this article I explained how KIIS prepared for the top-rated *Rick Dees Morning Show* remote in Puerto Vallarta, Mexico. And now, on with the show.

Puerto Vallarta, on Central Standard time, was one hour off from Los Angeles' Pacific Daylight time.

*Jeremy Burnham is Special Projects Engineer at KIIS AM/FM Los Angeles. His phone number is (213) 466-8381.*

That still meant getting up at 5 AM Monday morning in order to get all the equipment that was stored in my hotel room out and set up on the adjoining patio by 6 AM.

From 6 to 7 AM, the news and sports people used the satellite to communicate with Hollywood and copy down news stories and sports scores because we had no wire services or current newspapers to use as sources.

From 7 to 11 AM, (6-10 L.A. time) the show was scheduled to be on the air.

Operationally the remote studio setup was very similar in layout and types of equipment to that used at home.

The primary difference was that in this remote the music and commercials were still played from the main studio, since bringing literally hundreds of them along would have been far too cumbersome to be practical.

The recorded features and drop-ins were brought along as their use and proper timing are a major part of the program.

### Circuits in place

Three audio circuits were used by KIIS for this remote. The first was the primary 15 kHz "fronthaul" circuit which carries program from the remote site to

the studio.

The second was a 15 kHz "backhaul" circuit which brings the mix-minus back from the studio to the remote site.

This was mixed with the output of the remote console to provide the audience with a complete program without having to contend with the satellite delay on the announcer's voice.

The air talent heard that same mixture in headphones along with a third "comm" circuit from the studio.

On this 7.5 kHz link, the producer at the studio can describe upcoming events, take take phone calls, etc. without distracting the audience from the main program.

Since the music is played from the studio, the talent is free to talk to the studio down the fronthaul circuit during records. The producer merely listens to the remote site on "cue."

Finally, Monday morning arrived along with the usual excitement about doing a live broadcast. It didn't take long for everyone involved to get comfortable with the set-up.

The news and sports personalities each had a leather-covered wicker chair and table, the producer had the drop-in cartridges, program notes and a space to pace, and our air personality had his familiar equipment along with a desk-type swivel chair.

### Fielding problems

The week in Margaritaville did not go totally without a hitch.

In the middle of one program the backhaul circuit developed a severe crackle which was quickly traced to a Telco line from the KIIS studio to IDB's uplink.

We switched the wideband circuit with

*It didn't take long for everyone involved to get comfortable.*

the narrow-band "comm" line both in Hollywood and in Mexico.

This put the interference on the intercom and let the audience hear the program on the 7.5 kHz circuit. I seriously doubt that they noticed the difference.

Another problem late in one program involved all circuits vanishing in both directions for a few seconds. We traced that out to para-sailors blocking the path from our dish to Morelos.

The final problem loomed when some workmen showed up to install a satellite TV system on the roof of the hotel directly in front of our flyaway dish. We persuaded them to wait three more days.

Otherwise, all went pretty smoothly.

### One little snag

After the final program on Friday, Don Gilmore from IDB and I packed our satellite and audio equipment respectively for shipping back to the States.

Ironically, it was then that we discovered a rather serious problem that had nothing to do with the technical success of our endeavor.

Apparently the electronic equipment had come from the airport to the hotel without going through all the normal channels.

*(continued on next page)*

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# Mexican Remote Is Successful

(continued from previous page)

When we took it back to Mexicana Airlines, they would not ship it without the proper customs forms, and those did not exist.

To make a very long story short, we received help from the local Bureau of Tourism which coordinated with Mexicana Airlines.

They arranged for the equipment to leave with us, without the benefit of Mexican customs, as "excess baggage".

Since baggage can no longer travel on an airplane without a passenger assigned to it, we had to wait until the following Tuesday when a flight would have room for both us and the eighteen large boxes of equipment.

A further complication involved paying the substantial fee for the 1200 lbs.

of "excess baggage".

Mexicana will not normally ship passenger baggage collect, however tight coordination between Ryder International (our Los Angeles customs broker) and the airline allowed an exception.

The equipment was impounded at the Los Angeles Airport for an hour or so until the check was in Mexicana's hands.

And we were home, safe and mostly sound.

### Helpful tips

Based on KIIS's experience doing four international broadcasts I have some

recommendations for completing foreign remotes with the least amount of trouble.

First make a preliminary trip to the site, meet the people involved and become familiar with potential problems in time to prepare for them.

Engage a full-service domestic customs broker and be sure there is a reputable one on the other end to handle foreign affairs.

Take along spares of everything possible, from components to whole circuit boards.

Ship the equipment a week earlier

than might seem necessary, and arrive at the remote site several days in advance in order to handle unforeseen problems.

Learn the location of all pertinent circuit breakers including those in series with the obvious ones.

Assure yourself a good ground system, and don't rely on the "U-grounds" —if they exist at all.

Foreign remote broadcasts are a lot of work but can be an enjoyable experience with the proper foresight.

Prepare as much as possible, allow more time than normally needed, and always expect the unexpected.

## The Future Of Radio Is Digital

(continued from page 5)

panies have to prioritize their future plans and products, but when they also go to extra length to prevent users from adapting their existing equipment to specialized needs, no one is served.

In the case of R-DAT a schematic and a listing of the CIRCS code for this equipment would be ample to get radio stations started. The availability of basic decks for custom manufacturers would also speed development of digital audio.

### Winds of change

While Japan Inc. either sleeps or quivers in fear of American legal vultures, there is some good news on the horizon.

Other digital storage and delivery systems are just around the corner.

It might seem strange, but a developed technology like R-DAT might be eclipsed by some systems that are in a more infant stage, only they are being promoted by more flexible companies than those off-shore giants.

No matter how it finally ends the tape cartridge is now nearly 30 years old!

It is time to put this antique to rest with other radio legends, like water-cooled tubes.

We even have digital transmitters and STLs, and possibly even full digital audio processors, all being fed by a 30 year old mechanical nightmare that has a 48 dB SNR ratio.

It is sad that our future no longer seems to be controlled by our ingenuity, but by legal pitfalls and corporate myopia.

Canada has broken the long tradition of "watching the American market" before setting broadcast standards, selecting an AM stereo format and possibly even putting the NRSC standard into law.

R-DAT will not be stopped at Canada's border either.

It is time for radio to surge into the future. Opportunities for inventive broadcasters are on the increase.

R-DAT may be one of the very useful tools to help achieve the productivity needed in the future.

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ERI Super Power 6 bay FM on 94.7 MHz. \$1000. WFBQ. 616 Fallcreek Rd. Indianapolis IN 46220 317-257-7565

Tower. 70' self-supporting. \$1000 D Fields. KUFO. POB 1713. Big Springs TX 79721 915-263-7326

Tower. 980'. solid leg. zone A w/guy wires. on ground L Dupree. KOID. POB 7057 Alexandria LA 71301 318-445-1234

Gates lighting chokes. (2). never used. \$75 ea/BO G Wilson. WGLE. 7519 Dorrr #196 Toledo OH 43617 419-865-7289

ERI CP FM 4 bay B Dodge. WTUJ. POB 1818. Brattleboro VT 05301 802-254-2560

Continental/ERI 12 bay CP antenna. 93.1 MHz L Dupree. KOID. POB 7057. Alexandria LA 71301 318-445-1234

Piord 18. 200' tower. 7 yrs old. on ground. \$2395 plus ship S Peters. KKCM. Box 357. Minneapolis MN 55379 612-496-1530

Phelps Dodge SPC-5. 5 bay FM heavy duty. new. used 6 weeks. BO A Anderson. KBMR. 3500 E Rosser. Bismarck ND 58501. 701-255-1234

Phelps-Dodge HFM-LP4 4 bay FM 91.5 MHz. \$1000 E Welch. WKCL. POB 809. Ladson SC 29456 803-553-5420

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

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. EMCCE UHF corner reflector antenna 10 gain. \$200 C Haynes. Haynes Comm. POB 31235 Jackson MS 39206 601-948-1515

Symetrix SE-400 parametric EQ. excel cond. \$350. Soundcraftsmen SE-450 10 band/chan EQ gd cond. \$100 C Fries. KSQY. Box D. Deadwood SD 57732 605-578-3533

Harris Phase Fixer audio TBC. w/3 encoder units. 18 mos old. 30 T Bryan. KARO. 503 Old Hwy 63 Columbia MO 65201 314-442-3116

White 1/4 oct passive EQ. high end & 1 kHz boost modules. rack mt. excel cond. \$90 B Busetti. Lizard Elect. 1124 W 2nd St. Florence CO 81226 303-784-3540.

Shure FP11 & FP12 mic to line & headphone amp. \$89 ea C Butler. Butler Bdct Svcs. 1775 Bartlett Ave. Orange Park FL 32073 904-264-8169

Symetrix SE400 EQ's. \$250. Soundcraftsmen SE450 EQ. \$100. C Fries. KSQY. Box D. Deadwood SD 57732. 605-578-3533

Shure Production Master sub-mixer. mates to M67/M267. \$100 plus ship. S Sibulsky KVNI. POB 308. Coeur d'Alene ID 83812 208-664-9271

Gentner Microtel 1. new. never used. \$120 P Keogh WKFX. POB 11907. Greenbay WI 54307 414-499-1336

Alden C2000 color radar w/zoom soft wave w/19" RGB monitor & autodialer \$4800 B Hughes. KNET. POB 649. Palestine TX 75801 214-729-6077.

AKG K340 headphones. \$115. S Rosenthal Rosenthal Prod. 3145 Geary Blvd Ste 344 San Fran CA 94118. 415-665-1035

Symetrix T1101. in new cond. telephone hybrid interface. \$295. T Johnson. KEST 1231 Market St. San Francisco CA 94103 415-626-5585

### Want to Buy

Tabble Cat 1/4" tape splice unit S James Re-nu Carts. Rte 6 Box 127. Ottumwa IA 52501 515-684-7012.

## AUTOMATION EQUIP.

### Want to Sell

Instacart 48 PBS stereo. used less than 50 hrs. mint cond. \$7500 firm. D Jenkins. KCLB 50 Mark West Springs Rd #3. Santa Rosa CA 95403 707-528-9236

MEI 100MP microprocessor control programmer w/latest factory mods. run 8 sources plus net input. \$2000. T Saunders WSBH 56 Tagger Ln. Southampton NY 11968 516-283-9500

SMC ESP-1 complete w/remote control. data encoder. (3) IGM Instacart decks & interfaces. \$20K/BO P Wolf. WOZZ. 2010 San Carlos Blvd. Ft Myers Beach FL 33931 813-574-5548

IGM Instacart 24 tray. mono. BO over \$2000 K Harnack. KWLN. 88 Union Cntr Ste 309 Memphis TN 38103. 901-529-0098

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Cablewave HCC 158-50J coax. approx 170' \$500. E Welch. WKCL. POB 809. Ladson SC 29456 803-553-5420

Phelps Dodge 4 bay FM HP 96.7 MHz. \$2500 J Powell. WSEL. POB 240 Pontotoc MS 38863 601-489-1440

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 WOE E 1825 Hwy 182. Park Falls WI 54552 715-762-2611

Hughey & Philips beacon. side light flasher. used 6 weeks. BO A Anderson. KBMR. 3500 E Rosser. Bismarck ND 58501. 701-255-1234

Rohn 45-G 10' section. w/tapered base B Zellmer KRZD. POB 2224 Greeley CO 80632 303-351-8354

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

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

Andrew 250' helix 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

LI 42" base. 480' tubular tower. welded. call for price D Steed. KFOX. Box 588. Lufkin TX 75901 409-634-5596

Potomac 4 tower digital phase monitor T Jordan. WFNC. POB 35297. Fayetteville NC 28303 919-864-5222

Kintronic FM isocoupler. 98.1. 7.5 kW. \$850/BO W Hoisington. WTCG. 303 S Three-Notch St. Andalusia AL 36420 205-222-8849

### Want to Buy

Nitrogen regulator & fittings for pressurization of transmission line. S Streitenberger. WFCB. 45 W Main. Chillicothe OH 45601. 614-773-3000

High band VHF TV antenna. tuneable to chan 10 or 12. will re-harness & rebuild. J Powley. KIIU. 1536 Logan Ave. Altoona PA 16602 814-944-8571.

Bogner or Scala UHF TV translator or LPTV antenna. for low end of UHF band. 1 kW input rated or more pref. J Powley. KIIU. 1536 Logan Ave. Altoona PA 16602. 814-944-8571

Antenna feed line. 7/8". 500-1000'. R Wright. WLLX. 1208 N Locust Ave. Lawrenceburg TN 38464. 615-762-2916.

## AUDIO PRODUCTION OTHER

### Want to Sell

Shure M-625 Voicegate. one new. \$100 plus ship. one used. \$75 plus ship S Sibulsky. KVNI. POB 308. Coeur d'Alene ID 83812 208-664-9271.

SWA dual audio matrix system & XLR cable sets for simultaneous encode & decode of a stereo signal. made for Lexicon Inc. list price \$995. now \$395. new! Call Lexicon sales. 617-891-6790.

Lexicon 1200 time compressor/expanders. change program running time w/o changing pitch. interfaces w/variable speed ATR's. VTR's. Telecines. used w/90-day factory warranty. 1200B. \$3500; 1200C. \$3950; Demo. \$6900; new. \$9500. Call Lexicon sales. 617-891-6790.

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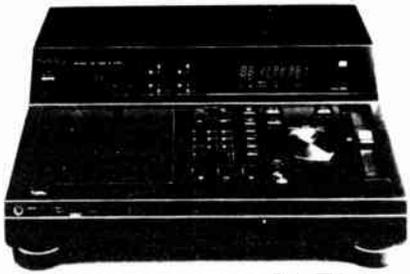
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**BE System 16X**, excel cond, 3 yrs old, (4) Otari ARS-1000s, (2) IGM 24-tray, IGM 48-tray, control panel, live-assist panel, (2) CRTs, battery backup, all interfaces. T Spaight, WLRZ, POB 73, Peru IL 61354. 815-224-2100.

**Sono-Mag 25ORS** 24 tray stereo Carousel, new, wired for RS, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

**Automation System, SMC DP-1** programmer, 16 chan switcher, 4 SMC/Otari reels, Scully 270 reel, 5 SMC 252-RS random select Carousels, 3 dual PB cart machines, time announcer, teletype logging encoder/decoder, \$8000. D Mackenzie, WJBR, 2617 Ebricht Rd, Wilmington DE 19810. 302-475-4000.

**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.

**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 ship. 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 RSB, best serious offer. R McKay, KXRB, 3205 S Meadow, Sioux Falls SD. 605-361-0300.

**TAC-1 time announce controller**, \$350. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

**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, WQXY, 100 St James St 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, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

**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**, 46 tray stereo in gd to excel cond, for non-profit educ station. J Tocknell, Cedarville College (WCDD), POB 601, Cedarville OH 45314. 513-766-5595.

**Cetec 7000** automation system. D Williams, KLCB, POB 730, Libby MT. 406-293-8234.

**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 GZS3U** compact saticon 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, 462 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 Trinicon 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. 207-762-1941.

**CART MACHINES**

**Want to Sell**

**PR&E Tomcat**, rackmount stereo R/P w/factory spare parts kit, Maxtrax heads, new; (3) Tomcat stereo reproducers in rack mount, trimount, new, Maxtrax heads w/manuals, \$11,500 for all 4. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

**Tapecaster, Spotmaster** machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7222.

**Audicord A-Series** stereo reproducers, as is, need work (3), \$150 ea. E Welch, WKCL, POB 809, Ladson SC 29456. 803-553-5420.

**Spotmaster 500BR** R/P unit, works, \$150. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

**Audicord A-Series** stereo R/P w/3 tones, as is, need some work, \$250/BO. E Welch, WKCL, POB 809, Ladson SC 29456. 803-553-5420.

**Spotmaster 1070** R/P, mic & line inputs, mo-no. \$300. P Badger, WKRE, POB 220, Exmore VA 23350. 804-442-5000.

**ITC RP-3** mono R/P desk mount, 2 tone, excel cond, w/manual, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

**ITC SP-3** (2) desk mount stereo reproducers, excel cond, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

**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 Horner, 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. 504-429-1212.

**Twin Tape 642E-1** (2) PB mono, \$150 ea. M Matusi, WSSA, POB 831, Morrow GA 30260. 404-361-8843.

**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 Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

**ITC PB** mono w/fresh Beau motor, excel cond, wide play unit, \$995. S Horner, KCAQ, 3434 Dodge Rd, Oxnard CA 93033. 805-488-0901.

**ITC SP** excel cond, \$850. B Anthony, Anthony & Assoc, Rt 3 Box 185, Cornelious OR 97113. 503-857-6120.

**BE Spotmaster 505CR** rack mount player, \$200; 500CR rack mount recorder, \$250. M Persons, WCMP, Rt 2 Box 230, Pine City MN 55063. 218-829-1326.

**Want to Buy**

**ITC splicefinder**. S James, Re-nu Carts, Rt 6 Box 127, Ottumwa IA 52501. 515-684-7012.

**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.

**Splicefinder**, good used one. D Sherwood, WMKC, 334 N State, St Ignace MI 49781. 906-643-9494.

**ITC Premium** Line parts, pieces, boards, cases, W/P deck, any cond. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

**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.

**Used splice finder**. P Allen, Bdct Cart Rewinding, 5516 H Tomahawk Dr, Greensboro NC 27410. 919-855-8726.

**ITC or BE** late model stereo R/P. G McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

**CASSETTE & REEL-TO-REEL RECORDERS**

**Want to Sell**

**Ampex AG-440** mono in Russiang wooden roll-around console, 7.5-15 ips, \$1250. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

**Nagra IV-D** portable recorder, excel cond, \$3000/BO. J Hooper, 513-485-6751.

**Ampex 351/440**, 2 trk in console, excel cond, \$1000; Ampex MM1000 transport parts; various cassette decks; reverb equipment; generators; & various recording studio gear, call for details & prices. B Skye, Plant Recdg, 2200 Bridgeway, Sausalito CA 94965. 415-332-6100.

**Ampex MM1000** 16 trk w/dbx NR, VSO remote control, test tape wiring harness, spare parts, new heads, \$6000. G Ernst, Bayside Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

**Telex 6120** R-R module, like new, \$1995. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

**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; AG-440 2 trk elect w/AG-440 PS, \$250; AG-440 rec & play heads, \$75 ea; (2) homemade wood recorder consoles w/overbridge for 7" of elect, \$50 ea. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

**Ampex 601** portable unit in case, mono, no power cord, \$150. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

**Scully 100** parts, motors, schematics, call or write w/reg; Scully 24 trk w/16 trk heads, spare parts, ddc. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

**Otari ARS1000D** (4) reproducers, gd cond, \$1000 ea. M Holderfield, WOOF, POB 1427, Dothan AL 36302. 205-792-1149.

**Ampex AG350** ss 8 trk, \$2200; Ampex 350 ss 4 trk; Ampex 350 ss, 3 trk, \$725; Ampex 350 2 trk (2), \$700 ea; Ampex FT 350, \$525. L Oliver, Lynn Oliver Sids, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

**Sony TC-K6** cassette deck, servo, solenoid assist, mint cond, \$150; Ampex 1450 as is, \$35 plus ship. W Laughlin, KDCV, 2636 N 56th, Lincoln NE 68504. 402-466-8670.

**Dokorder 1140 1/4"** 4 trk, gd cond, \$500. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

**Ampex PR10** rack mnt w/elect, works OK, \$150 plus frt. M Kanter, WPOB, 50 Knickerbocker Rd, Plainfield NY 11803.

**Pioneer 102L 1/4"** 2 chan w/4 chan repro, gd cond, \$300. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

**Otari MX5050-QHXD** 1/2" 4 chan, excel cond, low hrs, recently realigned, almost new, \$2000. T Evans, Reel Prod, POB 427, Boston MA 02134. 617-576-2872.

**Scully 280-2** (2) in roll around cabinets, \$900 ea. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

**Scully 284-8 1"** 8 trk, late model w/silent punch & motion sensing, used only in home studio, w/4 spare record/repro modules, excel cond, \$2900. B Sgorbati, Sgam Recording, 747 Saddle River Rd, Mondsey NY 10952. 914-356-6553.

**Revox B710** MK 2 rack extensions, \$10; Teac T2612 reel hubs, black, \$10. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

**Revox B710MK2** service & parts manual, \$10; Teac 3440 service & parts manual, \$5; Revox B77 MK II ops manual, \$5; Technics 1500 US service/parts manual, \$5. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

**Scully 280 2** trk, w/wood console, \$600/BO; Superscope RBC-2, 5 V NiCad battery pack, \$12; VSC Soundpacer C-4, new cond, \$125; Alpha 21, 16:1 hi-spnd mono cass dupl, vgc, \$700. Ed Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

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**Otari 5050** 8 trk w/rack & splices, \$3500; Otari 5050B 2 trk master machine, \$1500. W Brengman, Bill Harris Sid, 74 N 9th Ave, Beachgrove IN 46107. 317-787-2001.

**Roll-around cabinet** w/overbridge, cut for Revox A77, \$100. S Ami, WRRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

**ITC 750**, gd cond, w/manual, BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

**Otari ARS-1000** (4), all in gd cond, \$975/BO. T Bryan, KARO, 503 Old Hwy 63, Columbia MO 65201. 314-442-3116.

**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 JH16-B** JH100 transport, \$3000/BO. M Fiedler, Mahoney Fiedler Prod, 5346 Dupont Ave S, Minneapolis MN 55419. 612-822-0013.

**Ampex AG 350-2** in Ampex console, gd cond w/manual, \$395 plus ship. J Meloon, WDBA, 28 W Scriener Ave, Du Bois PA 15801. 814-371-1330.

**Otari ARS1000** (2) in excel cond, \$1000/BC. R Knapp, KENE, POB 350, Toppenish 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.

**Uher 4000 Reporter L**, excel cond, \$100; Magnecord 728, for parts. P Andrus, No Coast Media, POB 261, Chincum 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, Chubbick Rd RD1, 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, Foxtrax Sids, 2204 Siesta Ln, Santa Rose CA 95404. 707-528-9269.

**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 Sid, 3016 Greenmount, Baltimore MD 21218. 301-467-7900.

**Akai 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.

**Ampex 350 FT** w/manual, \$500/BO. B Fouer, Fouer Prod, 38190 Twin Pines Dr, Warrenville IL 60555. 312-393-1179.

**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 QSL** 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.



# Broadcast Equipment Exchange

## CASSETTES . . . WTB

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.

Rack mounts for Revax A77, at least 1, 2 pref. R Petty, KORE, 2080 Laura St, Springfield OR 97477. 503-749-5673.

Studer B67 MK 2, in gd shape, ready to go. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Scully 284B-8. M Guthrie, WUSA, 504 Reo St, Tampa FL 33609. 813-876-0455.

Crown SC824 rec & amp elect. DMT AVV, Box 9064-RW, Newark NJ 07104. 201-484-5291.

RT707 1/4 reversible reel. J Vukelich, Metro Recdg, 4551 Flag Ave, Minneapolis MN 55428. 612-537-1431.

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.

API console parts, EQ's, line amps, mic amps, blank panels, faders, input modules, card cages, opamps. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Sparta A-16R rack mountable console, 5-chan, 15 input, 2 chan output, \$600 plus ship. S Sibulsky, KVNI, POB 308, Coeur d'Alene ID 83814. 208-664-9271.

Ampex MX35 mixers (3), \$250 ea; Altec portable mixers 1567A, \$260 ea; Sigma mixers (4) 4 chan, \$240 ea. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Studio Mixer II, 24 x 8 x 2, 3 band EQ, 6 sends, never used, \$3900. B Sgorbati, Sgam Recording, 747 Saddle River Rd, Monsey NY 10952. 914-356-6553.

Auditronics 501 16 trk 26 inputs, 16 x 8 x 2 in line modules, 4 band EQ, monitor & echo assign, almost new, \$9500. B Vineis, BV Snd Studios, 211 E 43rd St, NY NY 10017. 212-949-9170.

Tangent 32-16, 16 bus, 8 x 8, producer's desk, normalized patch bay, like new, comes w/pedestal & snake, \$4200/BO. R Tyrone, DB Snd Prod, 3902 Palomar Ln, Austin TX 78727. 512-255-9975.

Ramsa WR88-16 mixing console, \$3500. W Brengman, Bill Harris St, 74 N 9th Ave, Beachgrove IN 46107. 317-787-2001.

CCA Ultimate, 10 pot stereo; Sparta AS30, 5 pot stereo; Moseley TRC15AR, gd cond, w/manual, 67 kHz boards. B Mishkind, KKPW, 3222 S Richey Ave, Tucson AZ 85713. 602-296-3792.

Ward-Beck 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, KOKQ, 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 16 x 8 x 2, Anvil case, like new, \$1600. B Busetti, 1124 W 2nd, Florence CO 81226.

Russco 505 Studio Master console, mono, BO. K Schipper, KOKS, 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, \$850. R Rocks, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

Sony MX-16 8 x 4 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.

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-F. F Morton, KMGZ, POB 7953, Lawton OK 73506. 405-536-9530.

McMartin 5 ch mono mixer, very clean, \$250. W Hoisington, WTCG, 303 S Three-Notch St, Andalusia AL 36420. 205-222-8849.

LPB S13 Signature II, 3 mic, 5 line inputs, meets all specs, excel cond, BO. B Gellhaus, WDTV, 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 16 x 16 monitors, almost new in leakwood, w/meter bridge & patchbay, photos avail, \$6500. J Block, The Production Block, 906 E 5th St, Austin TX 78702. 512-472-8975.

Tascam 512 12 x 8 mixer, brand new under warranty w/SRC manual, \$2750. F Wyatt, BTM Studios, Box 928, Burnsville NC 28714. 704-675-5685.

### Want to Buy

Gates Yard, stereo, immaculate cond, have parts, want complete console. B Bartoli, New World Bdc, Rte 2 Box 749B, Mt Shasta CA 96067. 916-926-3273.

Teac 2A mixer. R Coates, KJJG, 724 2nd Ave E, Spencer IA 51301. 712-262-8036.

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

Mic snake, 50', 12 input, \$150. S Burgh, Bdc Monster Stds, 645 Bdway, NY NY 10012. 212-260-5226.

Fairchild 359 spring reverb, \$250. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Complete 8 trk prod studio incl Scully 284-8, Sounderworkshop 1280, etc., \$10,000. T Houston, Custom Audio Recdg, 929 California Ave, Bakersfield CA 93304. 805-324-0736.

KEF 104AB studio reference series speakers, (2) no grills, excel cond, \$500. M Matchman, Unsprung Music, 322 W 57 St, NY NY 10019. 212-489-7354.

JBL 4312 studio monitors, \$400/pr; Century L100, \$300/pr; 4408, \$200/pr. G Ernst, Bay-side Snd, POB 166, Lincoln City OR 97367. 503-996-6020.

EMT 148-T vintage reverb, mono, \$1500. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Sparta A-16-R 15 input mixer, \$550; Shure M67, \$120; Teac 3300SX RR, \$275; RE16 mic (2), \$100. C Elmajian, Tri-Core Recd, 27503 Five Mile Rd, Livonia MI 48154. 427-0832.

KLH Burwen TNE7000A transient noise eliminator, excel cond, rtk 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) midrange speakers, 8 mic booms, cassette recorder, Sony & AKG mics, \$6500. B Burchett, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

EMT 148ST reverb plate, excel cond, \$3200. R Vogt, Vogt Quality Rec, Box 302, Needham MA 02192. 617-444-8687.

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. 215-776-1455.

Delta Lab DL-4 digital delay, \$325; Loft delay line/langer, \$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.

Orban 245F, (2) brand new, BO. B Salzman, Steves Comm, 2695 Regis Dr, Boulder CO 80303. 303-476-6786.

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, WMGA, 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.

Vanco MM-7, stereo/mono audio prod/disco mixer, 2 mic inputs w/pair, 2 TT inputs, 2 line-tape inputs, cue buss, \$100. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

E-V 12TR03B 3 way speaker, \$50. G Falk, Falk Recdg, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Misc items: Shure SR-110 mon mixer, \$175; (2) Shure A102A 70 V xmr, \$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 mdll 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.

### 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 Pultec, Lang, program EQ's. D Petty, Larrabee Sound, 8811 Santa Monica, W Hollywood CA 90069. 213-657-6750.

## LIMITERS

### Want to Sell

Orban 8000A, mint cond (2) w/manuals, \$1750 ea; PR&E ML FM Multimeter, single chan FM limiter/compressor, 4 matched pairs, new w/manuals, \$1200/pr; CBS Labs 4110 slimline stereo audio compressor, very low hrs w/manual, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Pye stereo compressor, discrete transistor design from early 70's, spare parts & doc. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Audimax 4440 AGC (2), \$300 ea. K Hamack, KWLN, 88 Union Cntr Ste 309, Memphis TN 33103. 901-529-0098.

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You call the shots with this 3-band stereo-FM processor. A wide range of user controls lets you burn a hole in the dial or back it off to totally mellow. Many unusual features - call for blurb.

**Inovonic**  
(408) 458-0552

Orban Optimod 8000A compressor, limiter, stereo gen, excel cond, \$2000. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Automated Bdc Controls wideband mod controller, new, composite clipper, w/manuals (2), BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

CBS Volumax 411 stereo, \$250. R Gray, Aray Audio, 223 W Mtn Rd, W Simsbury CT 06092. 203-658-6941.

**GIVE IT A CALL**

This stereo processor can be pre-programmed with 5 different presets to "call up" for format changes, etc. Unit has slow-AGC, 5-band compressor, and either an AM or FM peak limiter. Computer/modern control option available.

**Inovonic**  
(408) 458-0552

Dorrough DAP 310 like new, extra AM peak limiter board, \$650. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Aphex IIB bdc aural exciter, less than 1 yr old, \$1850. R Dieterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Gates Solid Statesman FM limiter, \$200. K Hamack, KWLN, 88 Union Cntr Ste 309, Memphis TN 33103. 901-529-0098.

UREI LA5, similar to LA4, w/rack mt, \$250. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Inovonics 220 audio level optimizer, mono, BO. C Coombs, Cape Cod Cc, Rte 132 W, Barnstable MA 02668. 617-362-2131.

Harris MSP90, FM, \$500; CBS Audimax #3, \$500; CBS Volumax, \$100. T Hunt, KILA, 2201 S 6th St, Las Vegas NV 89104. 702-731-5452.

CRL AM4, mono, factory realigned, \$1300. T Saunders, WSBH, 56 Tagger Ln, Southampton NY 11968. 516-283-9500.

Fairchild Conax 600 mono, \$250; Gates Stay-well M5167, \$250. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

Texar Audio Prism, (2), \$2800/both. M Wilson, KNOE, Monroe LA. 318-388-8888.

CBS FM Volumax 4110 stereo, BO. K Schipper, KOKS, 9191 Sheridan Blvd, Ste 205, Westminster CO 80030. 303-427-7700.

Harris solid state limiters, \$100. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

CRL SEP 800 limiters, great shape (2), \$1600/pr. P Parks, KHYS, 7700 Gulfway Dr, Pt Arthur TX 77642. 409-963-1276.

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 CL, gd cond, BO. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

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## LIMITERS . . . WT B

### Want to Buy

Orban 8000A. J Stromquist, WNCB, 2816, Hogberg St, Duluth MN 55811. 218-722-3017.  
Orban 8000A. E Sutton, WOKI, 114 Tulsa Rd, Oak Ridge TN 37830. 615-483-8451.

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.

## MICROPHONES

### Want to Sell

Telefunken U47 & 49 w/w/o pwrpcks, \$100-1400; MK Caps V14, \$250 ea; 77DX w/cable 44's w/V/M switch. United Recd Labs, 681 Fifth Ave, NY NY 10002. 212-751-4660.

AKG C414EB condenser, \$500. P Cibley, Cibley Music, 138 E 78th, NY NY 10016. 212-986-2219.

Neumann N80G2 phantom 48 V, \$80. J Ying, Aerial Recd, 140A Bellevue Ave, Newport RI 02840. 401-846-9743.

AKG 451E (2) excel cond, preamp & capsule just rebuilt by factory, \$400 for both; EV DL42 (2), excel cond, just rebuilt by factory, \$400 ea. C Butler, Butler Bdcnt Svcs, 1775 Bartlett Ave, Orange Park FL 32073. 904-264-8169.

RCA 44BX w/original desk stand from early 50's, sounds & looks gd, \$375/BO. L Smith, Box 69, Amsterdam NY 12010. 518-843-2500.

Sennheiser 404 & 405, both need work, have spare cables, PS, BO or trade. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Parts for AKG C-28 & S7C 4126A, mainly outer shell & windscreen. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Superscope EC12B (6) electret cond lapel mics, gd cond, \$22 ea/all six \$120. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

AKG D1000E (3), \$50 ea; (3) SM33 Shure ribbon mic, \$100 ea. C Fries, KSQY, Box D, Deadwood SD 57732. 605-578-3533.

Beyer M260 dynamic ribbon, like new, \$250. G Wilson, WGLE, 7519 Dorr #196, Toledo OH 43617. 419-865-7289.

Neumann U47 power supply & stand, \$2250. L Oliver, Lynn Oliver Stds, 304 W 89th, NY NY 10024. 212-874-7660 alt 12.

Neumann U-47NV (2) excel cond, consecutive S/Ns. R Vogt, Vogt Quality Rec, Box 302, Needham MA 02192. 617-444-8687.

AKG D1000E (3), excel cond, \$50 ea; Shure SM-33 ribbon mics, excel cond, \$100 ea or all for \$250. C Fries, KSQY, Box D, Deadwood SD 57732. 605-578-3533.

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, Foxdur Stds, 2204 Siesta Ln, Santa Rosa CA 95404. 707-528-9269.

EV RE, mint cond, \$250; MB Pearlless 520 mics w/PS, mint cond, \$500 for pair incl PS. 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, Kenfield 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. 415-665-1035.

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.

### 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. 415-665-1035.

## MISCELLANEOUS

### Want to Sell

Clarostat 73JA 90-2K ohms, 10 turn precision pots, \$200 ea or \$100 for all. G Wilson, WGLE, 7519 Dorr #196, Toledo OH 43617. 419-865-7289.

Rustang 23T41058 cart rack, Lazy Susan for 148 carts, like new, \$120. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Sola line voltage reg, input 208 V single phase, 5 kv. J Turner, WMIN, Mt Carmel PA 171-339-1600.

Harris dummy load 50 kW, new, BO. A Anderson, KBMR, 3500 E Rosser, Bismarck ND 58501. 701-255-1234.

Beau motor, new for Ampex AG-440, 3-speed/7.5-15-30, \$275. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

Gelling vacuum tube console module, mic pre, EQ & line amp. BO. R Robinson, TNA, Box 57, Wallingford CT 06492. 203-269-4465.

Anvil case, 27" x 22" x 17" deep, heavy duty casters, twist latches & ball corners, gd shape, \$300. B Deakin, Village Sports, POB 3300, Chapel Hill NC 27515. 919-968-4811.

Teletype 33 (2), ASR, w/punch & reader, w/lor w/o stands, take one or both, \$250 ea or BO & you pick-up; many 16mm projectors to sell; Fairchild Galaxy (rear screen) salesman's projector. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

MIPA Industries K-65 speed gun, perfect for race coverage, \$650. D Murray, WPRO, POB WPRO, Kingsport TN 37663. 615-239-4745.

Jack Strip, 52 RTS, dbl closed-circuit jacks, all grounds normalized, gd cond, \$100; UTC xmsrs A21 500/500 ohms; (2) A22 50,200,500/50,200,500 ohms; (2) A24 15K/500,333,200,125,50 ohms; (2) A39 600,150/2K,500 ohms, \$20 ea/all 7 \$120; (2) UTC A33 20 dB magnetic shields, \$10/both; line xmsrs (2) EV 502, EV 502B, Shure A86A, \$12.50 ea/all for \$40. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Plate transformer, 3-phase 240 V primary, 4000 V, 1 A nominal sec, unused, \$450/BO/trade. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

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, Manassquan NJ 08736. 201-974-2180.

## BROADCAST AMERICA

### NEW AND USED EQUIPMENT

- 15 W FM Exciter \$1,995 (new)
- 30 W FM Exciter \$3,495 (new)
- 1 kW FM XMTR \$6,995 (new)

### ITC Cart Machines From \$500 (used)

### Call for Complete List of Equipment 209-298-2373

AP news wire paper, 8" wide, 12 rolls per box, 10 boxes avail, \$15 per box plus frt. D Smith, KKLS, Box 460, Rapid City SD 57709. 605-343-6161.

RCA, GE, Tamophone 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, Bdcnt Tech Assoc, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

Adhesive-Backed Lettering computer generated for labelling, advertising, call letters, etc. Many colors and typesyles from 1/2" to 12". Send for info: Kelly Graphics, 4720 Montgomery St, Annandale VA 22003.

Equip rack, BO. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

## Want to Buy

Motor for Sparta-matic cart-time delay & reverb, model CD-15, motor D162H, or equiv. T Heathwood, Heritage Radio, POB 16, Boston MA 02167.

Advise & info on accounting & or logging software for IBM PC's. C Alexander, WYTW, POB 669, Cadillac MI 49601. 616-775-1071.

Phase converter, single to 3 phase AC converter, Phasemaster or equal, to handle 10 kW or more. J Powley, KIUU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Manual for Scully 280. M Baykiam, Granry's Kitchen, 6689 Orchard Lake Dr Ste 151, W Bloomfield MI 48033. 313-737-0751.

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 xmtr, 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.

## MONITORS

### Want to Sell

McMartin TBM 2000 SCA monitor, cond unknown, \$200. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

McMartin TBM2000B, used latest version SCA monitor, factory tuned & tested. Goodrich Ent Inc., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

Collins FM freq monitor, \$100. R Gray, Aray Audio, 223 W Mtn Rd, W Simsbery CT 06092.

TFT 753 mono AM mod mon w/pre-selector options, new, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Belar FMM1 & FMS1 & RFA1 on 68.9 currently, \$1850 for pkg. B Klinger, WRDL, 401 College Ave, Ashland OH 44805. 419-289-4142 X5137.

Belar RFA-1 AM RF amp, excel cond, w/manual, BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

RCA BW74 FM stereo monitor, \$300. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

McMartin TBM 3500 FM mod mon, 68.3 MHz, gd cond, w/manual, \$100 plus ship. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

McMartin TBM4000 FM mod multiplex monitor at 89.3 MHz, \$200. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

McMartin TBM4500A excel cond, just taken out of service, \$600. G McCoy, KZEN, 1608 16th St, Central City NE 68826. 308-946-3816.

Belar RFA-1 FM RF amp, 2 yrs old, \$300. 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.

### Want to Buy

TFT tuneable mod monitor or equiv QEI. B Dodge, WTJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

McMartin TBM 4500A or later Solid State monitors, any cond. Goodrich Ent Inc., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

Belar RFA-1 FM RF amp for FMM-1. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

CCA AMM-10 AM mod monitor. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

CCA AMF-10 AM freq monitor. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

## MOVIE PROD. EQUIP.

### Want to Sell

Auricon 16mm sound on film 200 foot programmer, Precision 16 & 35mm optical & magnetic sound reader, Zeiss 16mm Movie-scope. H Deans, Deans Prod, 170 Grand St, White Plains NY 10601. 914-949-5920.

Auricon Pro 1200 16mm camera, mint cond, factory installed mag head both optical & mag M11 amps cases (2) \$2000. L Meister, 321 River Rd, Nutley NJ 07110. 201-667-2323.

## RECEIVERS & TRANSCEIVERS

### Want to Sell

Shortwave receiver, BC-348Q, 200-500 kHz, 1.5-18 MHz, \$35; RCA CMV-1A, crystal controlled FM xmtr/cvr, \$35. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

### 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 Series 9000 satellite dish, 3.2 meters w/extender panels, BO. J Hansen, KFMD, Des Moines IA. 515-282-1033.

Wegener CCN Radio Network rec & tone decoder, w/1602 mainframe, 1615 demod card & 1647 cue tone card, \$500. K Hamack, WEZ1, 6080 Mt Moriah, Memphis TN 38115. 901-365-2032.

# Consultants

## BROADCAST TECHNIQUES



### Applications & FIELD ENGINEERING SERVICES

P.O. Box 26899  
Phoenix, AZ. 85068  
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FAIRFIELD, FLORIDA

# Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: \_\_\_\_\_.

## POSITIONS WANTED

CE, very exper, small to major market, high power AM/FM, D-As, turnkey installations, studio designs, automation, hard working team player, in Michigan. Write: RW, POB 1214, Falls Church VA 22041, Attn: Box 10-1.

CE, trans. knowledge, studio maint. AM/FM + FM, costs shared, 2 companies, live Honolulu. 40K, qualified persone, resume to KPOI, 741 Bishop St., Honolulu HI 96813.

South Texas Powerhouse combo seeks CE to maintain first class facilities on the sun-swept Gulf Coast just minutes from Mexico. Applicants should be neat, budget conscious & articulate. Send resume to Don Wolfe, KRIX, 2100 Boca Chica Blvd #305, Brownsville TX 78521. EOE.

Chicago Sound: give your station's promos, commercials & breaks the polished Chicago sound, voiced from your copy by exp Chicago announcer. D Farrell, POB 68441, Schaumburg IL 60168. 312-310-8179.

Station or Group CE, 20 yrs exper in all phases & powers of AM/FM eng in construction. P Shirley, 7505 Lake Wheeler Rd, Raleigh NC 27603. 919-779-7547.

CE, radio, 13 yrs exp, AM, DA, FM, STL, automation, construction. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-1.

CE, hard working, looking for FT position w/growing company, well qual, 10 yrs exp,

will consider announcer w/country station, interested in KS, CO, MO, NE, OK, TX & IA. Larry, 402-461-3528.

Seeking staff/assist eng position. 8 yrs bdcnt exper, FCC genrt, SBE cert. So. Cal area. Call Mark, 818-447-2544.

## HELP WANTED

KNIS-FM non-comm Christian ministry near Reno seeks FT professional to maintain station & growing FM translator network. Write: GM,



# Broadcast Equipment Exchange

**REMOTE . . . WTS**

15K card for S-A 7325 DPU, sell or trade for 7.5K card, \$880. C Wilson, KSFE, POB 738, Needles CA 92363. 619-326-2101.

Simpson 7026 freq counter. 904-760-1413.

Moseley MRC1600, new unit, \$2500. R Lary, WRVR, 5904 Ridgeway Pkwy, Memphis TN 38118. 901-767-4104.

Micro Controls PL6 10 SCA gen, used 6 mos, set for 23 kHz, \$500. D Fields, KUFO, POB 1713, Big Springs TX 79721. 915-263-7326.

Moseley CIP-1 slave relay panel, rack mount wirelays (2), BO; Moseley PCL-505C, 50 MHz composite aural STL system w/factory spare parts kit, \$5000. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

Century Video MRP-1 ABC Talk Radio cue decoder, like new, \$350. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Datsat DS-140 satellite receiver cue encoder, excel cond, BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Moseley PCL-404 mono STL system, works perfectly, BO over \$1500. K Hamack, Harnack Eng, 88 Union Ctr Ste 307, Memphis TN 38103. 901-529-0098.

Wegener 1602 satellite subcarrier. demod, 6.3 MHz for CNN radio, \$350. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

Microdyne SPSC receiver & power supply, 904-760-1413.

M/A-Com MA-4001 satellite receiver, 3.7-4.2 GHz input, freq agile, baseband, video & audio outputs, \$500. S Streitberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

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.

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, WPRQ, POB WPRQ, Kingsport TN 37663. 615-239-4745.

Andrew LJ7-50A 10-1000' rolls, new, \$3/ft. R Wurst, Wurstex Tower, POB 227, Gainesville TX 76240. 817-665-0485.

Moseley remote control w/relay 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 Solinske, WSYR, 2 Clinton Sq, Syracuse NY 13202. 315-472-9797.

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.

**Want to Buy**

Mari, gd cond unit, xmtr & rec, UHF or VHF. G Jones, WYTM, POB 717, Fayetteville TN 37334. 615-433-1531.

Wegener satellite gear in gd cond, 1601 mainframe, 1626 demod card, 1648 tone decoder, 1644 relay card. B Dodge, WTJ, POB 1818, Brattleboro VT 05301. 802-254-2560.

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.

**STATIONS**

**Want to Sell**

KRAN AM daytimer, Morton TX, \$60,000 cash. E Couzens, 806-266-5545.

Class A FM in Oklahoma w/new equip, low down to qualified, long payout, retiring, \$149,000. G Erway, 405-832-5432 after 6 PM.

Radio station, 1000 W daytimer, big band, jazz & 50's swing station, only live format of its kind in S Colorado, large senior community plus 6 acres, \$400,000. Susan, KAYK, 4211 N Elizabeth, Pueblo CO 81008. 303-542-1480.

CP, FM radio station, sell or trade. G Lack, 205 N Second St, Thayer MO 65791. 417-264-7266. (M-Th)

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**

FM CP or AM/FM combo, medium market. D Ganske, WISM, 1819 Mitchell Ave, Eau Claire WI 54701. 715-836-9476.

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**

Moseley SCG-3T rack mount FM stereo gen, w/manual, excel cond, \$150; Moseley SCG-9 (2), stereo gen, rack mount, new, \$975 ea. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

McMartin BFM-1521 stereo generator, like

new, factory tuned & tested. Goodrich Ent Inc., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

Harris MS15R stereo gen, \$1000 or trade for Urban 8000 Optimod. B Umberger, WNL, 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**

Harris, Kahn or Motorola AM stereo, complete pkg, D Ganske, WISM, 1819 Mitchell Ave, Eau Claire WI 54701. 715-836-9476.

Kahn stereo gen. NDXE Eng, Box 569, 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-5080P 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**

Audio tape, 1", 3M on reel (34 pcs), \$20; 3M on hub (6 pcs), \$15; Ampex on reel (8 pcs), \$20; Audiotape on reel (11 pcs) \$15; Audiotape on hub (1), \$10; 3M 1" leader tape (1), \$10. D Flynn, Continental Recdgs, 102 South St, Boston MA 02111. 617-426-3131.

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.

Carts, 10-1/2 min, (400), gd cond, \$1.50 ea. K Hollingsworth, KCSP, 214 E Georgetown St, Crystal Springs MS 39059. 601-892-3001.

3M Scotch 206, 208 & Ampex 632 1/4" on 5", 7" & 10 1/2" reels-repro. Also available Ampex 406, 456, 3M 250 & Agfa 469 2" audio tape who 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.

Complete black music library, 1940's to 1980's, also complete black gospel library, \$2000/BO. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Replacement record jackets, white, fabricated, (5), \$10 plus ship. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

U-Matic 3/4" video cassettes, (9) short lengths (5-10 min) w/vinyl cases, \$3.50 ea/all for \$27. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Hit Parade of Star's automated library, developed as Saturday showcase for radio, \$150. J Shepherd, Globe Prod, POB 20465, Roanoke VA 24018. 703-344-3283.

3M 206 1/2" tape (12) full, (2) partial hubs, 3M 208 full hub, Ampex 406 full hub, \$5 per roll, (2) 1/2" metal 10" reels, \$3 ea or entire lot \$70. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

3M 206 1" tape, (6) full on reels, 3M 206 (2) full one on reel, other on hub, Ampex 406 partial on hub, \$10/roll or entire lot, \$70. E Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

Audiopeaks, various selection (300), 40-70 sec, \$300. J Carrigan, WDOM, Providence College, Providence RI 02918. 401-865-2460.

BPI pop vocals, 45 reels. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

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.

Nostalgic radio commercials on 5" reels, approx 100, \$100. M Kamtorowitz, WPOB, 50 Knickerbocker Rd, Plainville 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**

Copies of Top 100/200 or more of each year from 1954 or before to 1987. Stevenson Corp, PO Box 735, Blaine WA 98230.

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, Lobelville TN 37097. 615-593-2294.

**TAX DEDUCT. EQUIP**

School needs equip for educ FM & recording studio. B Dean, DownEast Machine School, RT 1 Box 388, Machias ME 04654. 207-255-4735.

Xmtr & antenna, 250 W range, for non-profit public station. S Rubick, KDNK, POB 1388, Carbondale CO 81623. 303-963-0139.

ENG related equip to train bdct news students at Univ of FL, call or write. D Hofmann, WUFT, Box 13375, Gainesville FL 32604. 904-392-4311.

Eng student desiring donation of bdct equip (anything), EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

**TEST EQUIPMENT**

**Want to Sell**

Test equip & spec sheets & manuals for sale, send SAE for lists. L Oliver, Lynn Oliver Slds, 304 W 89th, NY NY 10024. 212-874-7660 aft 12.

**Bankruptcy Sale:** includes Potomac Instruments AT-51 test set, OEU 69101 FM mod mon, ALS mdl TR 1 tracer, B&K 1652 dual output power supply, Sencore SG 165 AM/FM stereo analyzer, Digimax D1200 freq counter & a Global LTC 2 logical analysis test kit NSN, all BO. Bankruptcy Trustee for Richard Shepard d/b/a Broadcast Services. Whitmore-Phelps Law Firm, P.S., 115 South Chelan, Wenatchee WA 98001. 509-662-9544.

Tek 1410R NTSC Sync & test signal generator w/SPG2 sync gen, TSG7 color bars generator, TSG3 linearity & modulated pedestal test generators, TSG5 pulse & bar generator, & TSG6 multiburst signal generator, like new, \$6950. T Hopkins, Cape Fear Enter., Rt 1 Box 269-A, Faison NC 28341. 919-594-0172.

Sound Tech 1000A/1100A FM alignment gen w/stereo gen & signal conditioner, new, w/manuals, must sell together, rack mount, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.



FOR FREE LISTINGS IN BROADCAST EQUIPMENT EXCHANGE



CALL TOLL FREE 1-800-426-8434 15 LINES TO SERVE YOU

Free listings in Broadcast equipment exchange are offered to all United States Broadcasters AM/FM/TV and all Pro-Sound end users. BSW will accept up to three listings by telephone. For more than three listings BSW will send you an ad order sheet for your convenience. BSW will list each ad for a period of three full months.

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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.

**Positions Wanted**

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  Positions Wanted  Without Box Number

Text (25 words maximum): \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Company/Station \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

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BROADCAST EQUIPMENT EXCHANGE  
PO BOX 1214  
FALLS CHURCH VA 22041

# RW

# Broadcast Equipment Exchange

## TEST . . . WTS

Sencore Z meter 2, freq counter & scope, BO. C Creekmore, Metro Traffic Control, 101 Wymore Rd Ste 200, Altamont Springs FL 32714. 305-682-1500.

Hitachi V202 dual trace scope. 904-760-1413.

Rust AL-100 autolog xmt chart recorder w/AP-12 alarm panel, \$100. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

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/PS, 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 Beatty, 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.

Sync gens, BO; Tek waveform monitors, BO. C Haynes, Haynes Comm, POB 31235, Jackson MS 39206. 601-948-1515.

Potomac FIM21 mint cond, \$1500. D Murray, WPRQ, POB 5715, Kingsport TN 37663. 615-239-4745.

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, 207-823-1941.

Federal 101-C field strength meter, operates on cigarette lighter option. JB Crawley, WLBN, POB 185, Campbellsville KY 42718. 502-465-8884.

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.

## Want to Buy

Bird or equiv Thruline wattmeter w/3-1/8" or 1-5/8" flanged line section; Bird or equiv inline wattmeter, Mdl 43. B Emanuel, KASH, 1300 E 68th Ave #208, Anchorage AK 99518. 907-522-1515.

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

ITA FM 5000 for parts w/tubes & harmonic filter, BO. J Yeager, WVLC, POB 1559, Lexington KY 40592. 606-253-5900.

McMartin Model DPTU-75K, 50kW AM Electro Impulse Air cooled load, list new at \$11,000, will sell for less than 1/2, used 4 times; also for sale are (2) 7 port 3-1/8" patch panels, factory new, sacrifice price. Goodrich Ent Inc., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

RCA BTA25 250 W xmt, \$750/BO. K Hollingsworth, KCSP, 214 E Georgetown St, Crystal Springs MS 39059. 601-892-3001.

Gates BC1E 590 kHz, 1 kW, gd cond, some spare tubes, \$1500/BO. J Yeager, WVLC, POB 1559, Lexington KY 40592. 606-253-5900.

Collins 830F-1A, 10 kW FM, gd cond, w/exciter & stereo gen, manuals, BO. J Whitmer, Murray Bdcg, POB 1340, Murray KY 42071. 502-759-1300.

Harris TE-3, new FM exciters, (2) one w/factory stereo gen (new) & one w/composite stereo input panel w/manuals, BO. R Royster, 8922 Valencia Dr, Spring Valley CA 92077.

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Best TEX20P 15 W exciter, \$1995; Best 1 kW FM xmt, \$6995. B White, 4600 E Herndon #244, Clovis CA 93612. 209-298-2373.

Solid state audio driver for Harris BC10H, latest design, \$1000/BO. T Saunders, WSBH, 56 Tagger Ln, Southampton NY 11968. 516-283-9500.

RCA BTA-1L 1 kW, working when removed from service, w/manual, BO plus ship. F Kelly, WAZQ, POB 2493, Orangeburg SC 29116. 803-531-3990.

Gates FM1G/1H 1 kW FM, w/new final & spare parts, 97.7 MHz, \$4800/BO. D Balough, WOXY, 5120 College Corner Pike, Oxford OH 45056. 513-523-4114.



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San Diego, CA 92101  
619-239-8462  
Telex 229882LJMUR

CSI 5TA 5/10 kW AM, 1982, currently on-air w/new tubes, current proof, \$18,000/BO. J Hoge, WYND, 316 E Taylor Rd, Deland FL 32724. 904-734-1310.

McMartin B-910 exciter, 102.9 MHz removed from service 4/87 w/some extra modules, \$1000. P Jettison, WBLY, 117 S Fountain Ave #301, Springfield OH 45502. 513-324-5643.

LPB carrier current, 20 W AM at 1610 kHz crystal controlled, BO. K Kraska, WDBN, 1719 Kingsley Ave, Akron OH 44313. 216-869-9640.

RCA BTF-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 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.

CCA 10 kW FM, solid & reliable. P Anderson, KZBO, POB 97, Pocatello ID 83204. 208-234-1290.

### Want to Buy

CCA or CSI 10 kW or 20 kW FM xmt. B Barry, WAMB, 1617 Lebanon Rd, Nashville TN 37210. 615-889-1960.

McMartin B-910 FM exciter, any cond. Goodrich Ent Inc., 11435 Manderson St., Omaha NE 68164. 402-493-1886.

High band VHF xmt, any make/mdl, 100 W to 25-35 kW, will consider low power driver stage of any xmt. J Powley, KIUU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

FM xmt for standby, 10, 20 or 25 kW. D Hollingsworth, KOCZ, POB 430, Ruston LA 71270. 318-255-5000.

RCA TTU-1B 1 kW xmt or parts, need to keep existing unit operating, any cond; RCA TTU-2A 2 kW xmt or parts, need to rebuild damaged unit, any cond. J Powley, KIUU, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

FM translator, tunable to 92.1 MHz. K Brown, 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.

Tepeco 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 Bdc 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.

## TUBES

### Want to Sell

Assorted audio tubes, call for info. D Fields, KUFO, POB 1713, Big Springs TX 79721. 915-263-7326.

Eimac 3CX1080A7, new, BO over \$200. K Harnack, Harnack Eng, 88 Union Cir Ste 307, Memphis TN 38103. 901-529-0098.

EIMAC 4-1000A new, (2), \$300 ea. AH Bott, BHP Inc, 340 S 24th St, Quincy IL 62301. 217-224-1076.

VA221H Idystron 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.

ORF 3-speed TTs (4) w/ORF tonearms, no cartridge shells, \$100 ea plus ship. S Sibulsky, KVIN, POB 308, Coeur d'Alene ID 83814. 208-664-9271.

Russco RTA-12 tonearms (2), \$360/both. T Fernandez, WKOY, POB 2500, Sarasota FL 33578. 813-366-4422.

Russco Cue-Master (2) w/tonearms, Stanton 680 cartridge & preamps, gd cond, \$150 ea. C Fries, KSOY, Box D, Dearwood SD 57732. 605-578-3533.

Russco Studio Pro, brand new, \$350. B Marshall, WT Studios, 2025 S 900 E, Salt Lake City UT 84105. 801-486-4977.

Technics SP10 IIIK II, \$500. R Gray, Aray Audio, 223 W Min Rd, W Simsbury CT 06092. 203-658-6941.

Lead screws for Presto 6M 224/104/106 lines per inch, all \$135. L Oliver, Lynn Oliver Sids, 304 W 89th, NY NY 10024. 212-874-7660 alt 12.

ORF 12C w/Ret-O-Cut tonearm, \$125. S Amé, WFRS, 317 E 5th St, Cincinnati OH 45202. 513-621-4545.

Russco Studio Pro w/Micro-Trak 303 arm, \$175; ORF 3-spd TT w/Micro-Trak 303 arm, \$150. W Laughlin, KDCV, 2636 N 56th, Lincoln NE 68504. 402-466-8670.

Gray 16" transcription arms, (3), \$75; Gates M6244 transistor equalized preamps (2), \$150. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

ORF 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.

ORF 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 1 w/Westrex model 2B recording head, amp, preamp & elect. S Barnard, Imperial Int, POB 548, Karikakee 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.

## TV FILM EQUIP.

### Want to Buy

Philco Cinecanner TV bdc projector. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

## VIDEO PRODUCTION EQUIPMENT

### Want to Sell

Panasonic NVA970 time code edit controller, \$700. B Chapman, Video Effects, POB 6316, Napa CA 94581. 707-257-7669.

Lexicon 1200 time compressor/expanders, change program running time without changing pitch, interfaces w/variable speed ATR's, VTR's, Telecines, used w/90-day factory warranty, 1200B, \$3500; 1200C, \$3590; Demo, \$6900; new, \$9500. Call Lexicon Sales, 617-891-6790.

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.

ICM CG7000P character gen, like new, \$1800. H Donnell, Creative Video Prod, 211 Windsor St, Reading PA 19601. 215-378-0994.

Sony AC148 power supply (3) in mint cond, \$100. J Diamond, Blue Diamond Studios, Box 102C, Chubbick 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 synch generator w/Modern Video Eng B&W to color adapter. O Berliner, Soundesign, Box 921, Beverly Hills CA 90213. 213-276-2726.

Crosspoint 6006B 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.

### Want to Buy

Tech manual (service) for video projectors, GE PJ7100 & PJ700. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

## VIDEO TAPE RECORDERS

### Want to Sell

Panasonic NV8170 & NV8200 VHS rec/play, gd cond, \$500 firm. M Russell, Sherwood Comm, 1310 Industrial Hwy, Southampton PA 18966. 215-357-9065.

Sony VP2000 3/4" player & VO1800 recorder, \$95 ea. L Grazioplene, Graillen Research, 3532 N Main, North Java NY 14113. 716-535-7251.

Panasonic MV9300A 3/4" VCR w/built-in UHF/VHF tuner, \$750/BO. R Branske, WL00, 875 N Michigan, Chicago IL 60611. 312-440-3100.

JVC 3/4" PB only, works but needs minor repair, \$150. P Badger, WKRE, POB 220, Exmore VA 23350. 804-442-5000.

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.

Panasonic 9240 source deck, \$2775; Panasonic 9600 editor, gd cond, 43500. P Costa, Eastern Snd & Video, 462 Merrimack St, Methuen MA 01844. 617-685-1832.

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Digital PAL/SECAM/NTSC. Chroma, Luminance, Error Correction given careful set-up for broadcast quality at budget price. VHS, BETA, 3/4", \$45/hr. Quantity discount.  
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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 Kerbaway, 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 SLO383, 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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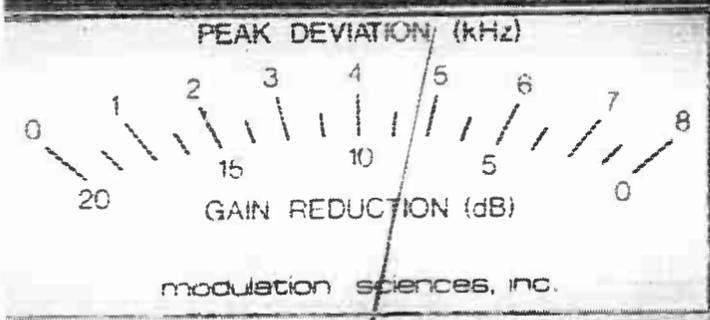
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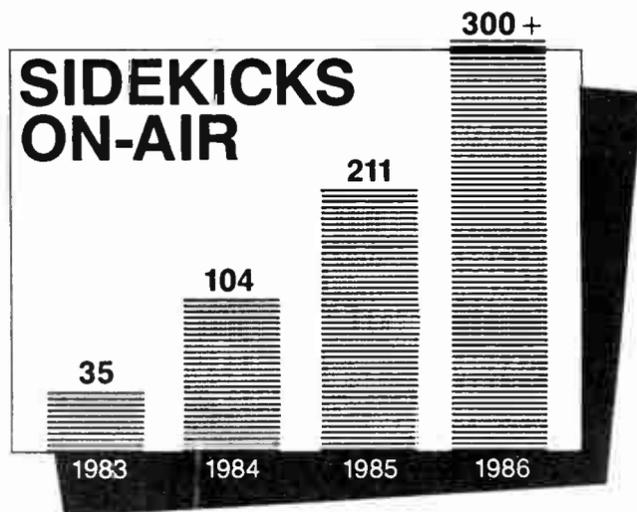
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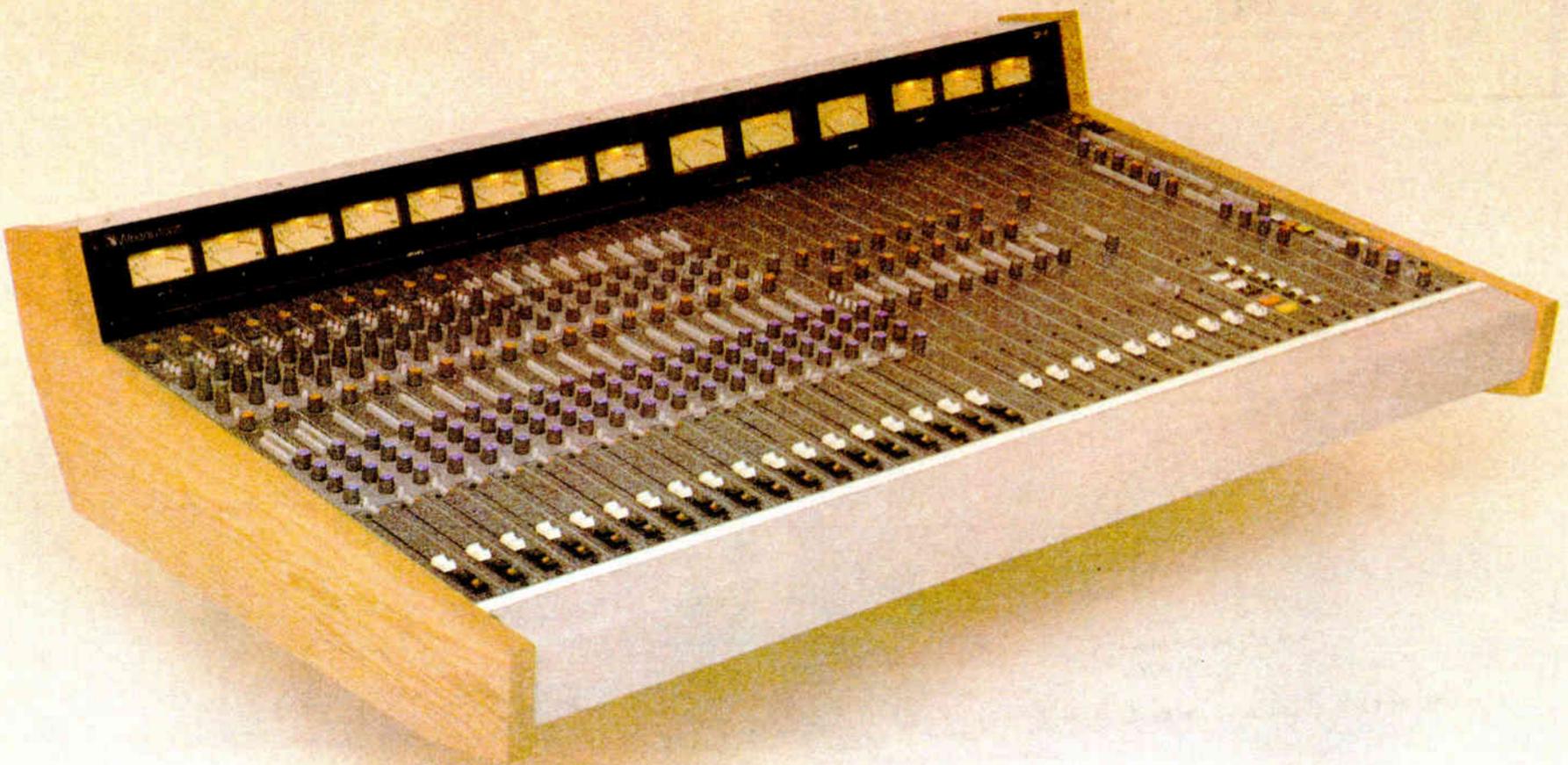
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