Published twice a month

# Radio World

Broadcast Equipment Exchange See pages B-1 to B-6

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# Stay Urged on Translator Feeds

by Charles Taylor

**Washington DC** ... Four groups have joined forces to get the FCC to put a stay on allowing non-commercial educational FMs to feed translators via satellite or terrestrial microwave.

National Public Radio, the NAB, the National Federation of Community Broadcasters and the Association of Maximum Service Telecasters, Inc., all based in Washington, filed a motion of stay with the Commission 10 May.

The petition follows a two-step decision handed down 24 March that, first, allowed noncommercial FM translators owned and operated by their primary station to expand coverage through the use of satellite and microwave links. Previously, the translators were required to be fed over the air.

The Commission's action was a decision on a petition by the Moody Bible Institute to allow satellite feeds.

The decision also imposed a general freeze on applications for new FM translator stations.

The decision affecting NCE-FM frequencies "has not simply created expanded noncommercial service, but rather it has created a mechanism for the introduction of a new and unwarranted low power FM service in the NCE reserved portion of the FM band," according to the petition.

"(This will) deplete limited noncommercial FM spectrum availability and will result in irreversible harm to the development and expansion of public radio ... This rule change is a substantive policy change which is unwarranted, arbitrary and capricious."

The filing continued, "In its decision, the Commission has failed to take into account competing NCE-FM spectrum needs, public interest obligations, localism and other factors relevant to the Commission's role in decisions about spectrum allocation."

The organizations contended that they do not oppose the use of alternative signal delivery for NCE-FM stations extending local service to unserved areas or waivers for Alaskan stations.

### Moody Bible

The issue of a station using alternative-signal delivery in conjunction with a translator first caught the attention of the industry when Chicago-based Moody Bible Institute asked the FCC in 1981 to allow it to feed its translators by methods other than over-the-air feeds.

Three years later, the FCC turned down Moody's request and asked the institute to file again after the Commission could study the issue. Moody filed again in 1985, and was given approval with the 24 March FCC ruling.

The four organizations opposing the ruling hold as a major point of contention that implementation of the alternative signal delivery ruling will create a crunch of applications for NCE-FM frequencies, "precluding some communities from development or expansion of local public radio."

Community-by-community applications cannot be filed as quickly as those filed by large centralized entities, the filing stated, leading to station monopolies that will broadcast simultaneous programming to their stations via alternative-signal delivery. This could harm the existing concept of locally owned and oriented radio stations, the petitioners added.

Not all in the industry agree, however.

### Disagreement

"I see no foundation to that argument," said Jim Goodrich, assistant to the VP for Moody. "There are more than 3,000 communities that do not have primary service. Neither (one-station owners) nor organizations of our size can fill that void. Why should people be deprived just because we want to argue about the space? I think there's plenty there for everyone."

NPR, in a prepared statement responding to Goodrich's comments, said, "Introducing large numbers of FM translators without defining technical standards relating those translators to full-service stations at least as exacting as the standards relating full-service to full-service stations is potentially disruptive to all of non-commercial broadcasting and therefore to the public."

Goodrich noted surprise that NPR doesn't support the use of alternative signal delivery. "A glass can be half full

*(continued on page 7)*

# Delta Demos Splatter Monitor

by Alan Carter

**Washington DC** ... A splatter monitor designed to measure compliance with the NRSC standard is "a reality, not a prototype of something that would be nice to have," according to the monitor's manufacturer.

Delta Electronics demonstrated its new AM splatter monitor to FCC officials and to the Radio Advisory Committee in mid-May, to help foster industry acceptance in anticipation of an FCC rule making on the NRSC standard and complementary RF mask.

The splatter monitor, which is designed to evaluate a transmitter's level of AM interference, was offered for sale for the first time at the 1988 NAB convention. To date, Delta says it has taken three orders and a dozen proposals for orders, with delivery time between 45 and 60 days.

The company has invested more than $150,000 in the design of the monitor as a result of the National Radio Systems Committee's (NRSC) effort to more effectively measure the performance of radio stations in evaluating the NRSC preemphasis standard.

Delta's John Bisset (l) and Tom Wright explain the features of the AM Splatter Monitor.

### Measurement concerns

The NRSC voluntary 75 μsec preemphasis and 10 kHz stopband audio standard went into effect last year, and the complementary transmission standard or "RF mask" was approved in April.

The NAB has asked the FCC to make the audio portion of the standard mandatory and has received industry support for the proposal.

However, neither the NAB nor the NRSC wish to see the RF mask made mandatory at this time, although the FCC seemed inclined to include both as part of a rule making procedure from indications at a previous RAC meeting.

The NRSC's reluctance to see the transmission portion included in the rule making in part stems from difficulty in measuring compliance—a stumbling

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# REGULATORY NEWS

## FCC Files

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

### AM Technical Deregulation

Broadcasters voiced opposition to a proposal by the NAB that the FCC place a freeze on granting new AM stations and major changes to existing stations in reply comments filed in March on the Commission's comprehensive review of AM assignment criteria.

Commenters claimed the freeze would make it difficult for existing licensees who desire or need to make facilities modifications, would deny new service to the public and possibly "throw additional dirt on the coffin of the AM industry."

The NAB called for a freeze, it argued, in an effort to reduce interference on the band.

Previously, broadcasters filed comments in February on the FCC's July 1987 Notice of Inquiry, Docket 87-267, that reviews the technical assignment criteria for AM broadcasting. In the comments, broadcasters generally supported the National Radio Systems Committee's (NRSC) pre/deemphasis standard, and urged the FCC to more forcefully uphold technical criteria.

The AM review addresses the question of whether to overhaul rules which set the degree of interference protection for AM stations, as well as those that establish service areas.

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

A second round of comments is due to be filed on 17 June on sections of the Notice of Inquiry dealing with antenna issues and audio listening studies.

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

### Dial-up Remotes

A detailed list of 11 points intended to clarify the Federal Communications Consulting Engineers' (AFCCE) dial-up remote control transmittter rules has been drafted by the FCC and currently is awaiting Commission approval. The list of points first was released at an October 1987 AFCCE meeting.

The 11 points cover a wide range of remote functions. They specified that the use of dial-up circuits is legal for metering, adjustments and control. But they also indicated that EBS monitoring and backup control must be provided.

Contact David Workman at the FCC: 202-632-9660.

### Synchronous Transmitters

Comments were due 9 May regarding the FCC's ongoing investigation on whether to allow widespread use of AM synchronous transmitters.

So far, several stations have been granted authorizations for experimental synchronous transmitter operations. The reply comment period will end 8 June.

In its comments, the NAB stated that it has "reluctantly" concluded a rule making at this time on synchronous AM transmitters would be "premature."

The NAB said instead that the Commission should authorize more experiments with synchronous AM "to garner more information on the possibilities and problems relating to synchronous AM transmitters.

The Commission continues to wait on test data from several on-air experiments such as one taking place at KROL in Laughlin, NV. Jay Jackson, an FCC engineer, was unsure when results would surface. No date has been set by the FCC for an action on the proposal, which was announced in early 1987.

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

### FM Translators

The FCC on 24 March imposed a freeze on new FM translators in conjunction with an inquiry to "reevaluate the proper role of FM translators in the radio broadcast service."

The freeze affects acceptance of applications for new FM translators stations pending Commission action in the proceeding, Docket MM 88-140.

The freeze and new study comes in response to a series of requests from the NAB, which argued that many translator operators are "abusing" the FCC's rules by extending signals from a station's home market into markets already served by numerous local signals.

Along with the freeze, the FCC said it was seeking comments on a possible rule making procedure or Notice of Inquiry. The Commission maintained it wants to "develop information" to assist it in "evaluating the role of FM translators in the provision of FM radio service."

The contact at the FCC is Marcia Glauberman: 202-632-6302.

On a related issue, the FCC in a two-step decision approved allowing some noncommercial FM translators to be fed by satellite and microwave links, while proposing it for others.

The Commission voted 24 March to allow noncommercial translators to use "alternative technologies" for signal delivery. Previously, the translators were required to be fed by an over-the-air link.

On 10 May several groups filed a motion for a stay of the Commission's action allowing satellite and terrestrial feeds for noncommercial educational FM translators. (See story, this issue)

The item is contained in Docket 86-112. Contact Tatsu Kondo at the FCC: 202-632-6302.

### RF Radiation

Results from a joint FCC/Environmental Protection Agency Protection Agency study, hampered by delays since November 1987, were expected to be released early this month.

The study addresses levels of RF radiation emitted by broadcast towers in Spokane, WA. FCC Office of Engineering and Technology Physical Scientist Robert Cleveland would not comment on the pending report.

Statistics will be based on research conducted last 28 June to 3 July on RF emission levels from towers at Krell Mountain and Mount Spokane, two antenna farms in the vicinity of Spokane. Readings also were made of body current induced in tower climbers.

Results first were expected from the EPA in October 1987, then December and then March 1988. Delays were caused by a manpower shortage at the EPA, according to Cleveland.

The FCC's RF radiation contact is Robert Cleveland: 202-653-8169.

### Class A Hike

Comments and reply comments are in on a request with the FCC filed last September by a group of New Jersey Class A FM stations—the New Jersey Class A Broadcasters Association—to permit a blanket power hike to 6 kW for Class A FMers. The stations now face a 3 kW, or the equivalent, power limit.

In comments, some of the largest broadcast group owners came out in opposition to the request for an across-the-board power hike, while Class A stations that would be affected registered their support promising to take advantage of the increase.

In reply comments, the New Jersey group stated that opponents raised unrealistic scenarios and challenged proposed remedies but not the basic premise of their proposed rule making.

The New Jersey group argued that commenters did not find fault with their theory that the power limit for Class A broadcasters increasingly prevents them from effectively serving the communities

***(continued on page 8)***



## INDEX

# RAC Reviews Draft AM Report

by Judith Gross

**Washington** DC ... With only five weeks remaining until the second comment deadline on AM technical standards, members of the FCC's Radio Advisory Committee (RAC) got a look at a draft version of a comprehensive report on AM assignment criteria.

The NAB released in draft form a report titled "AM Technical Assignment Criteria" compiled by Harrison Klein of San Francisco-based consulting firm Hammett & Edison at an RAC meeting here in May. The report was given to the committee to garner feedback and to give those wishing to file comments enough time to do so.

The report is one of two funded by the NAB relating to the FCC's review of its technical criteria for AM allocations. A psychoacoustic listening test to determine audience tolerance for interference has been done by Chicago-based B. Angell and Associates and its results are about to be released as well.

The report used a method for calculating a station's minimum usable field strength, defined as the field strength necessary to permit a desired reception quality under specific receiving conditions where there is natural and man-made noise.

It concluded that no single protected contour is appropriate for all circumstances, and that "differing requirements should be accommodated by the Commission's allocation scheme."

While both atmospheric and man-made noise were used to measure minimum usable field strength, the report pointed out that man-made noise in the form of power lines, industrial machinery and noise-generating appliances has become a much more serious allocation consideration.

The RAC gets a first look at Harrison Klein's report.

Other conclusions were that existing protection ratios do not prevent adjacent channel interference, even on narrowband AM receivers. The report suggested that new ratios be calculated to better reflect present and future conditions, including use of the NRSC standard.

The report also stated that the current 50% exclusion RSS calculation method results in "unrealistic" predictions of nighttime service and has allowed interference to increase over the years.

It noted that a 25% exclusion method would more accurately portray nighttime service contours. It also suggested that RSS calculations include the effects of adjacent channel skywave interference by "weighting each RSS contributor by the appropriate protection ratio."

However, the report stressed that changing the RSS calculation method may not have a great impact on AM interference. It pointed out that no stations would be required to cause less interference if the exclusion method were changed.

"Changing the exclusion method would not change the actual level of nighttime interference, it would only change the calculated level," the report noted.

It concluded that "due to the maturity of the AM band, a change in RSS calculation method is unlikely to have a major impact on future interference."

In addition to its findings on minimum usable field strength, adjacent channel protection and RSS calculations, the report also contained PC-compatible computer programs that permit an AM engineer to calculate the values of technical assignment criteria.

RAC committee members expressed some surprise and concern about the report's findings. Wallace Johnson of the consulting firm of Moffet, Larson and Johnson said he thought the report would be "a shock to some stations when they find out what their actual service area is."

Other committee members pointed out that some stations might have to increase their protection of other stations, especially in directions unprotected or minimally protected until now.

The possibility that several stronger stations in a geographical area might buy out the license of a station experiencing strong interference and each increase their own interference-free coverage was also raised.

Some committee members expressed concern that the time frame to read the report and file comments by the FCC's 17 June deadline on its NOI into AM technical standards was so short. The comments are to address antenna issues and subjective audio listening studies.

The NAB will use the report as the basis for its comments, according to Science & Technology VP Michael Rau. He said the association would not file for a further deadline extension.

In the comments for the first deadline on 1 February, broadcasters generally urged the FCC to take a more aggressive role in controlling the AM airwaves. The NAB also asked the FCC to put a freeze on granting new AM stations and major change applications at existing AMers. Comments focused on assignment criteria, emission limits and the National Radio Systems Committee pre/deemphasis curve.

The FCC NOI on technical standards is docket 87-267. The contact is Wilson LaFollette at 202-632-5414.

# AM's "Wizard of Oz" Revealed

by Judith Gross

**Falls Church VA** ... In my favorite scene in *The Wizard of Oz* Dorothy, Scarecrow, Tin Man and Cowardly Lion stand quaking before **the mighty Oz** who is snorting steam and flashing lights and generally striking terror into the hearts of all.

The along comes little **Toto** who tears down the curtain and instead of a mighty wizard we see just a little, **harmless travelling salesman** with delusions of grandeur.

Can't help but feel a sense of déja vù now that the **mysterious sign** that was in the **Kahn Communications** booth at the NAB show has been revealed as just the latest round of desperate legal entanglements: namely Leonard Kahn's **suit against General Motors**.


Now he's suing on two claims of a single patent in a civil suit that will probably **drag on for months**, even years, as one more nail gets hammered into **AM's coffin**.

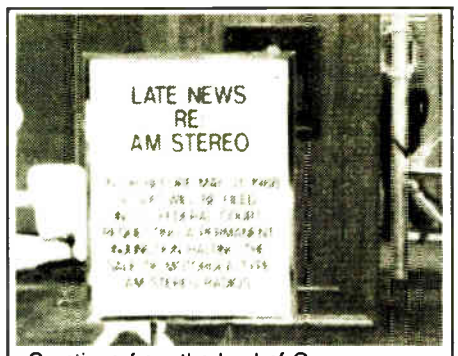
And for what? Not to stop the sale of C-QUAM receivers as the sign boldly implied. And certainly not to bring any kind of closure to a **ridiculous war** that has dragged on too long.

No. It's to **recover royalties** on a patent used to make C-QUAM-only radios.

Toto, we're not in Kansas anymore!

☆☆☆

His supporters claim that the plaintiff has the **interests of AM at heart**. But is he doing this for AM, which **twists slowly in the wind** while legal maneuverings drag on?



Greetings from the land of Oz ...

Is it even for those who still use the Kahn ISB stereo system, those tenacious souls who **cling loyally** to a stereo system that **no receiver** currently being marketed in the US can receive in stereo?

Nope. It's all about **money**. Getting royalties on patents used to make C-QUAM radios. In other words, now that C-QUAM has dominated the market, I want my **share of the pie**! Whose best interests are we talking about?

At the very least it will go the way of all such previous attempts—nowhere. At worst, it could just convince GM, and other receiver manufacturers who need less convincing, that AM stereo or maybe even AM altogether, is **just not worth this much trouble**.

☆☆☆

A broadcaster at the NAB convention's AM Improvement session asked why we can't get receiver manufacturers to **help AM** by making better receivers.

**Eb Tingley** of the Electronics Industries Association patiently replied that receiver companies would be only too happy to oblige, but that broadcasters have **hurt their own case** (and maybe sealed their own future?) by not even being able to agree on an AM stereo standard.

Maybe GM and the others will just shrug and say, "AM, who needs it?"

If you think we do need it, maybe it's time to speak up and let them know how *much* we need it.

As Dorothy discovered in the Emerald City, the power to get that which she most desired was right there within her all along.

☆☆☆

**It's contest time** once again, and this time the stakes go higher than a mug (even a coveted mug). Ted Schober and Bruce Schiller of **Radiotechniques**, a consulting firm in New Jersey think what this industry needs is a name for a certain type of FM reception problem.

The problem they refer to is the degrading of coverage and worsening of multipath propagation effects in FM caused by the introduction of **AM incidental modulation** in the FM transmitter.

Note that this differs from AM noise in the form of hum. This stuff (whatever we're going to call it) makes the area and severity of **multipath fades** greater.

Now a lot of engineers have been calling this problem "multipath" in the vernacular. But a **dispute arose** over this term at a panel at the NAB show. Some consultants don't want to confuse this with **true multipath**.

So how 'bout it? What should we call it? Radiotechniques has offered to supply a **Hewlett Packard HP-11C calculator** to the person who comes up with the best name, and we'll kick in an **RW** mug.

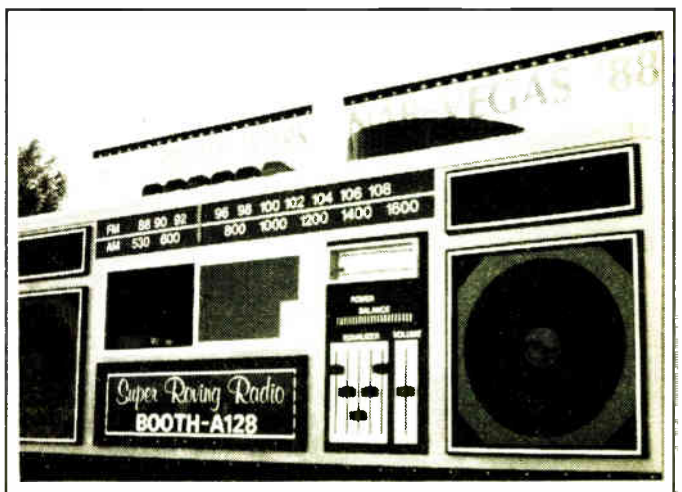
I'll be putting together a distinguished **panel of experts** in the field to judge entries. Send your suggestion to the address at the end of this column.

By the way, as the kick-off entry I'm submitting the phrase **Amplipath** coined by Joel Bump of Radio Design Labs in a recent **RW** article. Let's call it his entry.

☆☆☆

Those **giant boom boxes** you see at every show may be nifty for remotes, but they caused a few headaches in the outdoor exhibit area at the NAB convention.

Other nearby exhibitors complained about the **loudness of the music** blaring from them. Kind of hard to talk to a potential customer above the wailing of groups like **Motorhead** (the band that has billed their music as "so loud it will make your lawn die"). Let's see where the boxes end up next time.



Too much boom in the boxes?

Now **Hazeltine** (or is that Kahn?) has a **splatter monitor** design of its own. Copycode, splatter monitor, what's next?

Couple of kudos in order for a few well-known names.

First double congrats to NAB Science & Technology VP **Michael Rau**. CEO Eddie Fritts announced that they would be taking the word "acting" out of his department head title since he's proved himself a capable manager in the past five months.

Congrats also on the **law degree**, Mike. Guess all those footnotes finally paid off, huh?

And kudos to **Harrison Klein** of Hammett & Edison, whose studies on AM technical issues have proved of critical importance in AM improvement. Harrison has been elected to Hammett & Edison's **board of directors**.

H & E simultaneously announced that Harrison will be taking a two-year **leave of absence** from the firm to attend **Stanford University's** graduate business school but that he will continue to provide perspective on the technical needs of the industry. Well they don't use footnotes in business, Harrison, so I guess you're safe on that score.

And a warm welcome aboard to **RW**'s newest news reporter Charles, or as he prefers, **Chuck Taylor**.

Chuck has had a nose for news since high school; he's been at it professionally for the past seven years. He served his time in radio, too, as a DJ for **WWOD-AM** in Lynchburg VA.

Any engineers checked with their **astrologers** lately on what the future holds for radio? I figure if it's good enough for Ron and Nancy it's good enough for us.

*Heard something interesting? Spill your guts to* **Earwaves**. *Write PO Box 1214, Falls Church VA 22041, or call me at 703-998-7600. Best tidbit of the month wins a coveted* **Radio World** mug.

# OPINION

## Readers' Forum

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

**Giving Omega its due**

Dear **RW:**

The 1 May publication of **Radio World** contains an article commencing under the byline of David Hughes. This article has reference to turn-key firms and their work on behalf of various broadcast entities around the country.

In that article Mr. Dennis Ciapura, VP Technical Operations with Noble Broadcasting, is quoted concerning work done for XETRA AM/FM in Tijuana.

Mr. Ciapura states that Allied's new systems division carried out two specific projects for XETRA.

This is in fact not true. Work was carried out by Omega International Inc. utilizing Allied equipment.

Omega International, a relatively new, but growing organization, has been building its reputation for top flight turn-key work, and misinformation such as that contained in the article does not give Omega International the credit it deserves.

I am writing to request that you correct the erroneous information through a published clarification. I look forward to your understanding response.

Ray Peirce, President,
Omega International
Irvine CA

*Editor's response: Failure to mention Omega International's part in the work discussed was a regrettable oversight and we apologize for the error and any misunderstanding it may have caused.*

**GMs not all fat cats**

Dear **RW:**

I read with some disgust the letters/articles on the so called "fat-cat" owners who drive Cadillacs and eat dinner at the club while worrying about the cost of an engineer.

I'm certain that is the case many times; but I know personally there are a lot of engineers who drive better cars, live in a better house and eat in a nicer place than the owner.

I also know of many owners who are unable to pay themselves, or don't go on vacations and work longer hours than engineers in an effort to pay the staff, including the engineer.

I have found too many engineers who believe the radio station owner has all the bucks for all the whistles he wants ... and then criticize those who don't.

T. S. Storck, President
Grand Forks, ND

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**Editor:** Judith Gross
**Buyers Guide:** Marlene P. Lane
**News Dept.:** Alan Carter, Mgr.
Charles Taylor
**Production Editor** Alex Zavistovich
**Circulation Mgr.:** Marion Alsup
**Advertising Coord.:** Simone Leeser
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Jeanne Pearson

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## Last Call On NOI

The second—and final—deadline for comments on the FFC's Notice of Inquiry into AM allocations is approaching.

Comments on the first part of docket 87-267 were filed earlier this year but the deadline on this second round was extended to accomodate two important studies commissioned by the NAB.

The first study, by Harrison Klein of Hammet & Edison, tackled issues of man-made and atmospheric noise, minimum usable field strength, adjacent channel protection and RSS calculation methods for nighttime service.

The report may be a shock to many because it confirms the industry's worst fears that the FCC's current allocation policies for AM are outdated and that stations' interference-free coverage areas are in some cases much smaller than previously thought.

A second report, on how much interference AM listeners will tolerate, is also about to be released. It, too, is a long overdue gathering of critical factors that will help the Commission improve AM service.

The fact that the two reports were completed so close to the June 17 comment deadline is unfortunate. Many who wish to file comments on this docket have been waiting to digest the results of each study before filing.

With so little time remaining, it might be appropriate to ask the FCC for another deadline extension. While this second delay would be awkward, these issues are too important to be given short-shrift.

If more time is needed major industry players, such as the NAB, should band together and act quickly to persuade the FCC to grant an extension.

But whenever the final deadline on docket 87-267 arrives, all those concerned about AM's technical survival should take the opportunity to make a strong case for much-needed changes in allocation policies.

The future of existing AM stations as well as the expanded AM band depend on bringing all these issues to light now. There probably won't be a second chance.

—RW

# The Pitfalls of FM Translators

by Ben Downs

**Nacogdoches** TX ... In its 1 May editorial, **Radio World** editors say the "commission should allow the largest number of stations a community can support."

On the face of it, that assertion is a perfectly reasonable viewpoint. Indeed, it is a part of the American capitalist system. But the fact remains, a radio station doesn't just happen.

Almost every month, **RW** has an article or letter from an engineer noticing the corners being cut by management in order to save money. And every month there is a call to correct this shortsighted attitude.

The addition of five or six new translator stations to any market would ensure the demise of radio as we know it in markets below the top 100. "Bare minimum" radio would become the rule.

I currently am the manager of a small market radio station who worked a number of years on the engineering side of the business.

I still carry a pager on the weekends, and still do a portion of my own troubleshooting. So I feel I'm qualified to speak to engineers about this side of the issue.

Back when there was only one or maybe two stations in a town, the radio station could afford to have a four person news staff, a couple of engineers, and didn't have to worry about a promotion that was done to "just help out."

There would be about two people on the street selling ads, because business was easy to find, and everyone was pretty happy about the way things were going. The station was a big part of the community.

Then, it began to happen. More and more stations were brought into the market, either by class Cs from the metro areas improving their signals, or by a new 80-90 FM drop-in.

The pie got smaller, and something had to give. Newspeople expect to be paid. So do engineers. When the money started getting harder and harder to come by, hiring a new salesperson had a lot more impact on a station's immediate survival than buying a spectrum analyzer, or hiring a weekend engineer.

## Guest Editorial

If income drops, then profit drops. When a station stops showing a profit, the only way to stay in business is to cut expenses. And *that* is what brought about the radio business we live in today.

Sales became much tougher when there were 30 radio salespeople in town, instead of four or five. So management is *forced* to put more money on the sales side. And hope that the average listeners just can't hear the difference (though I know they can). The free remotes for charities had to go, as did the hokey (but service oriented) Jaycee Radio Day.

Most people don't realize that any signal, AM, FM or low power FM will get *some* business. It may only be $5000 or 10,000 monthly, but that leaves a big hole in my monthly budget.

The thought of five new translator stations pulling $25,000 to 30,000 out of my station's revenues each month is truly frightening. Something would have to go. So cuts would have to be made, and radio would take one more step toward becoming an automatic juke-box.

In my market, a translator signed on the air last year. It imports the same music I'm playing (country) and is only three channels away from me. And frankly, my market is served over most of the city limits by 100 watts ERP.

I was forced to drop our local church service because listeners were tuning over to my "competitor." I knew most listeners would prefer I play music for that hour, but a church service seemed to serve the needs of a small segment of our audience that wasn't being served at all. An hour a week seemed fair. But now, I have to cater exclusively toward the largest group. And unfortunately, that group prefers just music.

So to be competitive, out went the service, out goes the hourly network news. We find ourselves serving up a program mix with the fewest number of tune-outs. And we all know what that means.

No, radio isn't afraid of competition. And it will certainly survive. But I urge the **Radio World** editors to understand that radio doesn't come out of thin air. It comes from revenues.

And if there are many new competitors added to each market, that revenue will shrink. And the radio we all knew and enjoyed will take one more step toward becoming the ultimate juke-box.

Public service and quality aren't free. They cost money. And don't ever let anyone tell you differently. Most markets could probably support a few more stations. But what form would they have when the next series of cutbacks was made?

*Ben Downs is GM of KJCS/KEEE and can be reached at 409-564-4444.*

# ALLIED

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# Kahn Files Lawsuit Against GM

*Editor's note: The patent number cited in court documents filed by Leonard Kahn differs from the patent number on file with the US patent office pertaining to this dispute. The correct number is patent 4,018,994.*

**New York NY ...** Leonard Kahn, inventor of the ISB AM stereo system, filed suit 29 April in US District Court for the Southern District of New York against General Motors Corp., accusing the automobile giant of patent infringement on compatible AM stereophonic receivers.

Kahn alleged that GM infringed on two claims of Patent 4,108,994 (sic) that he obtained in 1977, the suit stated. He noted sole rights to patent claims 53 and 54 with respect to single-system AM stereo radio receivers that incorporate Delco part number DM-235 or Motorola part number MC13020P integrated circuits.

While requesting a jury trial, Kahn is seeking "injunction against continued infringement and inducing of infringement," "an accounting of damages," attorney fees, punitive damages and "an assessment of interest and other costs." No court dates have been set.

Kahn declined to comment to **Radio World** about the case.

Leonard Stark, a New York attorney representating Kahn, declined to elaborate on either the suit or the relief sought.

A GM patent spokesperson confirmed notification of the suit and explained that the company would respond through court documents.

At Motorola, which holds a patent on the competiting C-QUAM AM stereo used in GM's Delco radios, a spokesperson said the company has a policy of not issuing statements about its customers.

Kahn alleged in the suit that GM marketed an AM stereo radio receiver using the DM-235, developed jointly with Motorola, in competition with a multisystem car radios.

According to Kahn's suit, the receivers manufactured by GM incorporate a distortion reduction technology covered by the patent.

The suit claimed that Motorola has unsuccessfully sought to eliminate distortion in an AM stereo system without infringing on his patent.

But about six years after Motorola's AM stereo engineers learned of his patent, the court document continued, they adopted the distortion reduction invention by designing the MC13020P integrated circuit and jointly designing with GM the DM-235 integrated circuit, "so as to clearly utilize the invention."

Kahn's suit acknowledged that he has told GM he would not attempt to enforce any claims he might have against it regarding the patent "except those relating to infringement of claims 53 and 54 by defendant's AM stereo receivers which incorporate the DM-235 integrated circuits or a minor variant thereof."

The suit detailed an ongoing history between Kahn, GM, Motorola and Hazeltine Research Inc., to which Kahn granted exclusive license for the patent.

The suit alleged that Hazeltine first tried to assert infringement of the '944 patent, but according to the document, Hazeltine returned the license to Kahn when Motorola threatened to file an antitrust suit if Hazeltine continued to assert the '944 patent against receiver manufacturers using the Motorola chip.

In letters offered as supporting documentation, Kahn then sought royalty rates that at one point were 1.5% of the net selling price of subject receiver or 25 cents, whichever was greater.

The suit also charged GM with "inducing" other infringements by supporting the use of Motorola's MC13020P integrated circuits in trade shows, discussions with "after market" competitive radio receiver manufacturers and direct competitors in the automobile industry.

"This unusual and vigorous support induced other manufacturers such as Chrysler and foreign automobile and receiver manufacturers to manufacture and/or sell radios that similarly infringe claims 53 and 54 of US patent '944," the document stated.

# Stay for Translator Rule

***(continued from page 1)***

or half empty. I think NPR is missing an opportunity by viewing it as half empty," he said. "In order to serve additional audiences throughout the US, for all of us, the satellite or the microwave is a judicious use of funds.

"We're thinking of ourselves here and not thinking of the people we serve," Goodrich added. "It just makes good sense from a financial and a good solid signal standpoint, and yet it does not destroy the continuity of full-power stations being built."

**Consider interference problems**

The motion for stay also argued that the Commission needs to consider potential interference problems likely to arise under increased translator use, especially with alternative signal delivery.

"Complaints will be difficult to resolve if the primary broadcast station is located in a different state or region of the country from the translator," the filing stated.

NPR, NAB, NFCB and MST intend to file petitions for reconsideration requesting that the FCC withdraw the rule change or consider less sweeping revisions of the NCE-FM translator rules, according to the filing.

The organizations also plan to ask the Commission to include the use of NCE-FM translators in its pending comprehensive review of translator policies, covered in MM Docket 88-140, the filing noted. The FCC has not set a comment deadline on Docket 88-140.

The noncommercial FM translator issue is contained in FCC Docket MM 86-112. The deadline for comments is 6 June.

For more information, contact Martin Billips at NPR, 202-822-2458; Jim Goodrich at Moody, 312-329-4302; and Tatsu Kondo at the FCC, 202-632-6302.

# FCC Files

*(continued from page 2)*

and produces other "deleterious" effects within their current primary service contours.

The NAB filed comments supporting power hikes on a case by case basis.

The NJ group said that a previous FCC ruling, to allow Class A's to upgrade to Class B and C status without having to move off their reserved Class A frequencies, could not be put into use by most Class A stations because of interference considerations.

The Docket is RM-6237. Contact Joel Rosenberg at 202-634-6530.

### Cuban Interference

No further formal discussions have taken place in the ongoing effort to "delink" broadcasting issues from other issues, such as immigration, between the US and Cuba.

In November 1987, officials from the two countries held talks in Mexico City to discuss the topic.

The delinking action, FCC officials say, still is only one step in resolving the issues surrounding Cuban AM band interference. They say, however, that they hope future meetings, which could take place this year, may produce some results.

In a related issue, the NAB has expressed fear that a study to create a TV version of the existing Radio Marti service may aggravate the situation. Radio Marti is the VOA produced Spanish language service beamed to Cuba. Congress has earmarked funds for an early 1988 study of the feasibility of TV Marti.

One issue awaiting resolution is Cuba's demands to retaliate for the Radio Marti service with an English language AM service beamed from Cuba to the US.

The FCC contact is Wilson LaFollette at 202-632-5414.

### Ownership Limits

No action had been scheduled as of early May by the FCC on its proposal to relax duopoly and one-to-a-market rules.

In January 1987, the FCC proposed allowing ownership of UHF stations with AM and FM stations in the same market. Ownership of AM stations with either UHF or VHF television stations would also be permitted.

Current rules prohibit cross ownership of radio or TV properties if the service contour of the purchasing facility completely encompasses the community of license of the station to be purchased.

The proposed rule relaxation has been supported by a number of groups.

Recommendations from broadcasters who filed comments with the FCC ranged from case-by-case evaluation of station combinations to lifting restrictions entirely.

Contact Andrew Rhodes at the FCC: 202-632-7792.

### FM Regulations

The FCC closed its comment period on the issue of increased use of FM directional antennas in some short-spaced situations. Reply comments will be accepted by the Commission until June 27.

Mixed comments first were filed by broadcasters in August 1987 on the FCC inquiry, issued earlier that year. It considers the authorization of FM directional antenna systems to reduce the distance separations between an FM station's transmitter site and adjacent and co-channel stations and allotments.

The NAB has commented that the widespread use of directional antennas would increase clutter and interference on the FM band. However, other groups, such as the Association of Federal Communications Consulting Engineers, supported the use of directional antennas on a limited basis.

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

# Westwood One Purchases WYNY

by Charles Taylor

New York NY ... Westwood One, a producer and distributor of nationally sponsored radio programs and the parent company of several broadcasting networks, has acquired its first radio station, WYNY-FM in New York.

The station was purchased for $39 million in cash and other undisclosed considerations from Emmis Broadcasting Corp. in Indianapolis.

Emmis, which already owns seven radio stations in various markets nationwide, bought WYNY in March along with four other radio stations from NBC. But because of the FCC's one-to-a-market ruling, the company had to sell either WYNY or WQHT-FM in New York.

Westwood One will retain WYNY's call letters and its country format, but will swap its dial location with Emmis' highly successful CHR/urban contemporary formatted WQHT, moving WYNY to 103.5 and WQHT to 97.1 on the FM dial.

The move will give WQHT a better transmitter site/on New York City's World Trade Center, where several other FMs and TV stations are located. It will also move the station into a more competitive place on the dial, between two stations with similar music formats.

Still uncertain is what Emmis intends to do with its two New York AM stations, WFAN and WNBC, acquired in the purchase from NBC. There has been speculation that a similar "dial-swap" might take place between the two.

The acquisition gives Westwood One a potent initiation into station ownership, according to company Chairman and CEO Norman Pattiz. "This is the ground floor of a major opportunity for Westwood One," he said. "I'm extremely pleased that our first radio acquisition is in New York. It's clear that there is a major place for country radio in the nation's number one market."

Westwood One previously bought the NBC Radio Networks and is the parent company of the Mutual Broadcasting System as well as its own radio network.

For information from Westwood One, contact Cathy Lehrfeld at 212-237-2545.

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Circle Reader Service 36 on Page 22

# Splatter Monitor Demonstrated

*(continued from page 1)*
block the splatter monitor was designed to overcome.

**How it works**

Tom Wright, Delta's senior design and project engineer on the splatter monitor, and John Bisset, the company's broadcast product sales manager, demonstrated the device at the RAC meeting in mid-May.

The splatter monitor measures the level of splatter or any other spurious emissions between 11 kHz and 100 kHz away from both sides of the carrier.

According to Delta, the splatter monitor uses high performance in-phase and quadrature synchronous detectors. The output of each synchronous detector is available on the rear panel. This provides an advantage over the spectrum analyzer in that both in-phase and quadrature components can be viewed independently.

A measure of the overall splatter level requires a combination of the in-phase splatter and the quadrature splatter. A low frequency chopper circuit performs this function.

A detector switch is used to select the in-phase detector, the quadrature detector, the chopped combination of these two detectors or an external audio input depending upon measurement needs.

According to Bisset, the splatter monitor is priced at $2,150, which is low compared to the $20,000 to 40,000 cost of a spectrum analyzer.

The splatter monitor does the job of the spectrum analyzer but has "specific features necessary for an AM broadcaster," he said.

Even if AM broadcasters use a 10 kHz low pass filter to adopt the NRSC standard, they still need to measure their transmissions, Bisset said. Engineers may be given the misconception that by simply installing the NRSC filter, their splatter problems are over. By and large this may be true, however, misadjustment of processing, or worse yet, use of internal transmitter clipper circuits *beyond* the NRSC filter can create splatter which not only interferes with other stations but wastes transmitter power on useless sidebands as well as creating intermodulation components that add back into the audio passband further degrading the signal.

The splatter monitor also permits measurement of either the "I" (in-phase) or the "Q" (quadrature) modulation components. This gives AM monaural stations the ability to reduce transmitter-induced incidental phase modulation (IPM) by making adjustments to the transmitter neutralization and tuning while viewing the IPM levels on the splatter monitor.

With the ability to switch between the "I" and "Q" modes, engineers can determine whether any objectional splatter is being caused by improperly adjusted audio processing ("I"mode) or misadjusted neutralization of the transmitter ("Q") mode.

Another feature that Bisset stressed is an alarm that may be set to detect changes in splatter level. Stations can use this alarm through a remote control system.

Features such as the alarm attest to the unit's ease of interpretation, according to Bisset. "We're talking about reading a number off of a meter or watching for an alarm. You don't have to have a lot of technical expertise."

***use of internal transmitter clipper circuits beyond the NRSC filter can create splatter . . .***

In the 3 kHz switch position, the splatter monitor responds like a typical narrowband radio, while in the NRSC position a wideband receiver is modeled with NRSC deemphasis.

Bisset also discussed the unit's portability. Because it weighs only about 20 pounds, engineers can transport the monitor with ease. It will operate from a 12 V cigarette lighter, he said.

A final feature Bisset noted is a speaker and front panel headphone jack and volume control. "You actually listen to what you are reading off the meter," he said.

For information on the splatter monitor, contact John Bisset at Delta Electronics, 703-354-3350.

# SBE Convention Grows Larger

by Alex Zavistovich

**Indianapolis IN** ... Preparations for the 1988 Society of Broadcast Engineers (SBE) national convention are "more or less complete," with engineering sessions planned and the exhibit area filling up.

At a board meeting held during the NAB convention in Las Vegas, the SBE approved a convention progress report. No changes were suggested during the meeting, according to SBE Executive Director Andy Butler.

The event, to be held 22-25 September at Denver's Currigan Exhibit Hall, follows on the heels of the NAB's Radio '88 show in Washington DC. That show ends 19 September, only a week before the event.

However, in an effort to encourage exhibitors to travel from one show to the other, the SBE has made shipping of exhibits and equipment easier.

The SBE's Butler commented that American Airlines has arranged through the SBE show management firm, Eddie Barker and Associates, for a designated cargo plan for exhibitors who intend to move their displays right from the nation's capital to Denver.

Exhibitors breaking down on 19 September would have their displays transferred together in a single shipment, Butler explained. The plan would cost exhibitors 25% less for shipping than if they used nondesignated priority air.

Booths for the trade show will nearly double in number from last year—up to nearly 400 from last year's roughly 240, according to Butler.

At press time, companies confirmed for this year's show included Ampex, Sony, Harris, Broadcast Electronics, Allied Broadcasting, Fidelipac, Orban Associates and Tektronix. Also confirmed are Auditronics, Delta Electronics, Texar and TFT, among others.

Some regional distributors—such as VMI in St. Louis—will not participate in the trade show, Butler acknowledged. However, he pointed out that those companies would not be exhibiting in their region, and represented only 5%-7% of the floor space.

This year's show floor has been rearranged for better traffic flow, Butler noted, pointing out that floor space will nearly triple, using more "island-type" display booths and a lounge area on the floor.

For the video side of the trade show, the SBE has benefited from the absorption of the Rocky Mountain Film and Video Expo, a regional Denver show. This year, that show's exhibitors will also occupy space on the SBE show floor.

Engineering sessions this year will see greater involvement from the FCC and the NAB, Butler said. He noted that the opening session on the afternoon of 22 September will be hosted by NAB VP of Science and Technology Michael Rau.

Rau will bring attendees up to date on the NAB's work in radio broadcast-related activities, as well as action by the National Radio Systems Committee, an industry group formed in cooperation with the Electronic Industries Association.

The FCC will be represented as well. On 25 September, Mass Media Bureau Chief Alex Felker will moderate the FCC forum, which will also feature other notable members of the Commission staff.

Earlier that day at the Hyatt Regency Hotel, Felker will be the featured speaker of the SBE's annual engineering luncheon, Butler added.

As in years past, the SBE has had assistance in organizing the engineering conference from *Broadcast Engineering* magazine, primarily under the hand of consultant John Battison. This year, however, the evening sessions have been coordinated by Don Borchert, who organizes the Broadcast Engineering and Management Seminar each year in Madison, WI.

Butler acknowledged that the hottest issues this year are in the TV realm—high definition television and digital tape format wars are heating up video broadcasting. However, the radio industry will be focusing on FCC relaxation of FM allocation policies, such as directionalization and protection limits.

Sessions of particular interest to radio engineers will include a "night owl" evening panel discussion on audio processing. Orban, Texar, Aphex and CRL are among the companies represented on the panel.

On 23 September, a session will be held on narrowband remote pickup, Butler said. Another night owl session that evening will address career management for engineers, featuring career placement specialist Harry Martin of Reddy, Begley and Martin.

Other sessions of interest will include visualizing antenna fields and an update on the FCC's FM licensing policies, each taking place on 24 September. Digital AM technology, FM synchronous repeater systems and contract radio engineering will all be examined during 24 September sessions.

Butler said those organizing the workshops and sessions are still looking for input from engineers as to topics they'd like to see covered. He urged those with ideas to contact the SBE.

Registration fees for the convention will be $90 for an all-inclusive package. Attendees can sign up for seminars only for $50, and a copy of the proceedings and admission to the engineering luncheon are each $20, Butler said.

He noted that fees are constructed to allow engineers on tight budgets to be able to participate.

For additional information, contact Andy Butler at 718-706-7690.

# NAB Considers A Longer Show

**Washington DC** ... The NAB and it Exhibitor Advisory Committee are surveying attendees and exhibitors on the possibility of a longer spring convention.

This year's show had nearly four full days of exhibits, with the exhibit halls closing an hour earlier on the final day. In addition, the engineering conference began one day prior to the start of the show.

Many exhibitors reported good booth traffic right up to the last minute, and the possibility of an additional half-day is one idea being considered for future NAB shows.

The NAB Exhibitor Advisory Committee met here in late April to assess areas of the 1988 convention including housing, security and exhibitor guest registration as it plans for next year.

Committee members agreed that many of the old problems such as low traffic at the Hilton and outdoor exhibits experienced in 1985, the last time the show was in Las Vegas, were "very well taken care of," according to Exhibits Director Rick Dobson.

Because of the improvements, there are few areas of contention and few problems to be addressed, according to Irwin Ungerleider of Sony, who chairs the advisory committee.

"We've been for the first time in a long time pretty much in agreement with the NAB," Ungerleider said. "The proof of it is in the fact that there are very little problem areas with NAB exhibitors."

Ungerleider said when problems and concerns do arise, Dobson gives exhibitors a chance to express their views and be heard.

***Many exhibitors reported good booth traffic right up to the last minute, and the possibility of an additional half-day is one idea being considered . . .***

Some minor problems surfaced with overbooked hotels, with express courier service and with long waits in the guest registration area.

Looking toward the return to Vegas in 1989, Dobson noted that exhibitors want to reserve blocks of hotel rooms without having to submit names initially. "This made a lot of sense to us, so it's something that we are going to be looking into," he said.

Exhibitors also want to be able to reserve hotel rooms at the time they reserve booth space.

With guest registrations, some exhibitors reported extremely long lines with the wait as long as 2½ hours at one point.

Dobson attributed the delay to an unexpected number of guest registrants, which he estimated at 20,000. That far exceeded the projected 15,000.

Dobson promised the situation will be resolved for 1989. "It's an easy fix. I have no intention of eliminating those lines," he said. "What I intend to do is speed them up. Our guests will not find that kind of inconvenience next year."

In another area, the committee discussed security although Dobson said there were no "security" problems. "The areas of concern were just in terms of the overall number of personnel and being able to make the exhibitors feel very secure in that nothing is going to easily walk away from the floor," he said.

The committee wants "to continue to evaluate security to ensure that it's at the optimum level," Dobson said.

One related problem centered on the fact that some non-exhibitors were able to enter the exhibit area the day before the show opened, when sessions were in progress.

Ungerleider said that exhibitors would prefer to complete booth construction before facing visitors.

"Those trying to get in the show before it opens make it difficult on the exhibitor, who may not have time to talk, is in the middle of construction chores, etc. But we realize we're dealing with human beings," Ungerleider said, adding that the situation was improved from the previous year.

***(continued on next page)***

# AM Antenna Site Lease Drafted

**Washington DC ...** The NAB's antiskywave antenna project has nearly cleared its last remaining hurdles with the anticipated signing of a lease for the test site by the end of May.

NAB Science & Technology VP Michael Rau confirmed that the lease was ready on property owned by Howard University that will be used first to construct an antiskywave antenna designed by consultant Ogden Prestholdt.

"We are looking over the final draft of the lease and will be sending it off to Howard," he said. "The next major step will be the filing of our building permit application."

A topographical survey of the site in Beltsville, MD, north of here, is complete, Rau said. That, along with the lease, is among the documents to be attached to the building permit application which will be submitted to Prince George's County, MD.

An FCC application is being prepared, Rau added, and should be filed "soon." The FAA application already has been filed.

"We're moving along; there's probably work on four or five fronts going on," Rau said.

The NAB project will test antenna designs intended to limit skywave while increasing groundwave propagation of AM transmissions.

Two designs are involved in the test—the two-element array design by Prestholdt, and a monopole-ring radiator design by Richard Biby, of Communications Engineering Services in Arlington, VA.

The Beltsville location will be timeshared between the two antennas in the AM project, with the Prestholdt antenna to be constructed first.

Rau said the building permit application would be filed in June, and then it will be up to county officials to take action on the application. Depending on how soon the county acts, Rau said the NAB was targeting a late summer/early fall construction start.

For information on the antenna project, contact the NAB at 429-5346.

# Convention

***(continued from previous page)***

On other issues, Dobson said he plans to set up a package delivery tent at the loading dock for private couriers. Exhibitors complained of delays in commercial deliveries, which he attributed to processing required when convention employees distributed the packages inside the convention center. Private couriers cannot make deliveries inside the convention center due to union contracts.

The committee also addressed union disputes on setup procedures but Dobson said the NAB should not be involved. "We advise our exhibitors to never get in an argument with the unions," he said. "Just simply get a floor manager. That's what we pay them for. If it cannot be resolved at that level, I'm generally brought in, and if I need backup, I go to our general contractor."

In the area of exhibit space selection, Dobson acknowledged that some exhibitors may not be pleased with the point system that will be used for the second year in 1989.

"We've got a handful of exhibitors who I'm sure feel they are victims of fairness," he said. "I can't do anything about the fact that in the past, an exhibitor might have gotten space that they were not necessarily entitled to. Regardless of how happy or uphappy any given company is about their space, they do agree that it's all being done fairly."

Ungerleider agreed that the consensus was that the priority point system was working well. He also said the split between radio & audio and video booths was well received.

In addition, Ungerleider emphasized that the NAB's fall Radio Show is also benefitting from the participation of the committee, and that exhibitors with concerns about Radio '88 should talk to committee members.

"We as a voice can bring concerns from radio exhibitors to the attention of the NAB," Ungerleider explained. "That's what we're there for, to represent radio exhibitors as well."

As for the longer show, Ungerleider confirmed that it's being looked at. "In some cases it would be beneficial to some exhibitors, but it becomes a costly venture for the exhibit management people who have to rent the premises for a longer time period and hire security for more hours," Ungerleider said.

The Exhibitor Advisory Committee will be assessing survey results on various aspects of the convention at its next meeting, slated for mid-August.

For information on NAB exhibits, contact the NAB exhibit office at 202-429-5335.

# High Power FM Power

## *Before you purchase a high power FM transmitter, ASK:*

**Q.** ***Which manufacturer has offered leadership in high power FM since 1961?***

**A.** ONLY HARRIS. Since we introduced our first high power FM transmitter in 1961, we've been the *only* constant force in the business. Some companies have come. Others have changed hands. And a few have gone completely.

As the high power FM industry's most solid player, Harris will give you the industry's strongest safety net. You can count on us for top confidence that service and parts will be available *tomorrow* for the product you invest in *today.*

**Q.** ***Which manufacturer combines a continuing record for innovation in FM with a broad range of high power FM transmitters?***

**A.** ONLY HARRIS. From the first solid-state FM exciter to our revolutionary IPA, functional innovation is more than a Harris tradition. It's a principle we've applied to an extensive range of compact high power FM transmitters. We have *new* 20, 25, 30 and 35 kilowatt models. And they're available in dual configurations for FM super powers!

At *every* power level you'll get a competitively-priced transmitter engineered for years of top performance, low-cost ownership, and easy operation and maintenance.

**Q.** ***Which manufacturer has provided 24-hour technical service since 1975?***

**A.** ONLY HARRIS. Because we were the first company to understand your need for service on *more* than a 9 to 5, Monday through Friday basis.

*Total* approaches to RF system problems are always available from our specially-trained RF systems service engineers — even if your system went on the air before they were born! Your engineers can get answers to over 90 percent of their technical questions by phone. And the service is free to our customers!

You can also phone us 24-hours-a-day for parts — even for products we no longer manufacture!

If you use our toll free parts priority hotline — 1-800-422-2218 — we'll even pay for the call!

We take our service commitment seriously. Because we know that if you're off the air, everything stops. Except the expenses.

**Q.** ***Which manufacturer offers formal technical training?***

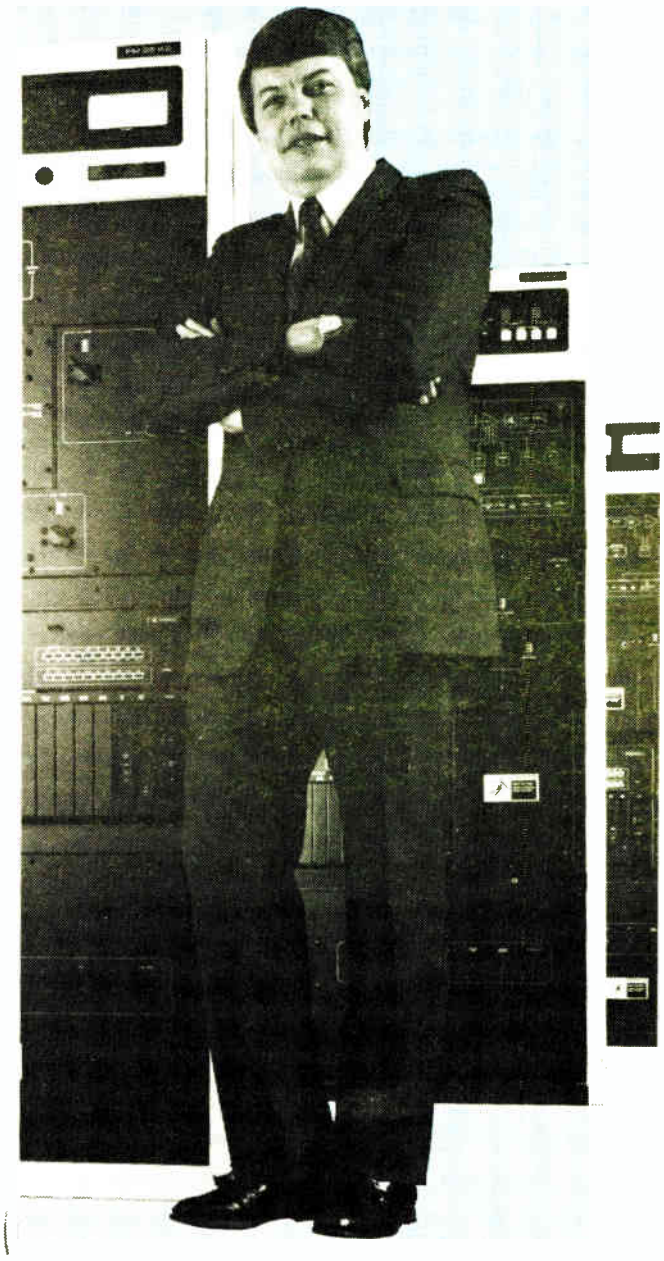
**A.** ONLY HARRIS. We know station engineers retire . . . that new engineers come on board . . . that engineers move from studio to RF systems maintenance. And we know that those who keep your equipment on the air need to be in the know.

That's why we offer more than 50 regularly-scheduled technical training programs every year at the industry's *only* Broadcast Technology Training Center. While some of our courses focus on major Harris products, we also offer comprehensive, general courses on complex RF systems for *all* broadcasters.

**Q.** ***Which manufacturer has more high power FM transmitters on the air nationwide than both the second and third-rated manufacturers combined?***

**A.** ONLY HARRIS.

For complete information about our high power transmitters or to arrange a visit from one of our radio district sales managers, write to me at Harris Broadcast Division, P.O. Box 4290, Quincy, IL 62305-4290, or phone Harris TOLL FREE: 1-800-4-HARRIS, Extension 3012.

Ronald C. Frillman
Manager — Domestic Radio Sales
Harris Corporation, Broadcast Division

HARRIS

# Understanding AM Noise In FM

by Joel Bump

Part II of III

Canyon Lake CA...In the first part of this series, we looked at amplipath, the principal effect of AM noise on an FM station's primary signal. Now let's back up and look at the transmitter site.

In the vernacular of our business, "making AM noise" implies achieving a certain "spec" or level of attenuation.

But what we need to consider first is literally how to make AM noise—that is, how to produce it! (Please note that references to AM noise relate to synchronous AM as discussed in the last issue).

**Making noise**

Making AM noise is really quite simple. All that is required is to amplify or couple FM RF through a circuit with poor bandpass characteristics.

In fact relatively good bandpass off-centered with respect to frequency will do just fine.

All that is really needed is some slope of either set of sideband frequencies, above or below center frequency.

During normal tune-up of transmitters the AM noise level fluctuates wildly, varying with tube loading, circuit "Q" and frequency of tuning.

Figure 1.

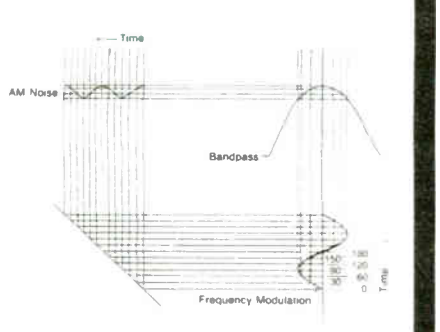
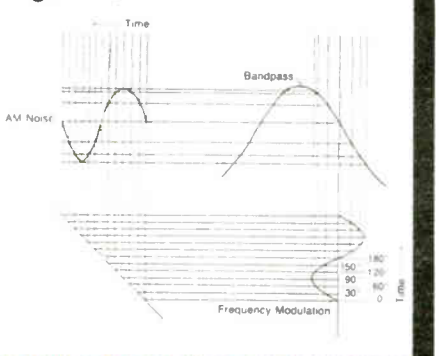



Figure 2.




As the frequency of the carrier shifts with modulation it can be regarded as instantaneously above or below the carrier frequency.

No bandpass is perfectly flat and any attenuation of the carrier at these new frequencies produces a carrier amplitude different from that at the center, or unmodulated, frequency.

**The effect of the bandpass**

The fact that an FM transmission system has a bandpass will necessarily produce AM noise.

The two important considerations are keeping the bandpass centered at carrier frequency and keeping the attenuation of the skirts to a minimum.

Figure 1 shows the production of AM noise in a circuit with equal bandpass skirts and centered tuning. This example covers one complete cycle of sinusoidal frequency modulation.

I have marked off time in 30° increments relative to the applied sine wave.

At the point each of these time increments bisects the sine wave, a vertical line has been drawn to represent the frequency of the carrier at that instant.

These various frequencies are carried upward to the bandpass curve which we are considering.

The intersection of instantaneous frequency and bandpass is then carried to the left side of the chart where a plot of the resulting AM noise is made against time.

Two particular characteristics of the AM noise waveform in Figure 1 need to be understaood.

First, the frequency of the AM noise is twice that of the original modulation: two cycles of AM have been completed for one complete cycle of modulation.

Second, the waveform of the AM is not sinusoidal, as the applied modulation was. The waveform of the AM noise is a function of the circuit bandpass.

If circuit coupling is increased, and the effective bandpass flattened over a wider frequency band before the skirts are encountered, the energy level of the AM noise will decrease.

The peak content of the AM noise may not decrease, however. And the peak content is capable of being equally disastrous in the receiver!

Tuning in transmitter stages is not always perfectly centered. In fact, with complex bandpasses exhibiting unequal skirts, it is frequently offset with regard to frequency.

The effect on the AM noise component is most easily understood using a symmetrical bandpass such as that shown in Figure 2.

The layout of this diagram is the same as that of Figure 1, except the bandpass has been shifted off center frequency.

The important change to note in the resulting AM noise component is that its frequency is the same as the frequency of the applied modulation: one cycle of AM is completed for one cycle of modulation.

In the real world transmitters are made

*(continued on page 19)*

DIGITAL DOMAIN

# Digital Products in Broadcast:

by Skip Pizzi

**Washington** DC ... Remember the "Squeaky Wheel Theory?"

As applied to digital audio, it tells us that for the next decade or so as we make the transition from analog to digital in the broadcast world, the progression of hardware to be replaced will be dictated by the greatest needs at the time.

We've identified storage media and transmission paths as the currently "weakest" links.

Digital audio may also increase capability and efficiency in certain areas, (such as production storage capacity) but so far, applications have chiefly been precipitated by aural fidelity improvements.

Eventually, cost effectiveness will also be an argument, but for now, you generally have to be willing to pay at least a bit more for digital compared to an analog counterpart, so any improvements have to be demonstrably worth it.

And reliability has to be as good or better. The pro-broadcast marketplace is made up of two kinds of customers: pragmatists and diehard skeptics, neither of which are easily convinced. (Not that vendors aren't trying; Pro-DAT and the digital "workstation" were in abundance at NAB '88.)

### The last link

Storage media and to a lesser extent point-to-point transmission paths (STL & RPU) are *today's* implementation areas for digital audio.

Next will be the signal path/routing/production areas, so *tomorrow* we enter the realm of all-digital switchers and the production workstation, which have already begun to proliferate in the hardware (and "vaporware") marketplace.

It's probably obvious that at some point we run into a brick wall, where the limiting factor becomes the product delivery method itself—the broadcast to the listener.

***If radio broadcasters don't want to be left in the dust, it's high time to start work on digital broadcast delivery.***

Is it too soon to begin thinking about how to make that a digital path as well? Apparently not, because several pioneers have already performed substantial work—albeit in relative seclusion—towards that end.

### Existing hardware

The first implementation of digital techniques to broadcast RF was by Harris, with the introduction of the DX-10 in 1987.

This 10 kW AM transmitter uses a 12-bit proprietary encoding process and a "power multiplying digital-to-analog converter" to modulate the carrier, using many small Class D RF amplifiers.

The advantages are better audio quality, (including AM stereo performance), high average modulation capability, and extremely high efficiency. A 25 kW version, the DX-25, was introduced at this year's NAB.

The next step beyond the use of digital techniques to modulate existing analog broadcast processes is the actual broadcast of a digital coding scheme for aural broadcast delivery.

This implies modulating a carrier with a datastream capable of encoding stereo (at least), high fidelity audio in a robust fashion, such that reception quality is improved over today's state-of-the-art without introducing any untenable tradeoffs.

### Direct audio

Keeping the signal in the digital domain from the broadcaster's exciter to the listener's receiver is like plugging your air console into his/her amplifier and speakers. If it works properly, bandwidth limitations, S/N problems, multipath, SCA crosstalk, etc. all become things of the past.

This isn't just blue sky, nor should it be. Remember when the definitive term for high fidelity was "FM-quality audio?"

Have you noticed that the new operative term is "CD-quality audio?" What does this tell you about consumer perception of where radio stands along the hi-fi continuum?

Certainly FMX and hardware like the DX-10 mentioned above will play incremental roles, but as with any system, pushing its limits means reduced cost-efficiency—the last 1% costs as much as the previous 99%—an asymptotic curve.

If radio broadcasters don't want to be left in the dust, it's high time to start work on digital broadcast delivery. The consumer's taste doesn't take long to develop, and what's acceptable today won't be tomorrow.

Also remember the additional time span required in the regulatory domain when a new broadcast system is proposed (the standard unit of measurement here is the geologic epoch), so all the more reason to get cracking.

### Spectrum issues

We already know that digital audio is bandwidth hungry. Storage media has moved to optical or very high-density magnetic technology for this reason.

For example, 16-bit PCM encoding of 20 kHz audio takes about 2.5 MHz of data bandwidth—hardly something you want to even bring up for broadcast use, in these days of spectrum scarcity.

Nevertheless it's in use experimentally in several places right now. WGBH-FM in Boston is digitally simulcasting part

***(continued on next page)***

DIGITAL DOMAIN

# Getting Tomorrow's Audience

*(continued from previous page)*
of its broadcast day on its sister station WGBX, using the Sony "F-I" pseudovideo PCM system.

WGBX is a black-and-white UHF, but since the Sony system outputs monochrome video, that's all you need.

Even so, that's 6 MHz of spectrum for one stereo audio signal; fine for experimentation (and results have been pretty spectacular), but no one expects this to be how we actually do it.

WGUC-FM in Cincinnati and others are using the same system to put their audio on a cable TV system, again for distribution to those few listeners with domestic PCM decoders (and for a nice STL via the cable!).

But cable operators have no excess of channel capacity either (witness the tooth-and-nail over "must-carry" regulation), so this too shall pass.

**Hardware solutions**

Well, PCM is not the only game in town. Variations on the delta-modulation scheme are much more spectrum efficient, and can be of relatively equivalent quality if properly implemented.

One such system, currently out of production, is the dbx CPDM (companded predictive delta modulation), used in their Model 700 pseudovideo system.

Another system that is available at present is Dolby Labs' ADM (adaptive delta modulation) system.

This one was really the first conceived from the start for broadcast delivery use, so spectrum efficiency is a primary design parameter. So is receiver cost, which is essentially a single chip that Dolby licenses like its domestic noise reduction systems.

It was originally designed for use in DBS systems, so it is typically configured as a 6 MHz QPSK (or "QPM"—quadrature phase modulation) modulated block in which up to 16 stereo audio channels can reliably be encoded.

Dolby ADM is currently in use with good results by the Australian Broadcasting Commission in the B-MAC satellite distribution system. Dolby has also proposed an "additional sound carrier" for NTSC using QPSK 350 kHz above the existing sound carrier, for a single stereo audio channel.

Furthermore, Dolby Labs just recently disclosed another, higher-priced-decoder format, proposed for professional use, in which 24 or more channels can be encoded with quality equivalent to 20-bit PCM in a 6 MHz bandwidth.

The so-called "Model 500" system uses multi-band, multi-frequency encoding techniques in a "modified PCM" format, according to Greg Todd of Dolby Labs. Sounds promising.

**A new radio band?**

The Digital Radio Broadcast Corporation of Reston, VA, has proposed an implementation of the Dolby ADM system for US broadcast, in which an addressable, encrypted, 12-stereo channel plus data channel system would be broadcast as an "interstitial" television channel using QPM.

This would involve co-locating on an existing TV station's tower, and broadcasting this QPM signal on the adjacent TV channel, at low power (1 kW ERP H&V for VHF, 2 kW for UHF).

***. . .the TV station would farm out the individual audio channels like an SCA service.***

DBRC further proposes that such a channel be licensed to the TV station whose tower is used, as a modification to its existing license, as a way to bypass regulatory delays on implementation.

Then the TV station would farm out the individual audio channels like an SCA service. Raises a few interesting questions, but some real possibilities, too.

Mobile reception quality of this format is uncertain, but DRBC says a second phase of implementation would utilize some unused bits for "smarting out" multipath problems. Contact John Humphries at DBRC (703-471-7518).

If this isn't incentive enough for broadcasters to get moving, General Instrument has proposed a multichannel digital cable audio hardware system.

And a company called Digital Radio Laboratories in Lomita, CA has proposed a programming service called the Digital Radio Network which would also use cable TV systems to serve audiences with 16 stereo, non-commercial "CD-quality," 24-hour channels plus video graphics, using a $200 home receiver.

Of course none of these have the mobility of an over-the-air system, but a "pay-per-album" service is included in the plan, in which DAT recorders can be programmed to record tapes which can then be played back portably or in the car.

The question is, can broadcasters afford to sit back complacently and wait for all of these upstarts to fail? Isn't it worth exploring how to get a piece of tomorrow's audience today?

This won't be the last you hear of these developments, in this column or elsewhere. Stay tuned. Next time, an overview of more down to earth, "current" technology, as seen at NAB, and tips on its implementation at the station.

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

# EBS Warning: Tornado Alert!

by John "Q" Shepler

Rockford IL ... Tim Mullin peeked through the screen as he punched the doorbell button three times, rapid fire.

"Come on in, I'm down here," a muffled voice yelled from the basement.

Tim cracked a smile as he let himself in. "That Jerome must be building something again."

Through the furnace pipes Tim could see a dark curly head leaning over a cluttered workbench. A cloud of rosin smoke was rising from the soldering iron. Jerome White, Tim's part-time assistant engineer, was nearly finished with his latest creation.

"Is this another weather forecasting project?"

"Yup," answered Jerome, "but just a simple one. It's a thunderstorm detector that measures static in the audio from a transistor radio. Suzy found the circuit in an electronics magazine her school was throwing out."

The younger sister chimed in. "The audio's converted to DC and drives an SCR latch. When the signal's strong enough, it turns on the tone circuit and warns you the storm is coming."

Tim tried not to look too impressed, but he was sure that there were now two mad scientists in the White household. Jerome had already filled the basement workshop and most of his bedroom with digital thermometers, barometers made of strange glass shapes full of colored water, a Heathkit Weather Station and an actual tank of helium.

The tank was intended to inflate surplus weather balloons for carrying small transmitters with instruments aloft. Unfortunately, his little brother had already tapped it out filling helium balloons for his birthday party.

### Field test

"Picked a good day to test it, Jerry," Tim offered, "Why don't you bring it along while we set up the booth?"

Jerome set the sensitivity to about a third and put the lid screws back in place. Suzy quickly glommed onto the detector and the three of them scrambled up the stairs and into Tim's old Torino. Suzy sat scrunched in the back seat with the remote equipment.

The summer air hung particularly heavy that afternoon. The dust they stirred up on the gravel fairgrounds road hung like a fog behind the car.

Suzy's thunderstorm detector remained silent although the AM band was full of static between stations. Tim punched the button for their station just in time to hear the forecast.

"...severe thunderstorms with large hail and damaging winds."

## Q-Tips

They pulled as close to the exhibition building as possible and quickly dragged the equipment from the car. Tim looked up to check the ring antenna strapped to a power pole next to the building.

### Successful dry run

Last year they had found a carney to shinny up the pole for ten bucks. No way would a VHF signal make it back to the station from inside that metal building.

Jerome connected the transmitter to the coax and AC in their booth and ran a quick check. Forward and reverse power readings looked good.

"OK, studio, gimme a quick affirmative if this is working," he called, while straining to hear his receiver through the AC noise and static.

Back at the station, the receiver squelch relay clicked off, closing the AC power contacts to the remote light on the studio tally board. Weekend announcer Buzzy Birdsong clicked the remote pot into cue and mentioned the great signal they were getting for tomorrow morning's remote.

With that, the engineering crew of three signed off and headed out of the dusty fairgrounds. Tim was a little annoyed that the White twosome was taking such delight in the greenish black sky that hung down in lumps. He would be happy to get back to his dry, safe engineering shop, a converted fallout shelter at the back of the transmitter building.

### Out of the blue

Halfway down the road a chunk of hail splatted on the windshield, followed by a rain of what seemed like golf ball sized pellets. Tim hit the brakes and pulled into a farm driveway. "Good thing I didn't spring for that Corvette," he called to the back seat.

Just then, Suzy's storm box started screeching with a 2 kHz tone. Jerome's eyes grew twice their normal size. He jerked the car door open and strained to see over the fields. The hail stopped as abruptly as it started. Except for the detector that Suzy was fumbling to turn off, there was complete silence around them. And then he saw it.

"Funnel cloud!" screamed Jerome.

Tim had lived in "Tornado Alley" all of his life, but never had he been face to face with a twister. He figured it might be five or 10 miles away.

At first the dark, twisting trunk seemed to just hang in one place, a indication that it might be headed right at them. Then he noticed that the funnel was moving slowly to the east, away from the fairgrounds, but right toward the town.

Jerome was swearing about not having a camera. Tim dragged him by the T-shirt, back into the car. "Come on, man, we gotta alert those people."

The Torino spun back into the fairgrounds, whipping from side to side. Tim bolted from the car and into the exhibition building, with Jerome on his heels. He slammed the transmitter button to On without waiting for the fan to wind up. "Get that radio on, Jerome."

### In the nick of time

Tim screamed into the microphone. Buzzy saw the remote tally lamp come back on, but ignored it as he finished his spot set and calmly repeated the afternoon's forecast. When he was well into the bridge of the next song, Buzzy finally clicked the remote pot into cue to the sound of a distorted voice yelling "Tornado!"

Not sure what to make of this, Buzzy potted the song down and announced, "There has been a report of a funnel cloud sighting near the fairgrounds. Please take necessary precautions." With that, he potted the music back up.

Jerome glared at Tim in shock. "He doesn't know the procedure."

Tim backed off from the mic and forced himself to talk slower. "OK, Buzzy, this is for real. Do you understand? For real, an emergency. Kill the music and punch up the EBS tones. Got that? Hit those tones *now*!"

After what seemed to be the longest few seconds of his life, the music abruptly disappeared and the dual warning tones blasted out of the radio. The sound they found so offensive in weekly tests was now music to their ears.

"Good work, Buzzy. Now grab the tornado warning cart from the rack on the back wall and punch it up when the tones end. Then send it live out here. Got it?"

### Emergency action

All over the county, EBS receivers in radio and TV stations came to life. For an additional 15 seconds the combined 853 and 960 Hz tones screeched a vital warning from transmitter racks and newsrooms.

At the airport, one of the most important monitors of all came to life. The chief forecaster, who had not yet seen the funnel cloud, moved close to the receiver.

When the prepared tornado warning message finished, Buzzy dutifully segued to the remote transmitting site. Tim held the microphone tight as Jerome cued him.

"This is Tim Mullin reporting from the fairgrounds. We have sighted, repeat sighted, a funnel cloud touchdown approximately 10 miles west. The tornado is headed for town. There are only a few minutes available, so take shelter immediately."

The NOAA weather station instantly switched to its own warning tones. The hospital, police, schools, factories and many homes received the alert through automatic weather radios that were quiet only a few seconds ago.

Every broadcast station within 50 miles was either simulcasting Tim Mullin's report or running its own alert. From the fairgrounds, Jerome could faintly hear the combined sirens of a dozen fire stations come to life. The alert was out.

Tim's last instructions to Buzzy before signing off were to turn on the filaments of the backup transmitter and warm up the emergency generator. They expected needing both.

### Saving the day

Halfway down the rain soaked gravel road, Suzy popped her head over the back seat. "You guys were great. Sure hope it didn't hit our house."

The drive back to the station was treacherous. Power poles were broken

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# Getting a Handle on AM Noise

*(continued from page 15)*

up of multiple stages coupled by numerous networks. If only two stages are considered there is considerably more going on than these first two figures show.

Presuming the stage prior to our observation point to contain a tube amplifier, there are many factors which affect the bandpass characteristic of the circuit.

**Tube operation**

For starters, sufficient tube loading is needed to produce the optimum bandwidth.

Many engineers have been surprised to discover that virtually every other parameter of the tube operation affects the AM noise level as well.

In most cases the screen control will yield as tight a null as will any other adjustment. Unfortunately, many transmitters provide automatic power control through screen adjustment.

Because the screen is usually quite "touchy" with respect to AM noise, a constant monitor and alarm of excessive AM noise levels is imperative with such transmitters.

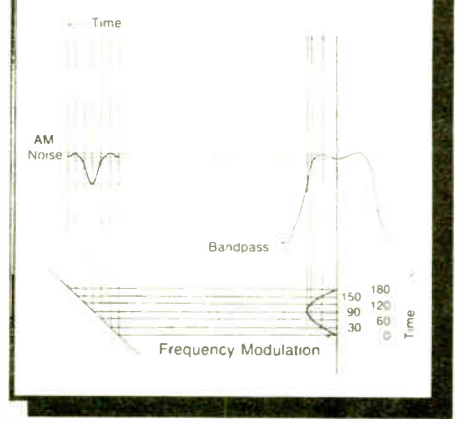
As the modulated FM carrier is coupled from one stage to the next (regardless of whether the prior stage is tube or solid state), the degree of coupling also affects the bandpass characteristic and resulting AM noise amplitude.

In Figure 3 we are looking at a slightly overcoupled circuit. A very interesting development is seen in the waveform of the AM component produced.

Considering the "baseline" as the horizontal line above and below which the noise waveform has been drawn, there are now two complete, though asymmetrical, cycles produced for ½ cycle applied modulation.

This AM noise could be looked at as being four times the frequency of the modulation; however, the degree of overcoupling would be so severe that this is not a noticeable condition in operating transmitters.

Figure 3.




**One or more cycles**

A very important development, however, *is* demonstrated in Figure 3. If the AM noise waveform is continued for a full cycle of modulation, the relationship between the flatness of the bandpass and the tightness of the skirts becomes evident.

Figure 4 is the extension of the noise waveform in Figure 3, carried out for two cycles of applied modulation.

The space between the major noise excursions becomes wider, producing a lower RMS voltage, or energy, while still producing significant peak material.

If the slope of the skirt in Figure 4 was tightened, it can easily be seen that the peak AM noise excursion would become narrower, while still producing the same peak amplitudes. This is the most common specific effect which occurs when multiple stages are connected in a transmitter.

So far only sine wave modulation has been considered. This elucidates the problem clearly, and may be adequate for certain transmitter measurements.

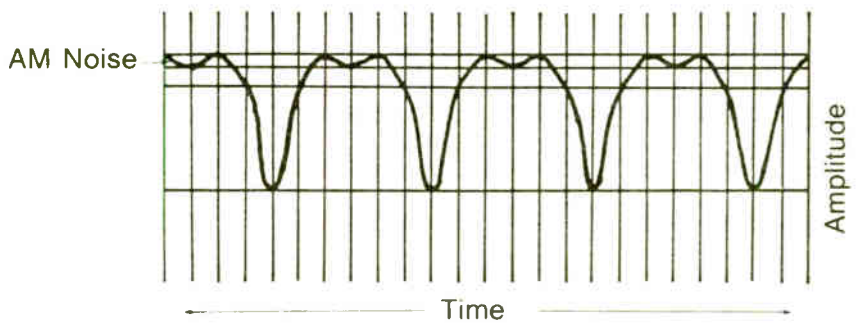
But our demands on tranmitter performance are made under modulation with normal program material.

Program audio consisting of narrower, more jagged waveforms naturally makes AM noise containing even less RMS energy while still producing the same peak amplitudes.

In the next part, we will examine AM noise waveforms produced by actual transmitters. We will also look at the reasons the most common measurement techniques produce erroneous results, often accounting for significant increases in AM noise.

*Joel Bump is a radio engineering consultant and is responsible for the design of Radio Design Lab's ACM-1 AM Noise Monitor. He can be reached at 714-244-3440.*

Figure 4.



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# RF Power Reduction Schemes

by Mark Persons

**Brainerd MN ...** More AM radio stations than ever are using RF reduction devices to cut back transmitter power for pre-sunrise, post-sunset and night operation.

It's true that most transmitters can be modified to run low power. However, specifications like noise, distortion and carrier shift suffer greatly when transmitter RF power output is dropped below one-fifth or one-tenth power.

With RF reduction, however, a transmitter can be run at a level where it works well. Some of the transmitter power is sent to the antenna and the remaining is dissipated as heat.

A typical scenario for RF power reduction involves a station that runs 5000 W during the day. The 5000 W transmitter has internal cutback to 500 W for pre-sunrise operation. The night authority is 50 W.

It is totally impractical to run a 5000 W transmitter at 50 W during the night. The wisest solution is to run the transmitter at 500 W and then employ an RF reduction network to cut power to the antenna to 50 W, burning 450 W power in a dummy load.

Actually the dummy load needs to be large because modulation can add 50% to the carrier power: 450 W × 1.5 = 675 W. A 1000 W dummy with some cooling will work well here.

### A "T" scheme

There are a number of schemes to attain RF power reduction. The most standard is shown in Figure 1.

You will note that the transmitter's output is run into a resistor bank. Then, a "T" network is used as an impedance matcher to transfer the correct amount of RF to the antenna.

The best sounding RF power reduction devices feed a transmission line with its characteristic impedance.

Almost all stations use 50 ohm coaxial lines nowadays. Therefore, ideally the output impedance of the T network should be 50 ohms.

## Field Service +

There are usually enough variables in a T network to accomplish this. The people at Kintronics go a step further and tap the dummy resistor bank at an appropriate point.

This additional variable assures the network output impedance is 50 ohms or any other desired impedance to fit the situation.

A variable inductor from the top of the resistors to ground can be used as a voltage divider instead of the tap.

### Inside the transmitter

Careful planning and adjustment of the circuit keeps the transmitter happy too. Its PA voltage and current should remain the same regardless of whether the RF reduction is switched in or out of the circuit.

Note that a DPDT contactor is used to accomplish the switching.

Logic lines should also be run between the RF reduction box and the transmitter to mute transmitter RF during switching and to lock the transmitter into its low power mode when RF reduction is being used. Otherwise, there could be component failures.

The design of an RF power reduction network is always situation dependent. They are not stocked on the shelf, but are designed, built and tuned to fit each individual situation.

If you order one from Kintronics, they will want to know the input power, output power, input and output impedances, operating frequency, type of transmission line couplings, whether it's 120 or 240 VAC switching power, transmitter logic required, maximum thru-power in the non-reduction mode and mounting configuration.

My experience with Kintronics is that they will build and adjust a network so that it does not need field tuning when I give them accurate answers to the above questions.

Tom King at Kintronics tells me that he recently built a motor driven tuning assembly to remotely adjust power reduction ratios. The variations are almost endless to suit every situation.

Another power reduction scheme uses an adjustable "Y" arrangement as shown in Figure 2. It has fewer adjustments to insure good matching, but is less expensive.

Each leg is adjusted to give the correct power output while keeping transmitter power correct. It's a juggling act.

Once set, the reduction ratio should remain constant unless the antenna impedance changes. Additional power reduction step levels can be achieved by changing taps on the coils involved.

At power levels below 500 W ordinary power relays can be used. I prefer ones that normally carry at least 15 amperes of current as they have more insulation than lower current models, hence less chance for RF breakdown.

In almost all cases the reduction on-off relay should be a contactor such as the Kintronics RFC-40-20-2 to handle the power going through in the non-power reduction mode.

### Checking the sidebands

It is a good idea to check sideband response through the network to make sure it isn't deteriorating station audio.

To do that, modulate the transmitter with a 10 kHz tone at 50% modulation. Run the transmitter to the antenna without power reduction.

Use a Potomac FIM-41 field intensity meter about one mile from the transmitter. Make sure you are in the major lobe if the antenna is directional.

Measure the carrier amplitude and then tune to the lower and then the upper sidebands. Sideband signal strength should be very close to 25% of the carrier in microvolts.

Read another way, sideband should be 12 dB below carrier. If they are more than 10% off, you've got antenna coupling network problems that should be addressed separately. Get ahold of me if you need help in that area. I'll be glad

*(continued on next page)*

Figure 1. Variable Power Reduction Network

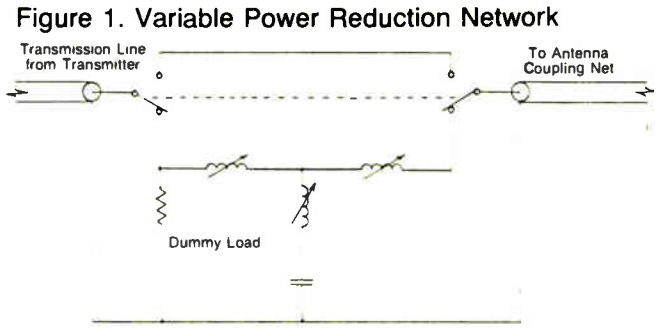
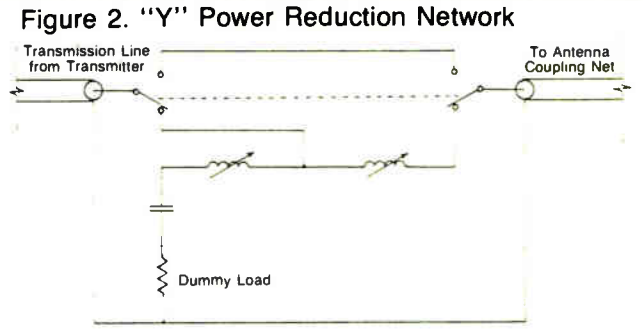



Figure 2. "Y" Power Reduction Network



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# Putting Out the Tornado Alert

*(continued from page 18)*

and their lines strewn across the roads. Pieces of barn siding and tree limbs nearly hid the still lethal power cables.

Tim backed up where necessary and took other roads to avoid getting even close to such imminent danger. Later, he would report the locations to the power company.

The town itself looked as if a trail a few blocks wide had been blazed from the west end to the east. Stunned residents were milling about picking up occasional belongings and empathizing with each other. Police and firefighters were everywhere.

Tim pulled up next to a police car and rolled down the window. "Anybody get hurt?"

"Thankfully, no," came the reply. "Luckily, somebody saw the funnel cloud and called the radio station in time to get the warning out."

The three in the car exchanged glances and moved on. As they got near the station, they could see the tower was still standing and the building appeared unharmed. The only visible damage was an anemometer and wind vane dangling upside down from a buckled support pole.

**Safe and sound**

Tim could hear the emergency generator running as he darted in to check the transmitter. PA current was a little high. He jiggled the tuning and loading knobs for a better match before deciding that the plant was doing its job just fine.

Jerome and Suzy were both pressed up to a phone handset in the production studio. At the other other end, their little brother Joe was babbling 300 words a minute, but otherwise was unaffected by the storm. No damage in that part of town.

Tim reached down and unlocked his desk. From the side drawer he retrieved a two-meter "walkie-talkie" and pocket scanner.

He quickly checked the battery condition and, like a fighter pilot getting ready for a combat mission, he strapped on the communications equipment and slipped into his orange emergency vest. His Red Cross, Amateur Radio, and CB club patches would be taken very seriously today.

It was time to go. Tim motioned through the production window and headed for the parking lot. Jerome cut off his brother, mid-sentence, and gave Suzy's sleeve a tug. "Let's see how much help we can be."

Suzy didn't really need any encouragement. She would gladly work all night just to feel like she had made a difference in this emergency.

With her thumb, she felt for the toggle switch of the storm detector and flicked it from Off/Reset to On. Then, as proud as could be, she strutted out of the room and followed the guys out to the car.

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

# Methods of RF Power Reduction

*(continued from previous page)*

to steer you right.

Assuming the 10 kHz sidebands were near equal and 12 dB below carrier, the next step is to switch the power reduction network inline. Repeat the measurements.

You'll note that carrier and sideband field intensities are lower because the station is running lower power.

However, the 25% (12 dB) carrier to sideband ratio should remain. If not, there is a tuning problem in the power reduction circuit. Pass go, do not collect $200, return to network for further tuning.

*Mark Persons is president of M.W. Persons and Associates engineering consultants. He can be reached at 218-829-1326.*

# A Suggested AM Station Log

by Harold Hallikainen

San Luis Obispo CA... Last month, we took a detour from our review of station logs to look at the wild world of FM translators. This month we'll get back to the station log.

Note that the Commission did *not* eliminate logs. The old maintenance and operating logs were combined into a single "station" log.

Rules relating to the station log are scattered throughout the FCC Rules. In an effort to organize them, I have made a sample station log as shown in Figure 1. We'll discuss this sample log in this article and the next one in the series.

## Insight on Rules

Figure 1 shows a station log, but it's only a suggested log form. It includes the information the FCC requires plus information that helps the designated chief operator (and the FCC) show compliance with the rules and the terms of the station license.

The suggested log form is a "worst case" log for an AM station with a three-tower DA. The logging of the parameters shown is required at least every three hours if the station has a non-approved sampling system.

If the station has an approved sampling system, is non-directional, or is an FM there is no specifically required parameter logging.

Routine parameter logging of sufficient information to demonstrate the station was operating within power limits (generally logging enough information to determine power by both direct and indirect methods) and within DA requirements (if DA) can be used to insure that the station does indeed operate within FCC requirements.

It is possible that I've left out something the FCC requires, so please let me know if you find such an omission. Each area of the log form includes an FCC rule section for your reference, and for our discussion.

**What must be logged**

As required by 73.1800(b), logs are to be legible, dated and the pages numbered. All log entries are to be in local time and the log is to indicate whether advanced or non-advanced time is used.

Section (a) of that rule requires any person making a log entry to sign the log. Since the person making the log entry is generally the transmitter duty operator required by 73.1860(a), having that person log on and off times also allows the log to demonstrate compliance with the transmitter operator requirements: a licensed operator must always be on duty when the station is on the air.

Should the station receive an official notice of violation due to operator inattention or improper operation of the transmitter, having a record of the operator on duty allows the station licensee to comply with the reporting requirements (name and license number of operator) of 1.89(c)(2).

Section 73.1820(a) specifies which transmitter system parameters are to be logged and at what frequency. The sample log shows required parameters for a three-tower directional station without an approved sampling system.

For all other stations (FMs or AMs with approved sampling systems) no parameter logging requirements are given.

Many stations are continuing to follow the "old" operating log rules, logging final amplifier voltage and current, antenna current, common point current or transmission line power indication and antenna monitor indications as appropriate.

Stations that are determining power by the indirect method also generally have the efficiency of each transmitter preprinted on the log so that the transmitter power output can be determined from the log.

Stations that utilize direct power determination will also generally list information to determine the transmitter power output. For FMs, this might include a notation that 100% power indicates the licensed TPO of so many kilowatts.

For AMs, a preprinted notation of the antenna resistance and the authorized power is often made.

**Parameter logging**

Note that for most stations routine parameter logging is not required by the Commission. However, establishing a schedule for parameter logging is helpful in demonstrating compliance with many of the rules.

Rule 73.1820(a) requires that the logging of any required parameters be done prior to making any adjustments to restore the parameters to within the licensed limits.

In the sample log we've used operator initials adjacent to several log entries to show who made the entry. Note that initials by themselves are not sufficient to meet the signature requirements of 73.1800(a).

Rule 73.1745 prohibits operation with modes and powers at times other than those authorized.

Logging the times of carrier on and off, changes to day/night pattern and power demonstrate compliance with this section.

Finally, 17.47(a)(1) requires a daily inspection of the tower lights or the tower light indicator.

Failure or repair of the tower lights must be logged, although completion of a routine inspection need not be. Logging of the daily inspection, however, demonstrates compliance with this section.

The station licensee often expects the Designated Chief Operator, contract operator, or other person responsible for the technical operation to be well aware of the FCC requirements. I hope these "monthly reminders" help.

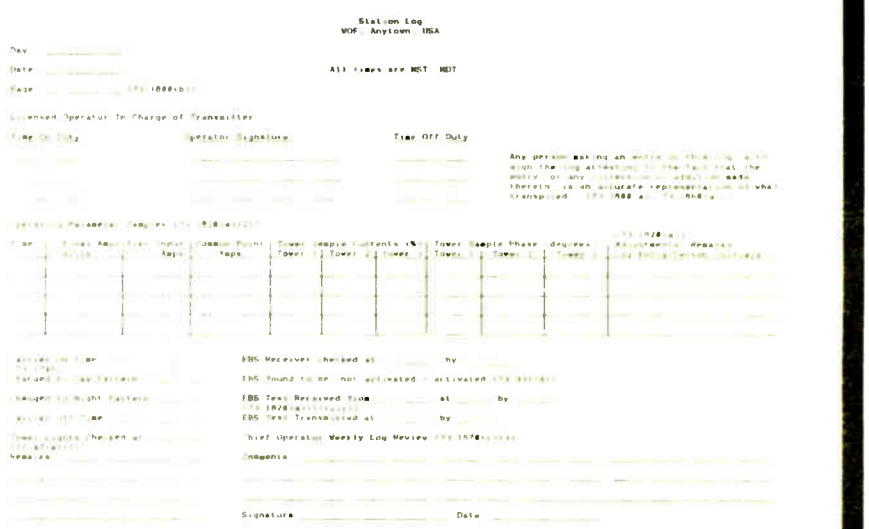
In addition, the FCC Field Operations Bureau has prepared a Broadcast Service Checklist that lists the "most common areas where problems occur and for which the FCC may impose a fine."

Call your local FCC field office and ask for FO Bulletin number 18, or call me for a copy.

Next month, we'll look at the right half of the bottom portion of the sample log (including EBS and chief operator logging requirements). Keep that sample log for reference, and call me with any comments.

*Harold Hallikainen is president of Hallikainen & Friends, a broadcast equipment design, manufacture, sales and installation firm. He can be reached at 805-541-0200.*

Figure 1. Sample station log



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# Relocating For Your New Job

by Tim McCartney

Boise ID ... Moving to another city for a new engineering job is risky business. But sometimes it's necessary and, hopefully, worth the many personal upheavals surely to follow.

I am reminded of the perils of moving as a result of this year's movie release of *Moving* featuring Richard Pryor. The out-of-work lead character finds his only real option to be a good job in what he considers a bad place—Boise, Idaho!!

Terrified about breaking the news to his family, he nervously heaps a mountain of potatoes onto his dinner plate while asking "are these Idaho potatoes? Yum!!"

And the family's reaction, predictably, is "Boise, Idaho? Boise, Idaho? ... "

Well, don't believe this Hollywood bunk. Mr. Pryor never even visited Boise during the 1987 filming and only two brief scenes were even shot here. Likewise, don't buy every perilous story about moving that passes by, either.

I prefer to view relocation in a positive vein, like the U-Haul tongue-in-cheek motto "adventure in moving."

And, it seems that radio people, including engineers, will continue to move in order to work in the field. Not everybody, but many.

In this we're not so different than other professionals who also must make such difficult choices. For example, a successful company VP may soon be seeing corporate headquarters as home. That's how a lot of people end up in Boise, with major firms, and for the most part, they're pleased with their new homes.

So when engineers confront me about problems they are having with GMs or new owners, I am naturally ourious about their views on relocation.

Several Chicago engineers, while complaining about their new owners, felt limited by what they perceived to be a soft radio engineering market in their city of seven million people and 120 radio stations. In a market that size, it really ought to be possible to switch jobs and stay in radio engineering.

But for most of us the decision boils down to switching out of engineering while remaining in the same city or moving. Is that fair? No, but it's realistic.

How, then, can we plan for this possibility if established roots have grown in our current homes?

We could begin to diversify to television engineering, where demand has been growing for years. We might become active in radio contract engineering. We may bone up on digital electronics, eventually orienting towards computer firms, or other local firms using the technology.

The ideas go on, but it might be that your heart just isn't in a switch away from radio engineering. Thus, the option of improving your current situation should be more seriously explored.

Just how long will the current GM/owner (or pizza company) likely be around? If you still have a job after they've axed all the expense line items, the environment might improve.

Over the decades engineers generally have outlasted their bosses. True, it's a tougher game today with so many new ownership interests limited solely to the acquisition of an FCC license instead of a station.

Yet, outlasting them remains possible. In the end pizza might sing louder for these owners than Merle Haggard or Michael Jackson.

Giving considerable thought to this dilemma is perfectly appropriate; it could well serve as effective therapy at low cost. Better yet, try looking at another job.

The weighing of the pros and cons helps focus on what's good about a current situation. Then again, maybe a new view of the same story will help cure the ailment.

Let's not assume that the GM/owner is totally at fault, either. As a former GM, I understand how impossible certain engineers can appear to managers. We all need to work together to minimize any reliance upon blame-casting.

A parody of contemporary radio and TV talk shows by Nora Dunn of *Saturday Night Live* goes something like: "Look at yourself. Will ya look at yourself? When was the last time you took a good look at yourself? Have you looked at yourself lately? ... " Stereotypical as it may be, the obvious message surfaces from the comedy sketch.

So, to move or not to move. Relocation may not necessarily be the answer. It is, however, a response many of us have chosen over the years. And, like the rest of the country, moving is now a fact of life.

By the way, moving to Boise was just great.

---

*Tim McCartney is director of engineering and operations at KBSU, Boise State University. He is an SBE broadcast engineer, a former GM and has a masters degree in human resources development. He can be reached at 208-385-3760.*

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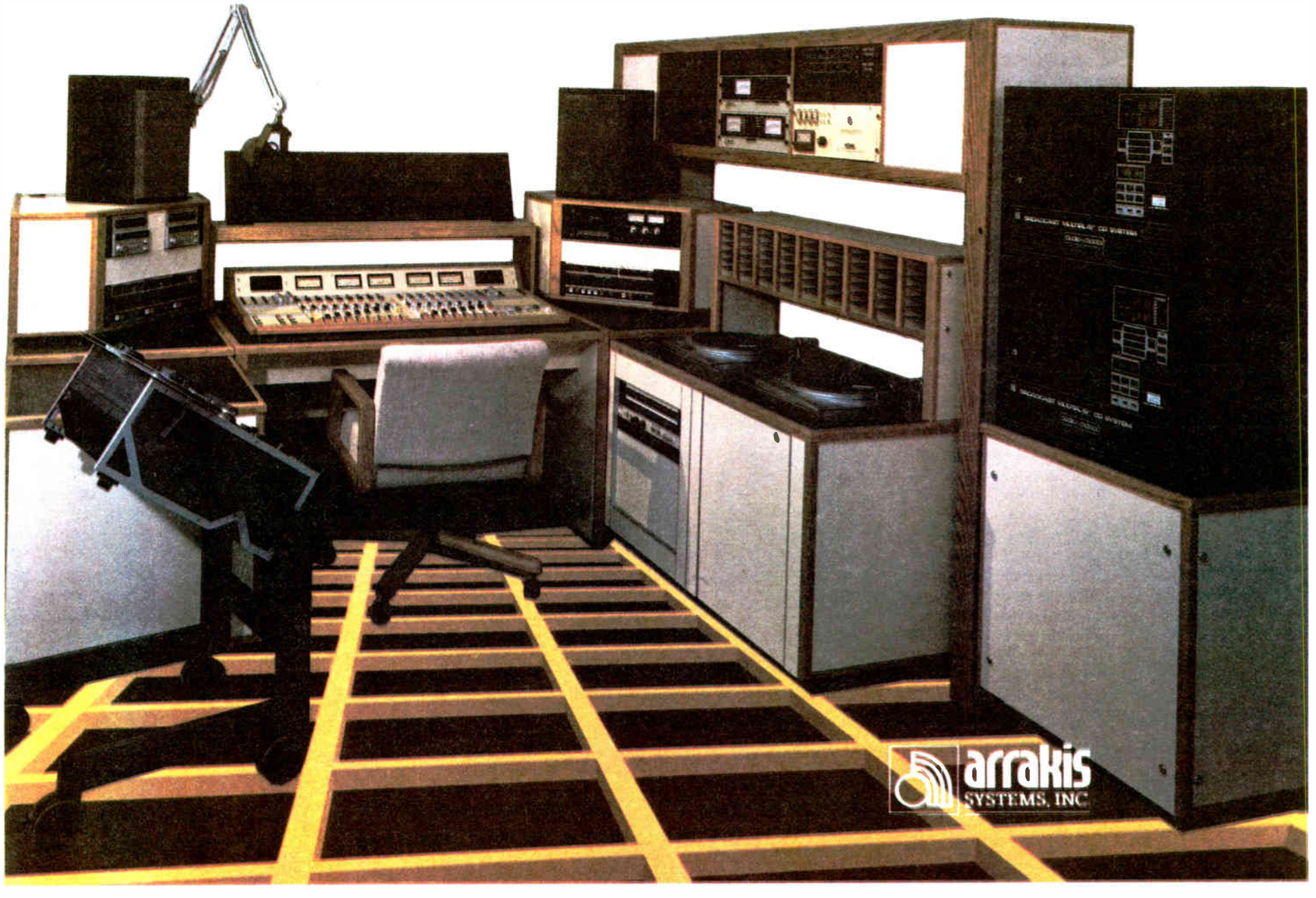

RadioWorld

# Broadcast Equipment Exchange®

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## AMPLIFIERS

### Want to Sell

**PR&E SDA-8,** new rack mnt stereo 2 x 16 audio dist amp w/man (4), BO; Dyma Eng, new rack mnt stereo 2 x 16 audio dist amp w/man, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**RCA BA48A** (3) audio amp, BO; RCA BA44C audio amp, BO. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

**BGW 250D** power amp 250 W stereo, $325. B Mortonsen, KALL, 312 E S Temple, Salt Lake City UT 84111. 801-364-3561.

**UREI 1122 phono preamp,** works & looks brand new, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

### Want to Buy

**Audio amps,** mono or stereo 300 + W, working or not. T Scott, Daley & Assoc, 311 S Gloster, Tupelo MS 38801. 601-841-1506.

**Crown, BGW** for sound reinforcement, 300 W or above. S Wallace, WWSN, 1400 Cincinatti St, Dayton OH 45408. 513-224-1137.

## ANTENNAS & TOWERS

### Want to Sell

**Andrew 1-5/8" & 3-1/8"** coaxial elbows, reducers & bullets, 120' LDF4-50 transmission line 1/2" Heliax (new) & new connectors/splices for same, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Andrew HJ9-50** 200' 5" Heliax xmsn line, new on original reel. G Westerberg, KRXY, 7075 W Hampden Ave, Denver CO 80227. 303-989-1075.

**Gates 5 bay,** HP, 97.7 MHz, $1000. G Kenny, EMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

**ERI 11 bay** center fed 100.3 MHz. T Dewitt, WDIZ, 2699 Lee Rd Ste 470, Winter Park FL 32789. 407-648-1802.

**Rohn SSV** self supporting tower, 85' at base, 2' at top. J Stevens, WLAU, POB 5, Laurel MS. 601-649-1840.

**CP cavity type** broadband panel antenna, multi-system application, omni or directional pattern, 88-108 MHz, high power, excel axial ratios, radomes. A Warmus, 216-659-4440.

**HTPG3500** (3), Philystran guy assemblies, gd cond, BO. E Goetsch, WXPR, 303 W Prospect Rhinedlander WI 54501. 715-362-6000.



**Scala FMO 4 bay** FM antenna, complete system, $1000/BO. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

**RCA 20' rigid section,** 3-1/8 line w/RF load & wattmeter, 50 ohm rated at 10 kW for UHF TV, $750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

**Jampro JA3B** FM antenna, horiz pol, 3 bay gain of 3 dB, w/manual, 90.7 MHz, $300 plus shpg. D Matthews, KASK, 802 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

**Harmonic filter,** 101.1. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

**Gates FMC-10,** 10 bay FM w/de-icers, tuned to 95.4 MHz, w/pole mounting brackets, avail 5/15/88, $5000 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**Utility, Type 480,** 100', guyed tubular tower, 30" face, non-insulated, w/Utility 95' pole, approx 10" diameter for mounting on tower, avail soon, $2500 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**Phelps-Dodge 2 element** FM antenna, medium power, tuned to 88.1 w/matching transformer, $1000. W Kennedy, KPAE, 13028 US Hwy 190, Port Allen LA 70767. 504-627-4578.

**Stainless 180'** AM bdct tower, on ground, $2000; Potomac AM19 analog antenna monitor, inline direct current sampling xfmrs w/cable & remote metering panel, $900; Harris 1 kW antenna tuning box, $200. G Davis, WXIC, POB 227, Waverly OH 45690. 614-947-2166.

**Cablewave 738350** EIA type connector for HCC300-50 cable (2), new. BO. C Springer, KLMR, Box 890, Lamar CO 81052. 719-336-2206.

**Phelps/Dodge** 6 bay, CP w/de-icers, set to 104.3, 1-5/8" connectors. BO. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

### Want to Buy

**Bogner 8 & 16 bay** low-power TV antenna; Scala antennas also. C Kidd, Kidd Comm, 4096 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

**FM, 4-6 bay antenna** w/de-icers, 98.5 MHz. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

**Guyed tower, 500'** & 4 bay FM antenna for 95.3 MHz. J Stitt, WIOK, 7075 Industrial Rd, Florence KY 41042. 606-727-0800.

**Mounting hardware,** (brackets) for RCA BFA-8B FM antenna. B Howard, KOTR, POB 902777, Cambria CA 90809. 805-929-5021.

**Tower beacons,** used 300mm, price depends on cond of glass & casting. J Muehlfelt, Bdct Comm, POB 131, Verona WI 53393. 608-845-6755.

## AUDIO PRODUCTION OTHER

### Want to Sell

**Eventide FL-201** flanger; Moseley SCM-1 subcarrier gen; Rood SC-204 stereo gen; Broadcast Controls 1050 limiter; PR&E Multilimiter FM (2) & MultiMax (2), all BO. J Hicks, KAYI, 7030 S Yale Ste 700, Tulsa OK 74136. 918-492-2020.

**PR&E DT-2** digital up timer, new in rosewood case, also ESE console mount digital up timer & (5) BG Eng BGE-1T digital up timers for retrofit into ITC cart machines. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.



**Dyma Eng** custom circular lazy susan 210 space wood cart rack (2); (2) 212 space wood wall mnt cart racks, BO; Dorrough 40-A loudness meters in cases (3), BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**ABC MRP-1** cue command decoder w/printer cable, $500. N Kling, KMA, Shenandoah IA 51601. 712-246-5270.

**Patch bays,** 52 jacks, 3 card, normalling, 19" A-1 cond, $35 plus shpg. N Carroll, So Bdctg Svcs, 108 Washington Ct, Hendersonville TN 37075.

**Eventide H949** Harmonizer w/the deglitch circuit, mint cond, $1500. B Umberger, WNLT, 51 S Main, Clearwater FL 34625. 813-446-0957.

**Numark DM 1550;** EXR SPI exciters; Alesis XT digital reverb; Eventide H190; Delta-Lab DL4; Loft delay line/flanger; Eventide phaser; UREI 9 band stereo graphic EQ, & much more, write for details & prices. P Costa, Eastern Snd & Video, 462 Merrimack, Methuen MA 01844.

**Orban 111B** reverb; CRL SPP800 stereo preparation processor; DAP 310 audio processors; McMartin B110R stereo gen; McMartin TG2 EBS tone gen; McMartin EBS-2 EBS decoder, all BO. J Hicks, KAYI, 7030 S Yale Ste 700, Tulsa OK 74136. 918-492-2020.

**Eventide BD955** digital delay w/15 kHz bandwidth excel cond, $2000. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

**Teac AN-80** Dolby encoding system, excel cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

**AKG BX20E** mint cond plus spares, BO. K Heyne, 415-664-0163.

**ESE ES 510L** 60 min timer, looks like new & works perfect, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

### Want to Buy

**KLH TNE7000A** transient noise eliminator; Burwin Research DNF1201A dynamic noise filter. J Robinson, WVRQ, Rt 4, Viroqua WI 54665. 608-637-7200.

## AUTOMATION EQUIP

### Want to Sell

**SMC Carousels** (3), w/controllers, MEI programmer & brain, (4) 25 Hz tone sensors, cables, must sell, space needed. S McDaniel, WIOZ, Southern Pines NC. 919-483-9565.

**SMC ESP-1** gd cond, working, $3500/BO. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**IGM 504** 3 chnl, w/manual, BO. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

**ABC Network alert** decoders (2), $200; ABC Talk Radio cue command decoder, $500; 25 Hz automation encoder, unused, $250. J Ashton, WIBX, POB 950, Utica NY 13503. 315-736-9313.

**Gates 250,** gd cond; Gates Stack 55, gd cond; Gates Criterion, gd cond; Gates RA-5, gd cond, all recently taken out of service, BO on each. A Sweat, Clear Logic Comm, 618 Community Dr, Waycross GA 31502. 912-285-5582.

**Music satellite** prog system, SMC MSP1 computer programmer w/DT5 data terminal, CRT screen, text decoder & Xtel printer, (4) SMC 352RSB Carousels & SMC 452 Carousel, ready to go on-air, performs flawlessly. S Carroll, WABK, POB 1280, Gardiner ME 04345. 207-582-3303.

**SMC 250-RS** new stereo Carousel wired for RS; spare SMC modules, parts, heads, BO; many new automatic electric plug-in telco type relays for Schafer 800 automation systems, have silence sense, etc, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**ABC Network cue decoder,** clean, excel cond, manual, $250. D Matthews, KASK, 802 First Natl Tower, Las Cruces NM 88001. 505-524-2103.

**Conex CG-25,** 25 Hz tone gen for automation tapes, almost new, $200. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**Harris System 90,** fair coond, (2) Automated Bdct Control Carousels, $3000. G Faltus, WLVH, Weathersfield CT 06114. 203-549-1175.

**Systemation X3MT16-D** cassette based automation systems, w/9 Nakamichi MR2's, remote terminal & printer logger option, live assist module up to 7 day walk away time, $27,000/BO. C Jones, WXDJ, 3191 Coral Way, Ste 1000, Miami FL 33145. 305-447-9595.

**Instacarts,** (2) late model, black panel, mono, 48 tray, excel cond, currently on-air, you pick up, $5500 ea. D Doelitzsch, WDDD, 1 Bdct Ctr, Marion IL 62959. 618-997-8123.

**Schafer 902-1/2,** (2) complete, working, (2) Schafer Audiofile I, Schafer Audiofile IIA, numerous Revox A77 & ITC I/O cards, remote control, lots of spare parts, complete tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

**Gates FA-S** 25Hz tone filter, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**BE TG-2A** dual tone gen/detector, w/manual, mint cond, $675. G Jones, KLXQ, Box 231, Uvalde TX 78802. 512-278-1102.

**Schafer 902** automation system, RAS/MOS keyboard, 4 EVOXS, 2-48 tray Audiophiles, $14,000. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

**Instacart,** SMC interface converts BCD to 1 of 48, w/150 Hz sensors, 2 yrs old, $600. D Doelitzsch, WDDD, 1 Bdct Ctr, Marion IL 62959. 618-997-8123.

**Gates SP-10-2 audiomation brain,** cannabalized, gd for parts, $200 for all; Tonmeister, TRE-3N tone decoder for NBC Network, excel, $195. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.



### Want to Buy

**Allison Research Gain Brain 700** card. K Smith, Smith Eng, RR 3 Box 483A, Gorham ME 04038. 207-929-6129.

**Encoder 25 Hz.** J Vukelich, 4551 Flag Ave, N Mpls MN. 612-537-1431.

## CAMERAS (VIDEO)

### Want to Sell

**Hitachi FP1010** studio camera w/zoom lens (2), $1000 ea; also rolling tripod for Hitachi FP100, $500 ea. B Lakey, KBJ Cable, 733 N Main, Covington TN 38019. 901-476-8644.

**Sony 1640** single tube, CCU & 50' cable, mint cond. R Weller, Radio Station Bdct Srvs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

**JVC KY1900** 10:1 zoom lens, DC adapter, case, $1395; JVC KY210 10:1 Fujinon lens, DC adapter, case, $2995. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

**Sony 3210** camera. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

**RCA TK44** bdct studio cameras (4), Cook zooms, all cables & manuals, $2500. G Urban, 314 W 52nd St, NY NY 10019. 212-677-2200.

### Want to Buy

**RCA metal tripod TD-11-A;** RCA tripod dolly TD-15-A; RCA Lo Hat MI-26190-1; RCA studio camera dolly TD-5-A; RCA studio camera pedestal TD-1-A; RCA lens turret for TK-11-A camera. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

**Panasonic WV3806B** remote control for 3990 camera & (2) 19A50 camera cables. J Major, Marguette Public Schools, 1203 W Fair, Marguette MI 49855. 906-225-4273.

## CART MACHINES

### Want to Sell

**Tapecaster 700RP,** stereo; 700RP mono; 700P mono, all units gd for parts only, buy all three & get one or two working. J Seaman, WSVA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

**Audi-Cord, Models S-26** R/P stereo, $1,250; Twin stereo play TDS-6 (2), $1095 ea. All unit factory rebuilt, mint cond, 1984 vintage. Kidd Communications, 4096 Bridge St., Ste 4, Fair Oaks CA 95628. 916-961-5433.

**Tapecaster, Spotmaster** machines repaired, bought & sold. Advent Duplication, 9723 Riggs Rd., Adelphi MD 20783. 301-439-7222.



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# RW Broadcast Equipment Exchange

**CART . . . WTB**

**Ampex 351,** mono, $200; Tapecaster 700 RP mono cart machine, w/2 tones, gd cond, $350. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

**PR&E Tomcat** recorder & (3) reproducers, new ITC Series 99A stereo recorder w/ELSA & (2) 99A stereo 3 tone PBs, new; also spare modules, rack mounts & record amp for Harris Criterion 80, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Spotmaster 605B** (2). L Pirallo, WAEL, POB 1370, Mayaguez PR 00709. 809-832-0600.

**BE 5304** stereo triple deck, new heads, new motor, all tones, gd cond, $1500; ITC RP mono, excel cond, $900. B Mountjoy, Custom A/V Srvs, POB 1240, Elizabethton TN 37644. 615-543-4849.

**Tapecaster 700RP,** gd cond, $225; LPB RC6A AM xmtr for carrier current, tube type, $1000; Tapecaster 700P, $150. J Ryan, KSMR, POB 29, St Marys College, Winona MN 55987. 507-457-1613.

**Sparta 800C** R/P unit, gd cond, $375. K Gordon, Remmington Agency, 10622 SW 100th St, Miami FL 33176. 305-271-1671.

**UMC Beaucart II** R/P, like new, $750. P Laffan, Emerald Prods, 757 Congdon St, Middletown CT 06457. 203-346-4080.

**ITC Delta Series** triple deck PB, stereo; ITC Delta Series stereo R/P machine. S Jay, WWUF, POB 1867, Waycross GA 31502. 912-283-2229.

**Fidelipac CTR 124** R/P units, stereo (5); Fidelipac CTR 112 (4) stereo play units. J Lackness, KRIA, 3407 NE Parkway, San Antonio TX 78218. 512-828-3737.

**ITC FM1** phone interface unit (4), $100 ea or all for $300. D Murray, POB 5715, Kingsport TN 37663. 615-239-4745.

**BE 2100P** mono play only w/telephone interface to use as answering machine, seldom used, $500/BO. A Martin, Seque Srvs, HCR1 Box 2860, Merrifield MN 56465. 218-765-3333.

**Harris mono PB** in gd cond (3), $500 ea. G Faltus, WLVH, Weathersfield CT 06114. 203-549-1175.

**Audi-Cord 521 mono,** gd cond. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**Spotmaster 505C** mono decks w/record amp & new spare heads for both (2), $400 ea. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

**ITC Premium & PD2** mono, R/P all tones mint (8). J Phillips, All American Bdct, 414 Washington Ave, Defiance OH 43512. 419-782-6591.

**ITC RP 5933** tape delay R/P w/2 combo head, will consider trade for stereo unit. T Black, KBAS, 2332 Hwy 95, Bullhead City AZ 86442. 602-763-5227.

**Tapecaster X600P** transport deck, new w/X700P motor, $40. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

**Gates Criterion III** mono R/P, $500/BO. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

**Audicord S Series** (2) stereo R/P & (2) S Series dual PB. G Blau, WXTR, 5210 Auth Rd, Marlow Hghts MD 20746. 301-899-3014.

**ITC SP** mono cart PBs (2), w/rack mount adapt; ITC RP mono/delay cart record, w/rack mount adapt, both in gd shape. B Schloss, WMT, 600 Old Marion Rd NE, Cedar Rapids IA 52402. 319-395-0530.



**Spotmaster TIA** winder w/timer, gd cond. $325. R Miller, WIMS, 685 E 1675 No, Michigan City IN 46360. 219-874-9467.

**Ramko elect cart winder** w/timer, vgc, $250. P Talerico, WWAX, POB 750, Olyphant PA 18447. 717-489-0005.

### Want to Buy

**ITC 3D** mono. J Vukelich, 4551 Flag Ave, N Mpls MN. 612-537-1431.

**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.

**Eraser/splice** locator. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

**BE/Spotmaster 1000 or 2000,** any version, any model, any cond. C Keith, Audiolab, Box 313, Keene NH 03431.

**ITC WRA or RA** record amp for cart machine (2). D Wiese, KJCK, POB 789, Junction City KS 66441. 913-765-5525.

**ITC R/P** mono machine in gd cond. J Bean, KSIV, 1750 S Brentwood, St Louis MO 63144. 314-961-1320.

**Mic preamp** for BE 1070 RP mono cart machine. R Armstrong, WVMR, Rte 28, Dunmore WV 24934. 304-799-6004.

**SMC,** any cond, prefer rack mount, buy or trade. B Van Prooyen, 2111 Shangrila Dr SE, Grand Rapids MI 49508. 616-532-1168.

## CASSETTE & REEL-TO-REEL RECORDERS

### Want to Sell

**Ampex 602** mono, $100. B Diffee, WRXO, Roxboro NC 27573. 919-599-0266.

**Ampex 440C** (2) in cabinets, $2800 ea. United Research, 681 Fifth Ave, NYNY 10022. 212-751-4661.



**ITC 770** 2 trk stereo repro w/25 Hz sensor (4), $675 ea plus shpg. B DeFelice, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

**Otari 5050B** R-R (2), vgc, $1300; Ampex 440AG 2 trk stereo (3), gd cond, $1200. G Barnett, KWXY, Bdct Ctr, Palm Springs CA 92262. 619-328-1104.

**Ampex 350-1** rebuilt transport, runs like new, $375. K Gordon, Remmington Agency, 10622 SW 100th St, Miami FL 33176. 305-271-1671.

**Magnecord 1028,** gd cond, works, $275. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**Revox A77 MK IV** 1/2 trk in suitcase, w/amps & spkrs, excel cond, $475. L Price, Sound Bank, 2207 Grundy Rd, Woodbridge VA 22191. 703-558-2764.

**Ampex 300-8** 8 trk 1" vintage tube machine, excel cond, BO; Ampex 351 tube elect (8), excel cond, BO. R Kaufman, Kaufman Recd, POB 462247, Garland TX 75046. 214-271-7625.

**Otari, Ampex & Scully,** many new spare parts, motors, heads & pinch rollers for Otari 5050, Ampex 350/440B & Scully 270/280B; also a used 350 stereo PB only Ampex deck & Ampex bridging input transformers; new PR&E rosewood roll-about tilt-up cabinet for 440B, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**JVC KD 3030,** recently factory overhauled, pause control needs work, $50. C Brescia, WNBZ, Box 211, Saranac Lake NY 12983. 518-891-1544.

**Scully 280** decks (2), two transports, 4 record amps, stereo heads moderatly worn, BO. J Seaman, WSVA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.



**Metrotech 500** audio logger, slow speed, full track, one pass missing power cord, no book. J Seaman, WSVA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

**Ampex ATR700** excel cond, rack mount (2), $1250 ea. H Jerregan, WHRO, 5200 Hampton Blvd, Norfolk VA 23508. 804-489-9476.

**Teac 32-2B** 2 trk, 7.5-15 ips, working cond, rack mount, $300. M Lapidus, WMJR, 7900 Sudley Rd #901, Manassas VA 22110. 703-369-1080.

**Magnecord 1028,** works w/book (2), $275 ea. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**Telex 300** high-speed duplicator w/2 R-R & 3 cassette transports & rack, $700; Nakamichi 1000II prof rack mount cassette deck, 3 head, full metering, EQ, remote control, etc, $300; Ampex ATR700 1/4" 2 trk, gd cond, $500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

**Otari MX5050BII,** 1/2 trk R-R, 100 hrs, BO; Pioneer 2024 1/2 trk & 4 trk, 2 head stacks, remote, factory road case, mint cond, $850. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

**Ampex AG440B** 2 trk, R/P, vgc, $1500. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

**Pioneer RT-909** several in box, w/warranty, $450 ea. R Weller, Radio Station Bdct Srvs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

**Teac A-3440** 4 chnl R-R less than 30 hrs w/remote controller & dbx NR, $1000. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**Telex 6120** R-R duplicating system, master unit w/2 slaves, gd cond. T Cummings, AM Comedy Net, 10 Middle St, Bridgeport CT 06604. 203-384-9443.

**Ampex 601-2** w/2 matching 620 amp/speakers, excel cond, $500/BO; Magnecord M21, excel cond, $300/BO. C Steinbacher, WWPA, POB 262, Williamsport PA 17103. 717-323-7118.

**ITC 750 Series** (4) stereo PB units w/25 Hz detectors, gd cond, $3500 plus shpg. S Smith, WKSB, 1559 W 4th St, Williamsport PA 17701. 717-327-1400.

**Pioneer RT909,** 1/2 trk stereo 92), like new cond, $500 ea/BO. A Martin, Segue Srvs, HCR1 Box 2860, Merrifield MN 56465. 218-765-3333.

**Magnecord 1021** in fair cond (2), $200 ea. G Faltus, WLVH, Weathersfield CT 06114. 203-549-1175.



**Ampex 351** mono w/Inovonics 380 elec, $300 pls shpg. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

**Inovonics 375** stereo w/Ampex 440 transport in Ruslang console, excel cond, $1795; Ampex 440 transports & 351 transports. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**MCI JH-110** stereo in Ruslang console w/auto locator, excel cond, $3500; Ampex AG-440 stereo, excel cond, in console, $1095. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Scully 280,** (2) mono, excel cond, in Ruslang console, $995 or w/o console, $795. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Alpha 21,** 16:1 hi-spd, mono cass dupl, one copy per pass, both sides, auto rewind, vgc, $700/BO; VSC Soundpacer mdl C-4 varispeed, varipitch, speech compression cass rec, AC/DC w/thruput, new cond, $125/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

**Ampex AG-350,** 2 trk, 3 spd reversible Beau motor, Inovonics electr, gd cond, $1000; Ampex 375 vari-speed amp for 300, 350, 440 decks, $75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

**Scully 280,** 2 trk, 7.5 & 3.75 ips, $600/BO; Ampex AG-440, 2 trk w/xtra 1/4 trk play hd, 7.5 & 15 ips, w/Inovonics elect, gd cond, $1000. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

**Ampex AG 600B** (2), one w/case, $300; one w/o, $250, both mono, w/manuals. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**Uher 4000 Report L,** recond, new belts, caps, full alignment w/power supply & service manual, vgc, 30 day delivery, $600 pls shpg; Uher 4000 Report S, recond, new belts, caps, full alignment w/service manual, gd cond, $450 plus shpg. T Vernon, Vernon Assoc, 1001 Dale Pl, Carlisle PA 17013. 717-249-1230.

**3M M64** 4 trk 1/2", gd cond, 7.5 & 15 ips, in roll around console, $850. J McDaniel, Sound Project, 1000 S Young, Kennewick WA 99337. 509-783-3534.



**Scully 280-280B,** 8 trks (2), console 16 in 16 out & Crown amp, mics, TTs, etc, sell or trade for car or truck, $6500. WC Burchett, Bur-K Inc, 842 Bellefonte Princess Rd, Ashland KY 41101. 606-324-8812.

**Wollensak T-1500** 1/2 trk mono R-R (2), BO; Wollensak stereo T-1515-4 R-R, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**Scully 9202** 2 trk, lapped R-R tape heads (32), $1000; Crown-Magnecord-Presto PB heads, all lapped (12), $250, plus large assortment of other heads. S Russell, Russell Music, 60410 Klett Dr, Decatur MI 49045. 616-782-9258.

**Scully 280,** (2) 4 chnl in Ruslang cabinets, 1/2" tape, $1100 ea. M Edwards, Pride Group, POB 2576, Montauk NY 11954. 212-713-5558.

**MCI recorder parts,** for JH-110 A & B: heads, motors, PC boards, pinch rollers, etc. at 1/2 price. Call 818-355-3656 for inventory list.

**Ampex 440,** scrape flutter idlers, perfectly reconditioned, $25 plus your old idler. C Close, 1502 Chappel Ct, Northbrook IL 60062.

**MCI JH16** 2" 16 trk, gd cond, $9500; Tascam 80-8 w/DS8 dbx, new record head, $1700. B McPeek, Mirror Image, 619 S Main St, Gainesville FL 32601. 904-376-8742.

**Ampex MM1000** 16 trk, w/full remote, auto locator, test tape, cables, VSO, like new, $6500. D Vost, 1913 Oaklawn, Cleveland OH 44134. 216-741-1400.

**Otari MX5050B** 2 trk master recorder, 1-1/2 yrs old, very little use, $1800. T Carroll, Linear Acoustic, LPO Box 932 CN 5064, New Brunswick NJ 08903. 201-932-1248.

**Ampex 350** 3 trk console, $800; Ampex 4 trk w/sel-sync, $950; Ampex 2 trk, $750, take all 3 for $2350. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

**Tandberg TCD-320** cassette deck, excel cond, 3 motors, dual capstans, $350. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

**Ampex AG440B** 2 trk in console (2), $1000 ea. T Gaiser, KUZZ, 3223 Sillect, Bakersfield CA 93308. 805-326-1011 X644.



**Ampex ATR-700** FT w/stereo capabilities in excel cond; Am 412-244-7600.

### Want to Buy

**Teac Tascam** or other 1/4", 4 chan, 4 trk recorder, OK if major or minor repairs needed. J Oleary, Oleary Tech Srvs, 1717 Euclid St NW, Washington DC 20009. 202-332-8377.

**Sony TC-800B** recorders, any cond, 1-6 wanted. T Lanik, North Star Audio Video Corp. 203-968-2323.



**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.



**Sony RM16** remote control for TC850 or TC850 or schematic for RM16; Sony H-60-215 2 trk head assy for TC850-4 recorder. R Meyers, Benchmark Comm, 4700 SW 75th Ave, Miami FL 33155. 305-376-1717/305-264-5963.



**Scully LJ-10-M** extended play reproducers as used in the Muzak M24A R-R tape music system. M McKenzie, KALL, 312 E South Temple, Salt Lake City UT 84111. 801-364-3561.

**Ampex AG440,** 351 or other 3 motor deck, R/P. P Hons, Mainline Comm, 100 Poplar St, Portage PA 15946. 814-736-3883.

## CONSOLES

### Want to Sell

**LPB Signature II** stereo, 8 chan, mint cond. $3000. B Mountjoy, Custom A/V Srvs, POB 1240, Elizabethton TN 37644. 615-543-4849.

**Shure M-267,** new, $200. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**Harris Executive** 10 chnl stereo w/AM line amp, $675 plus shpg. B DeFelice, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

**Cetec Series** 10 stereo/quad board, 10 chnls, 26 inputs, w/sliders, EQ, mic preamps & manual, in use, $1800/BO. J Hemingway, WGAJ, Box 212, Deerfield MA 01342. 413-779-9649.

**McMartin B-801** mono, 8 rotary pots, 3 inputs/chan, excel cond w/spare parts, $500 plus shpg. R Gwyn, WLFA, POB 746, Lafayette GA 30728. 404-638-3276.

**Collins 212F,** needs little work or for parts, $200; antique 1938 Collins console complete. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**McCurdy SS8800** 8 chnl (2) w/spares. D Fearn, WKSZ, 1001 Baltimore Pike, Media PA 19063. 215-565-8900.

**Sparta RA4** remote mixer, 4 chan w/cue & tone gen, $80. K Gordon, Remmington Agency, 10622 SW 100th St, Miami FL 33176. 305-271-1671.

**Autogram AC-10** 10 ch stereo, gd cond, $3500/BO. J Hicks, KAYI, 7030 S Yale Ste 700, Tulsa OK 74136. 918-492-2020.

**CCA Futura 6S** 10 input stereo, $200. RJ Shingleton, 2301 Coastal Hwy, Ocean City MD 21842. 301-289-3423.

**Spotmaster 8BME100** & 8BME200 mono consoles. L Pirallo, WAEL, POB 1370, Mayaguez PR 00709. 809-832-0600.

**Sparta A20B** 8 chnl mono, in gd cond, $600. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

**Autogram RTV12** stereo w/clock/timer, new, $7500. Gary, KLSK, 121 Sandoval, Santa Fe NM 87501. 505-983-5876.

**McCurdy SS7500** custom air console, all options. G Savoie, WHDQ, Box 1230, Claremont NH 03743. 603-542-7735.

**Autogram AC-8,** 8 chnl stereo console w/stereo audition chnl, remote controls, mono mixdown chnl, balanced input transformers, timer one-shot, many spare modules, pots, xfmrs, knobs, switches for AC-8, IC-10, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Arrakis 500SL,** 8 chnl stereo, excel cond, $1900/BO; Arrakis 150SL, 6 chnl stereo, excel cond, $1300/BO. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-386-2374.

**Gates Stereo 5,** rotary pot board, working when removed, $650 plus shpg. J Littlejohn, WBTU, 2150 Goshen Rd, Ft Wayne IN 46808. 219-482-9268.

**Spec 16 x 16 x 4** mixing board, w/lots of extras, excel cond, $3750; Audio Technica ATC820 8 x 4 mixing board in flight case, like new, $1250. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Auditronics 110A** 4 trk w/full EQ & custom cabinetry, cart equip rack; (2) Scully 280B 2 trk R-R; 280 4 trk R-R; Ampex ATR100 R-R, all transports have remote & vari-speed, excel cond, $7000 all/part. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

# Broadcast Equipment Exchange

## CONSOLES . . . WTS

**Arrakis 500SC-8S,** 8 pot stereo, new. G Blau, WXTR, 5210 Auth Rd, Marlow Hghts MD 20746. 301-899-3014.

**Optimrix Automation System,** uses SMPTE & floppy disc storage. 40 chnl capacity, no mods to faders required, $10K. R Robinson, 203-269-4465.

**Russco Studio Master 505** 5 chnl mono console in gd cond, $600. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**Shure M267** no scratches, like new, $225/BO. P Wdll, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.



**CCA dual 10 chan,** gd cond, $700; BE 4-150M (2), light service, $500 ea. T Shinn, WKSF, POB 6447, Ashville NC 28806. 704-257-2700.

**Gates Gatesway** & Gates 31 consoles. D Tabor, WLCK, POB 158, Scottsville KY 42164. 502-237-3149.

**Gemini MX4440** disco mixer, 5 chan, stereo, excel cond, $400. B Feinberg, Total Tape Publ Co, 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

### Want to Buy

**Parts for Gates** President console. D Morgan, KCOL, 1612 Laforte Ave, Ft Collins CO 80521. 303-482-5991.

**Remote console,** prefer Sport III or IV & Telex headphones for ballgames. D Cotton, WSCB, 73 Marshall St, E Long Meadow MA 01078. 413-525-8216.

**Gatesway II,** for parts, modules & power transformers. E Zellmer, KROZ, POB 2224, Greeley CO 80632. 303-351-8354.

**Manual for Sparta AS40D** console. M Numerick, WaCO, 1293 Floyd, Jackson MI 49203. 517-784-1510.

## DISCO & SOUND EQUIP

### Want to Sell

**Technics 1100A** direct drive TT w/tonearm & dust cover, variable 2 speed; Stanton 310 preamps (2), new Stanton 881S cartridges & styli, Stanton 681 cartridges & styli & new Discwasher diskit, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.



**Stax SRX III** electrostatic headphones w/SRD-7 supply, mint cond, $175. L Price, Sound Bank, 2207 Grundy Rd, Woodbridge VA 22191. 703-558-2764.

**dbx 60DB900** , $300; dbx 60DB902, $200; dbx 60DB903, $200. P Laffan, Emerald Prods, 757 Congdon, Middletown CT 06457. 203-346-4080.

**Pro gear inc:** JBL 4312 speakers, $325; Howe phase chasers, $800/pr; Crown 700 recorder, $350; Yamaha NS-10M; Crown PL-1 & D-150 power amps, $325 & $250; Nakamichi BX-125 cassette decks; EV-644 shotgun mike, $160. C Keith, Audiolab, Box 313, Keene NH 03431.

**ADC SA-3X Octave RTA,** Radio Shack TV audio tuner. R Robinson, 203-269-4465.

**Martin Audio Varispeed III,** AC capstan motor, low freq osc amp, solid state, excel cond, $350. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Fairchild 644B** EQ modules, (2), BO. P Cibley, Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

**Electro Harmonix** vocoder, $250. R Robinson, TNA. 203-269-4465.

**Klipsch-Heresey speaker,** $375; dbx 10/20 computer EQ analyzer, rack mount, $495. S Hofmann, Theater Arts Dept, Cameron Univ, 2800 W Gore, Lawton OK 73505. 405-581-2428.

**JBL 4406** studio monitors, like new, $200. G Ernst, Bayside Sound, POB 166, Lincoln City OR 97367. 503-996-6020.

**Altec-Lansing 9844A** monitor speaker, BO; Altec- Lansing Valencia 1792, BO; Altec-Lansing 604D, BO. J Phillips, All Am Bdctg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

### Want to Buy

**Time code reader,** inexpensive. P Sibley, Sibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

**JBL 4443,** 4415, 4413 monitors. D Glenn, WBZE, Box 3B Montgomery Ln, Waldorf MD 20601. 813-634-1940.

## LIMITERS

### Want to Sell

**UREI 1176LN,** $400. G Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

**Spotmaster CLA-20-40** compressor/limiters, rack mounted (3), gd cond. J Seaman, WSVA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

**UREI BL40.** L Pirallo, WAEL, POB 1370, Mayaguez PR 00709. 809-832-0600.

**Elcom Bauer WBL 2** composite clipper, $300. B Umberger, WNLT, 51 S Main, Clearwater FL 34625. 813-446-0957.

**Dorrough DAP-310** w/optional high freq boost card, excel cond, $500 plus shpg; CRL complete AM processing system, like new cond, $1000 plus shpg. R Gwyn, WLFA, POB 746, Lafayette GA 30728. 404-638-3276.

**Orban 8000A** audio processor/stereo gen, gd cond, $1450 plus shpg. B DeFelice, 621 Bishop Ave, Bridgeport CT 06610. 203-336-5606.

**PR&E Multimax,** Multilimiter; Dorrough DAP-310's; Dolby 334; Orban 418A & CBS 4110, 4111, 4450A, 410, 411 & Dynamic Presence EQ's; Burwen DNF-1100A & SAE Click & Pop filter. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**UREI 1176LN** limiter in gd cond, $325. S Smith, Chicago Audioworks, 1005 W Webster Ave, Chicago IL 60614. 312-327-5533.

**Orban 424A** stereo gated/comp-limit-deesser, perfect cond, $690; Orban 418A stereo limiter, perfect cond, $600. S Lawson, KAK Prod, 928 Hyland Dr, Santa Rosa CA 95404. 707-528-4055.

**AM limiter module** for Harris MSP-90. D Robinson, WVRQ, Rt 4, Viroqua WI 54665. 608-637-7200.

**CRL APP-400,** gd cond. $250/BO. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**Harris 994-6543-001 AM** Solid Statesman limiter; Harris FM Solid Statesman limiter, Kahn SP 58-1 Symmetra Peak, all in gd cond. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**Kahn Good & Loud** audio processor, $1500/BO. Dr Hollis, Hollis Bdct, POB 7008, Columbus GA 31908. 404-323-8127.

**CRL FM4G** & SPP800's proc system complete & (2) SPP800's. G Blau, WXTR, 5210 Auth Rd, Marlow Hghts MD 20746. 301-899-3014.

**Modulation Sciences CP803,** non rack mount compositie processor, $500. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**CBS Volumax 400,** auto peak controller mono, gd cond. R Roisaland, KEWI, POB 4407, Topeka KS 66604. 913-272-2122.

**Moseley TFL-280,** (2) gd cond, $750/BO both. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-386-2374.

**Texar Prisms,** two digital audio pre-cond for Optimod 8100, gd shape, $600; dbx 140 stereo NR, gd cond, $200. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**Orban 8000A** factory recond, $2000/BO. C Steinbacher, WWPA, POB 262, Williamsport PA 17103. 717-323-7118.



**Audimax 4440A, 4450A automatic limiter,** Volumax 4000A & 4110 auto peak limiters, all in gd working/physical cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

**Modulation Sciences CP803,** w/manual, like new, $750. R Blankenship, WARX, 880 Commenwealth Ave, Hagerstown MD 21740. 301-733-4500.

**EXR exciter,** one chnl is intermittent, $175; UREI 31 band model 531 graphic EQ, $475. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

**UREI 1176LN** limiter & compressor, excel cond, $375. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**UREI LA5,** similar to LA4, w/rack mt, $250/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

**Aphex Compellor,** like new, $800. J Breitner, WRQN, 136 W South Boundary, Perrysburg OH 43551. 419-874-1548.

**Fairchild Conax 600** mono, $200; Gates stalevel M5167 limiter, $175. Mr. Oliver, 304 W 89th, NY NY 10024. 212-874-0274.

**Stereo Volumax** model 411; Ampex 601-2 portable stereo, 1/4" recorder, send sealed bids by 4/15/88. M Starling, KPBS, SDSU, San Diego CA 92182.

**Volumax,** factory rebuilt. TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

### Want to Buy

**UREI LA3A,** need 2 in gd working order. R Kaufman, Kaufman Recd, POB 462247, Garland TX 75046. 214-271-7625.

## MICROPHONES

### Want to Sell

**Schoeps CMT-34** (2), cardioid condenser w/stereo PS & access, mint cond, $750. L Price, Sound Bank, 2207 Grundy Rd, Woodbridge VA 22191. 703-558-2764.

**Neumann tube mics,** U49, U-67, (2) Telef 251, C-12, etc. T Lanik, North Star Audio Video Corp. 203-968-2323.

**Sennheiser MD-421-U,** (2) gd cond, $150 ea. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**Beyer 726** zeppelin windscreen, new, swap for Neumann U87 shock mt. E Obrien, Imperial Sound, RR 31 Box 405, Terrehaute IN 47503. 812-877-2663.

**Edcor PM-5** wireless microphone with ST-3B receiver, $250. G Barnett, KWXY, Broadcast Center, Palm Springs CA 92262. 619-328-1104.

**AKG** (3) C60/CK22/N62E, $300 ea/all for $800. G Hoffman, Akron PA 17501. 717-859-1633.

**AKG The Tube,** mint cond, $975. J Arcotta, Sound Innovations, 3161 Westwood Ct. Boulder CO 80302. 303-444-5035.

**AKG 414,** (2) excel cond, $675 ea. AKG 460CK1, excel cond, $325. J Frankel, 8039 H Casminito De Pizza, San Diego CA 92108. 619-291-9118.

**Shure 545L,** BO; AKG 919E, BO. P Cibley. Cibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

**Shure SM5B,** (2) in gd cond, $500; Shure SM-81, AC power supply, metal boxes, EC, $500; EV-667A, EQable, boomable, studio dynamic, mint, $225. J Newman, Box 7703, Atlanta GA 30357. 404-876-8623.

**Audio-Technica AT813R** studio cardioid condenser mic, phantom powered, new in box, $140. G Jones, KLXQ, Box 231, Uvalde TX 78802. 512-278-1102.

**AKG D19E,** BO; Shure 545L, BO. P Sibley, Sibley Music, 138 E 38th, NY NY 10016. 212-986-2219.

**EV RE-20** w/EV 309 shock mount & both in excel cond, BO. R Ballard, Gospel Upbeat, 2110 N Second, Cabot AR 72023. 501-843-5512.

### Want to Buy

**RCA 88A,** junker for parts, cheap. B Robinson, WTOK, 9th & 23rd, Meridian MS 39301. 601-693-1441.

**RCA studio boom,** length approx 10', mfg by Mole-Richardson, 1940 era; RCA floor & desk mic stands. L Scott Jr, PO Drawer 1729, Bartow FL 33830. 813-533-4654 (PM).

## MISCELLANEOUS

### Want to Sell

**Peter Dahl Co** modulation reactor, 190 henry, 250 mA, new, $75. R DeNert, NEZT, 755 Quincy Ave, Bronx NY 10465. 212-931-6202.

**PR&E, ADC unwired TRS** mono & stereo dbl row patch bays w/cords (5); many mono & TRS patch cords; (2) wired, normalled stereo dbl row patch bays to Xmas trees, also punch blocks. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Bud** 6' equip racks w/back doors (4); Stantron TV rack w/rear rails & back door; (2) Bud 7' telco type racks; many new alum & hammertone grey blank rack panels & rack screws. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Splicefinder LEL SF101B,** factory checked, $75; Jennings MC1-1000 15 kV vacuum; (2) CDE CM-91 .0013 MFD, 25 kV mica 18 amp, 2 CDE CM93 .0012 MFD, 25 kV mica, all new, half price; Rust remote control type 108 for parts. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**Sola 500 VA;** (2) 750 VA & one 100 VA harmonic neutralized regulating transformers; Wilkinson single phase line surge protector in outdoor case; also many extender cards for SMC, ITC, Optimod, McMartin, UREI Mod One console, Criterion 80 cart equip. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413

# Distributor Directory

**The following distributors serving the broadcast industry would be glad to help you with any of your requirements.**



**Can't Find It?** Call 1-800-426-8434 For Immediate Action! **Want To Sell It?**

# RW Broadcast Equipment Exchange

### MISC . . . WTB

**Bird 3127,** gd cond, $100; Sola, great for computers, console & other susceptible equip, $125; Elgin ERC telco coupler, $75. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**Data Book set,** latest 3 vols, Nat'l Semi, Linear IC books & applications manual & seminar text, $60. J Lipski, Ind Eng, POB 1456, Lompoc CA 93438. 805-865-5497.

**Tandy computer,** 48K w/2 disk drives, monitor w/program disks for record/music lib files, free shpg, $275. J Shepard, Globe Prod, POB 20465, Roanoke VA 24018. 703-344-3283.

**IBM System 34** mod E35 mag reader, 128K RAM 128 M hard, 5211 printer, 2 work stations, $2000. J Schioss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.



**Zenith 3 phase** automatic xfer switch 25 kW, $500 K Dick, WVVA, Rt 460 Bypass, Bluefield WV 24701. 304-325-5487

**Sennheiser replcement cords,** pads & elements for HD-414/424 headphones, new replcement MZW-421 windscreens; Luxo & Tensimount mike spring arm, black & tensimount for 421/U; Atlas desk stands; RE-20 shock mount & lowpass inline filters, Atlas floor stands. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Electro Impulse CPTN-3000** (2) 3 kW dummy load, DC to 1 GHz oil filled, air cooled w/type LC connector, new, $995 ea. C Waltman, 66 Jack London Sq, Oakland CA 94607. 415-836-0910.

**Excalibur, Switchcraft** 6, 10 & 20 dB H pads; many new Switchcraft A3M, A3F XLR connectors; new Sony ECM-30 mic in case, lavalier electret condenser mike. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Gates antenna shunts** w/5 amp meters (2). E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**Rust AL-100** autolog xmtr chart recorder w/AP-12 alarm panel, $100 plus shpg. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**Ford Code-A-Phone** 111 & 180, $40 ea or both for $75. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**IBM System 34** computer, no peripherals, but comes w/full compliment of spares, storage since 1986, appears excel, $1000 plus shpg. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

**Superscope RBC-2,** 5 V, NiCad battery pack, $12; takahata Kogyo tape timer, $75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

**Jack strip, 52 RTS,** dbl closed circuit jacks, gnds normalled, gd cond, $100/BO; (2) UTC A-33 20 dB magnetic shields, $10/both; line xfmrs (2) EV 502, EV 502B, Shure A86A, $12.50 ea/all for $40; Pioneer JA-R102 rk mnt adaptor kit, $7. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.

**RCA AVQ10,** needs work, BO T Clucke, WQKS, 905 S Main, Hopkinsville KY 42240. 502-886-1480.

**Harris Cope 1035 printer;** Digital VT-8E terminal; NCR 796-401 terminal; (2) Wang 700B advanced programming calculators; IBM 6:5 cartridge system recorder type 281. E Hudson, WIYD, 900 River, Palatka FL 32077 904-325-4556.

**Extel AF11R** printer, used as auto logger, gd working/physical cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

**TI Silent 700** terminal w/acoustic modem, BO; Beckman 96 PH meter #9600, S/N 166679, BO; (2) Sony transcribers, gd cond. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**Aquarius 16K memory** w/expander w/printer data recorder, games & manuals, like new in original box, $125 plus frt. M Kantor, WPOB, 50 Knickerbocker Rd, Plainview NY 11803. 516-822-6915.

### Want to Buy

**NAB 7th** edition Engineering Handbook for Radio & Television. K Meades, POB 71098, LA CA 90071. 213-666-9570.

**Capacitor** for RCA BTF5D, 2 μF at 6 kV, paper, ±10%. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**Tibbs & Johnstone** freq mod. R Meyers, Benchmark Comm, 4700 SW 75th Ave, Miami FL 33155. 305-376-1717/305-264-5963.

**16mm TV shows,** old TV movies, radio, magazines; 35mm film trailers & cartoons. S Albert, TVC Enter, POB 188, Needham MA 02192. 617-238-1179.

## MONITORS

### Want to Sell

**Nems Clarke 108E** three tower antenna monitor, GR AM mod mon, spares. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**McMartin TBM400** FM mod monitor, tube type, tuned to 89.3 MHz, $100. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

**TFT 763 mod mon** w/724 stereo mon, 764 pre-selectors & remote metering, gd cond, $2000. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

**Potomac AM19** ant monitor, two tower day & night, $1500. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262 619-320-6818.

**TFT 785, 763, 724A** mod monitor, consists of preselector, mod mon & stereo mon, full spare part kits & manuals. 42000. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**McMartin TBM-3500B** mod mon w/TBM-2200A stereo monitor. TBM2000A SCA monitor, all in gd cond, $1200/all S Cilurzo, KGMG, 5735 Kearny Villa Rd, Ste G, San Diego CA 92123. 619-560-5464.

**McMartin TBM-300A FM** freq/pilot monitor. $80. R Roisaland, KEWI, POB 4407, Topeka KS 66604 913-272-2122

### Want to Buy

Cash for AM mod mon w/0-100% positive peaks, prefer GR 1931-A, but will consider any workable monitor. D Lee, 202 Baker Dr, Florence AL 35630.

## MOVIE PROD. EQUIP.

### Want to Sell

**Arriflex BL** camera, battery & all accessories, magazines, etc. F Singuschkin, Seraphin Comm, 1568 Eustis St, St Paul MN 55108. 612-645-9173.

## RECEIVERS & TRANSCEIVERS

### Want to Sell

**GE mobile phone,** ET-74E, ER-48C, head EC 79A13, seven channels, like new, $750; GE MVP series, one base, two mobiles, one hand held portable, 466.225 TX, 461.225 RX, good condition. R Johnson, 207 Sioux Terrace, Georgetown KY 40324. 502-863-9387.

**Motorola HT-200** VHF handheld transceivers (2) w/charger, $200/lot. N Beaty, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

**SCPC receiver,** TJ Tidwell, WAFT, Box 338, Valdosta GA 31601. 912-244-5180.

**Wilson WE-800,** 144-148 MHz, synthesized transceiver, 1 or 12 W, 12 VDC or internal NiCad batt, w/spkr/mic & hand-tooled leather case, mobile mnt, $200/BO. E Helvey, Helvey Prod, POB 1357, Winchester VA 22601. 703-877-1191.



**Sansui-G7700** stereo rec 120 W/chan, excl cond, dig tuner w/all kinds inputs, $300. B Feinberg, Total Tape Publ Co. 9417 Princess Palm Ave, Tampa FL 33631. 800-874-7599.

## REMOTE & MICROWAVE EQUIP.

### Want to Sell

**Moseley TRC15** w/subaud metering relay int for 110 V xmtr control. D Fearn, WKSZ, 1001 Baltimore Pike, Media PA 19063. 215-565-8900.

**Marti 450** tube type receiver, $150. G Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

**Symetrix 108** telco hybrid interface system w/2 controller consoles, used only 5 months, $1200. S Bush, KTKK, 3595 S 1300 W, Salt Lake City UT 84119. 801-264-8250.

**ABC Network** 32 pulse receiver, $250. R Ness, WCSJ, POB 270, Morris IL 60450. 815-942-0022.

**Moseley ICU-1** isocoupler, for the 940 to 960 MHz STL band, gd cond, $125. N Beaty, 3438 Galeston Ave, Indianapolis IN 46236. 317-897-6255.

**Moseley SCG-8,** TAU-2, SCS-2, etc. BO B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

# Consultants



# 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

**Engineer avail** to solve any problem, anytime, anywhere, assignments accepted by the day, week or project. Contact B Elliott, 413-442-1283.

**CE looking** for FT position in AM/FM combo or stand-alone operation, exp & will re-locate. W Ullrich, 219 Savannah-Gardner Rd, New Castle PA 16101. 412-654-5501.

**Production pro looking,** take charge type. Call S Cape, 6 Treasure Hills Circle, Little Rock AR 72205. 501-223-8601 for samples & resume.

**CE seeking** FT position in a quality conscience AM & FM or combo as chief or assistant, 17 yrs exper, 1st class gen lic, SBE member, certified eng, 1st class NARTE. Maint & repair background. E Gartett, 3111 Doner Circle NW, Huntsville AL 35810. 205-852-0322/4024 or 205-895-9574.

**Radio eng** seeks FT employment, exper w/AM DA's, multitrack prod, automation & xmtr exper, construction & design exper also, preferably Midwest area. D Walker, Walker Assoc, 883 Ross Ave, Hamilton OH 45013. 513-868-7064.

**Cert Brdct Eng,** AM/FM, 14 yrs exper. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 5-1-88.



## HELP WANTED

**CE needed** for AM/FM in Tallahassee FL, SBE cert. & 5 yrs exper required. Send resume to Bruce Timm, POB 1874, Tallahassee FL 32302.

**Salesman** to sell satellite uplink services both data and video. Must be experienced with good contacts. Based in Dallas, Chicago or LA for rapidly growing company with both Intelsat and domestic services. 1-800-DATA-LIN.

**CE wanted** at KUNI/KHKE/KUNY (NPR). To $25,900 plus. Send application, resume, June 15th to Dough Vernier, University of Northern Iowa, Cedar Falls IA 50614. AA/EOE.

**Staff writer, technical,** near San Diego. Responsible for writing tech manuals, brochures & newsletters. Excellent environment. Strong organizational skills, electronics/audio background. Anders Madsen, 619-438-3911.

# Broadcast Equipment Exchange

### REMOTE . . . WTS

**TFT 7610,** 7615, 7630 remote control 30 chnl, $3000. T Toenges, Rte 1 Box 149, St Marys KS 66536. 913-437-6549.

**Anixter-Mark P-972 GR-M1,** 6' STL antenna, vgc, $1000; Moseley SCM1 (2), one on 110 kHz, the other on 185 kHz plus power supply, new, $1000 for all three. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**Equatorial Sat Receiver** & down converter, 5100 controller, like new Model 5102-00, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**TFT 7601,** 10 chan digital single wire or audio chan link. $1200. D Doelitzsch, WDDD, 1 Bdct Ctr, Marion IL 62959. 618-997-8123.

**Moseley MRC-1600** remote control w/CRT option, excell cond, $3500. D Malin, WPHN, POB 1212, Gaylord MI 49735. 517-732-6274.

**S-A 7300 wide band rcvr,** 7325 processing unit & 2.8 meter dish, currently in use, excel cond, $5500/BO. A Wynn, KODL, POB 74, The Dalles OR 97058. 503-296-2101.

**Gabriel 10' microwave dish,** used as a sign, buyer must pick up, $95. R Haneman, WDAC, Box 3022, Lancaster PA 17604. 717-284-4123.

**Comtek (Fairchild) RCV 360** Transtar AC format receiver & downconverter, $1500; Moseley TRC15 remote control, set up for two wire, gd cond, $1000. S Karwan, KCMJ, 490 S Farrell C202, Palm Springs CA 92262. 619-320-6818.

**Moseley SCS-2** status control system, xmtr & rcvr, gd working & physical cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

**Moseley 505** STL receiver, 951.5 MHz, BO. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

**Moseley PCL 303/C** composite STL, gd cond, $2500; Moseley PBR-30/AR remote control, gd cond, $750. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

**S-A DAT 32,** complete receiving system, $9995. E Steinagel, WCAO, 8001 Park Heights Ave, Baltimore MD 20218. 301-653-2200.

**S-A DAT 32** digital audio terminal, complete receiving system. C Steinbacker, WWPA, POB 2168, Williamsport PA 19703. 717-323-7118.

**Gentner SPH3** telephone interface system, new, $350; Cetec Bdct remote 4 chnl console w/dual TTs, stand, etc, excel cond, $500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

#### Want to Buy

**S-A** digital 7.5 kHz card. R Vanderlinden, WVIN, POB 72, Bath NY 14810. 607-776-3326.

**Rust R1-108** 24 position remote control xmtr end, but will take entire system if avail, must have gd stepper relays in xmtr end. R Schott, WARD, POB 1550, Pittston PA 18640. 717-655-5521.

**M/A Video STL's,** 23 GHz, 18, 12 & 16 GHz; also used Moseley 505/C & 606/C units always wanted. C Kidd, Kidd Comm, 4096 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

**Moseley MRC 1600** xmtr unit only; Moseley PCL 505C STL receiver. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

## STATIONS

#### Want to Sell

**FM CP,** Illinois, small market. P Martin, PMA Mktg, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

**FM CP'S Wanted**
Clients seek CP's any size market. Small, medium, large. Will consider FM upgrades, too!
Send inquiries to: Radio World
POB 1214, Falls Church, VA 22041
Attn: Box 4-2

**LPTV's (2)** N. Minnesota/N. Dakota, equipment on site, ready to build! Low dial positions, Ch 17 & 28. Established UHF market in Fargo ADI. Kidd Communications, 4096 Bridge St., Ste 4, Fair Oaks CA 95628. 916-961-5433.

**Atlanta area,** 1 kW DT AM station, approx 4 acre tower site, recen renovated 1500 sq ft office bldg on approx ¼ acre in bus dist, new bdct & prod equip, more. J Brown, POB 958, Douglasville GA 30133. 404-920-2281.

#### Want to Buy

**Bdct investor group** forming to purchase profitable combo in medium market in South, reply to: Bdct Group, POB 976, Rayville LA 71269. 318-728-4574 (PM).

## STEREO GENERATORS

#### Want to Sell

**Harris TE-3** gd cond, stereo gen portion only, $100. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904. 813-574-5548.

**CRL 300A** 67 kHz subcarrier gen, audio or data modulation w/built in limiting, excel sound, $1200. R Malone, WCRN, POB 6336, E Rochester NH 03867. 603-335-2005.

**Harris MS 15R,** will trade even for Optimod 8000 or $1500 cash. B Umberger, WNLT, 51 S Main, Clearwater FL 34625. 813-446-0957.

**Orban 8000A,** & Moseley SCG-9. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Harris MSP95** limiter/stereo gen, excel cond. rack mount w/manual, BO or trade for ARS1000/PR99 decks; CCA SG-10, fair cond, needs some work, BO or trade for studio equip. F Morton, KMGZ, POB 7953, Lawton OK 73504. 405-536-9530.

**Harris 994-6533-001** FM stereo gen, new, for TE-3 etc. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**Moseley SCG-9,** excel cond, $400. L Clear, WIQI, 325 John Knox Rd #C-129, Tallahassee FL 32303. 904-386-2374.

**Moseley SCG-3T,** composit output, gd working/physical cond, w/tech manuals. R Yaw, North Montana Bdct, Box 7000, Havre MT 59501. 406-265-7841.

#### Want to Buy

**Standby generator,** 15 kW single phase 220V LP gas with automatic switching. G Magill, WKMC, POB 1311, Altoona PA 16603. 814-695-4441.

## SWITCHERS (VIDEO)

#### Want to Sell

**Panasonic WJ5000T** w/sync gen, $350. R Larson, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-848-3172.

**Dynair 5100 Series** routing switcher w/controller for 12 x 12 matrix, stuffed for 10 x 12, spares, extenders & docs. R Weller, Radio Station Bdct Srvs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

## TAPES, CARTS & REELS

#### Want to Sell

**Std library transcriptions,** (250) 16". B Diffee, WRXO, Roxboro NC 27573. 919-599-0266.

**NAB reels,** 10.5" metal 1/4", all in gd cond, 1-10, $1.50 ea, 11-100, $1.25 ea, 100 +, $1 ea. Falk Recd Srvs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

**We have largest quantity** of reprocessed audio tape in the world. We also have the lowest prices! Sizes from 5" to 14" & 1/4" to 2", all brands, all types. We carry a full line of cassettes, broadcast carts, reels, boxes & related accessories at unbeatable prices. Call for our new catalog & more info. 1-800-331-3191/516-678-4414 in NY. Burlington Audio Tapes, 106 Mott St, Oceanside, NY 11572.

**A&D**
**Cartridge Rebuilding Service**
We clean, load & pack. Serviced within 10 work days! Work guaranteed!
3380 Blakely Ave., Eau Claire, WI 54701
(715) 835-7347

**NAB reels,** 10.5" metal 1/4", all in gd cond, 1-10, $1.50 ea. 11-100, $1.25 ea, 100 +, $1 ea. Falk Recd Srvs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

**Fidelipac carts,** (150) 10.5 minute, new, $2 ea. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**Aristocart Type A** & Audiopak AA-3 carts; new MRL, Ampex, STL & CBS Labs mono & stereo align tapes, carts & test records, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Gatesound Beautiful Music** 14" reels (10), $250; beautiful music library, about 250 10.5" reels, $4000. G Barnett, KWXY, Bdct Ctr, Palm Springs CA 92262. 619-328-1104.

**Fidelipac 300,** (100) used carts, w/o tape or pads; also 30 lids, 90 grey reels, 28 white reels, carts/$30 & parts/$15. J Robinson, WVRQ, Rt 4, Viroqua WI 54665. 608-637-7200.

**3M used 1/2"** tape, 206 (12) full, (2) partial hubs, 208 (1) full hub; Ampex 406 (1) full hub, $5 per hub, (2) 1/2" metal 10" reels, $3 ea, entire lot, $75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

**Cassette C-Box,** has push eject system w/removable label holder, one hand operation, stackable, compatible w/old Scotch C-Boxes, 200 for $120. J Jarjoura, WCIB, POB C, Falmouth MA 02540. 617-457-0760.

**3M used 1"** tape, 206 (6) full on reels, 208 (2) full, one on reel, other on hub; Ampex 406, partial on hub, $10/roll or entire lot for $75. E Helvey, Helvey Prod, POB 1357, Winchester VA 22061. 703-877-1191.

**Beautiful Music** record collection, BO. C Bryson, Comserv, 93 Robinhood Dr, Zelienople PA 16063. 412-776-5204.

**Recortec tape evaluators,** 1", 2" & 3/4", several of each. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

**Used 3/4"** tape suitable for reloading. R Weller, Radio Station Bdct Srvs, 6117 Code Ave S, Edina MN 55436. 612-925-2162.

#### Want to Buy

**Old time rock-n-roll** or country hits from '50s & '60s in gd cond, reasonable prices for top cond library, prefer records, no tapes please. B Coleman Jr, WIST, POB 460, Lobelville TN 37097. 615-593-2294.

**Fidelipac carts** in rebuildable cond. JV Salazar, MRC, POB 3246, Laredo TX 78044. 512-722-6832.

## TAX DEDUC. EQUIP.

**Donations wanted** for listener supported station, need AM xmtr & tower (any cond), call weekdays after 5 PM & weekends. B Saltade, Stardust Prod, 6 Robbie Ridge Apt 4, Milford OH 45150. 513-831-0760.

**Eng student** desiring donation of old bdct equip (anything)in repairable cond, will pay shpg charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

**Non-profit educ station** needs any & all sorts of equip from mixing board to cart machines, tape decks & TTs, severely underfunded & behind the times equip-wise, any donations will be appreciated. C Gaughran, WLCX, Longwood College, Box 1130, Farmville VA 23901. 804-392-9362.

**Donations sought** by non-profit radio reading service for blind, need cart machines, mics, audio consoles & R-R decks. D Judy, CRIS, 589 Jordan Ln, Wethersfield CT 06109. 203-246-3579.

**School needs FM xmtr** for educ purposes, 10 W & up. Rev M Mullen, Intl Mission Radio Assn, St Johns Univ, Jamaica NY 11439.

## TEST EQUIPMENT

#### Want to Sell

**HP 330B** tube type dist analyzer, $150. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

**Field Equipment** of Carl Kowalski; RF ammeter mdl TCA 20/40; voltmeter, Weston mdl 904; GE FMR mobile units (2); compass; duo site range finder, make offer. 404-255-5152.

**Potomac FIM-41** field strength meter, 540 kHz to 5 MHz, excel cond. J Seaman, WSVA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

**B&K 6203** wow & flutter meter, excel cond, $1200. S Smith, Chicago Audioworks, 1005 W Webster Ave, Chicago IL 60614. 312-327-5533.

**Potomac FIM21** in excel cond, low miles, $1450. D Murray, POB 5715. Kingsport TN 37663. 615-239-4745.

**Tek 527** waveform monitor, $95 plus UPS; HP 5050B transient digital recorder, $85 plus UPS. J Baltar, Maine Reel Comm, 67 Green, Augusta ME 04330. 207-623-1941.

**Sound Tech 1710A,** 1200A, 1000A, 1100A, new rack mt. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Bird 43** wattmeter w/FM & microwave elements, BO. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Heath IM-4110/SG-18A,** gd cond, $100/counter & $100/gen. P Wolf, WRCC, 2600 Pine Island Rd, Cape Coral FL 33904 813-574-5548.

**Potomac SC-RX-31** synthesizer/detector, excel cond. $1500; Delta OIB-1 operating bridge, excel cond, $1500. J Swett, KCLS, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

**Sound Technology 1710A,** generator analyzer, excel cond, $2500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.



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## ACTION-GRAM

**EQUIPMENT LISTINGS:**
Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply call 1-800-426-8434 to place your listings courtesy of Broadcast Supply West.

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Listings are available on an $18/25 word basis. Call 800-336-3045 for details and complete display rates.

EMPLOYMENT SECTION:

**Help Wanted**
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 _____

Telephone _____

BROADCAST EQUIPMENT EXCHANGE
PO BOX 1214
FALLS CHURCH VA 22041

# RW Broadcast Equipment Exchange

### TEST . . . WTS

**HP 5212** electronic converter in use & gd working order, $100. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**GR 1932A** dist meter (2), one in gd cond & one operating as is; GR 1301 low distortion osc, gd cond. D Walker, Walker Assoc, 883 Ross Ave, Hamilton OH 45013. 513-868-7064.

**Potomac FIM-41** field strength meter, 540 kHz to 5 MHz, 6 yrs old, excel cond, some scratches on case, BO. J Seaman, WSVA, Box 752 Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

**Halcyon 701A** digital transmission test set, excel cond, $695; Ithaco 4302 dual 24 dB/octave filter, excel cond, $695. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Heathkit 10-4550** 10 MHz dual trace scope w/manual & Heathkit dist analyzer IM-5258 w/manual, both $350/BO. C Steinbacher, WWPA, POB 262, Williamsport PA 17103. 717-323-7118.

**NLS mini scope MS-215,** $275. J Frankel, 8039 H Casminito De Pizza, San Diego CA 92108. 619-291-9118.

**Tek 529** waveform monitors, $400; Tek 1420 & 1520 vector scopes, $400. G Urban, 314 W 52nd St, NY NY 10019. 212-677-2200.

**Potomac FIM 71,** $3000 & FIM 41, $1950; **Tek** 2215 scope, $1050; HP dist analyzer mdl 331A/332, $500; Sencor LC53 Z meter, $500; GR-916AL comm bridge, $450. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

**Sencore FC-51** 1 GHz freq counter, $450; HP 427A voltmeter, $250; HP 200CD wide range osc, $200; HP high freq probe 11096B, BO. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

**Tek 6120 probe,** BO; Bird 43 thruline wattmeter, BO; Bird dummy load, BO. M Kaiser, 248 Sleepy Hollow Rd, Pittsburgh PA 15216. 412-341-2384.

#### Want to Buy

**Bird or equiv,** 20 kW or higher dummy load, water cooled. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**AM signal gen,** T Sneed, Radio Paradise, POB 908, Hixson TN 37343. 615-877-0100.



## TRANSMITTERS

#### Want to Sell

**Wilkinson FM2500** 2.5 kW on 100.3 MHz, low hrs. D Fearn, WKSZ, 1001 Baltimore Pike, Media PA 19063. 215-565-8900.

**Collins 310Z-2,** 20 watt FM exciter, like new, used for R&D only, $2800. J Sze, Orban Assoc., 645 Bryant St, San Francisco CA 94107. 415-957-1063.

**Collins 310Z-2,** 20 watt FM exciter, like new, used for R&D only, $2800. J Sze, Orban Assoc., 645 Bryant St, San Francisco CA 94107. 415-957-1063.

**Willcott 500 W** (2) units in cabinet. R T Smith, Gospel Spotlight, POB 406, Somerville GA 30768. 404-857-5815.

**Kahn Powerside** with stereo generator, 1310 kHz, works great with tight directional nulls. $8000/BO. Dr Hollis, Hollis Bdct, POB 7008, Columbus GA 31908. 404-323-8127.

**Continental 816R-4** FM xmtr, 4 yrs old, 27.5 kW rating, excel cond, photo on request. D Metts, KBUL, 90 W Grove Ste 500, Reno NV 89509. 702-827-0980.

**QEI** rk mt RF meter panel for FM xmtrs up to 50 W, $150. S Lawson, KAK Prod, 928 Hyland, Santa Rosa CA 95404. 707-528-4055.

**CCA 40 W exciter** on 101.5, 8 yrs old, excel cond, w/manual & extender cable, trade for ARS1000/PR99. F Morton, KMGZ, POB 7953, Lawton OK 73504. 405-536-9530.

**Moseley LPE-10** 10 W exciter, SCG-3 stereo gen, $500 G Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

**RCA BTA-5SS** solid state 5 kW AM, some damaged output transistors, BO. J Swett, KCLS, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

**Gates BCA 250-M4454** 250 W aux on 1580 kHz, working when removed, Collins 10 W exciter type A830-2, now tuned to 103.1 MHz, gd cond. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**Westinghouse FM-10** vintage 1947, w/manuals, remove & haul, $2000/BO. G Liebisch, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

**Motorola C-QUAM AM** stereo sys, compl w/(2) stereo gen & mod mon, perf cond, $6000. J Swett, KCLS, 4025 Lugano, Flagstaff AZ 86001. 602-526-1975.

**Gates BC1F,** working cond, BO. T Clucke, WQKS, 905 S Main, Hopkinsville KY 42240. 502-886-1480.

**CSI 25 kW** xmtr, 2 yrs old, one phasor, (4) ATU's. M Pulley, KYOO, 304 E Jackson, Bolivar MO 65613. 417-326-5257.

**Collins 20V3** 1 kW, presently on air, clean, $6000. J Scott, WENT, Harrison St Ext, Gloversville NY 12078. 518-725-7175.

**Harris MS15 exciter** w/Harris 3CX150 rack mounted IPA stage, excel cond, $2500. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

**Nautel AMPFET 400 AM** transmitter, 2 years old, 810 kHz, factory stereo mod, easily retuned, $5000. D Doelitzsch, WDDD, 1 Broadcast Centerr, Marion IL 62959. 618-998-8123.

**RCA BTE-15A** FM exciter, 107.7 MHz, w/SCA module, wb input mod, manual, gd operating cond, $800. R Roisaland, KEWI, POB 4407, Topeka KS 66604. 913-272-2122.

#### Want to Buy

**AM** 1 kW, reasonable. D Swanson, KTFC, Rt 2 Box 102-A, Sioux City IA 51106.

**Non-profit FM needs** 10 W exciter in gd working cond. J Klauck, WSAM, 200 Bloomfield Ave, W Hartford CT 06117. 203-726-9083.



**Harris MW1A,** Gates BCA250 or other 100/50 W AM xmtr. P Hunn, WZZZ, Fulton NY 13069. 315-593-1313.

**Raytheon RF250,** in any cond. B Van Prooyen, WYGR, 1055 28th St SW, Wyoming MI 49509. 616-532-1168.

**LPTV 1 kW,** in gd cond, J Hold, WZ8AI, Iuka IL 62849. 618-822-6197.

**FM xmtr,** 10 kW w/exciter, must be in gd cond. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

**LPTV 1 kW,** 100 W, 10 & 20 W xmtrs, all brands considered. C Kidd, Kidd Comm, 5094 Bridge St Ste 4, Fair Oaks CA 95628. 916-961-5433.

**RCA 5 kW** (1960's). C Bryson, Comserv, 93 Robinhood Dr, Zelienople PA 16063 412-776-5204.

## TUBES

#### Want to Sell

**900KC (2),** 1220KC (2), 1050KC, T12 vacuum crystal (in need of 1450 kHz) to sell or swap. E Slimak, WWAK, POB 1195, Hawthorne FL 32640. 904-481-2310.

**3CX3000F1,** $150; 5762, $250; 575A, $30; 872A, $10, 8008, $15. J Cunningham, USDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

**Econco 5CX1500A** rebuilt, factory guaranteed, sealed carton, $350. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

**RCA DR-2000** (20) readout tubes for ESE timers, BO; EIMAC 4CX-250, 4CX-300A, 4CX-10,000D & more. B Royster, KQM Bdctg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

**Eimac 3-500Z** (2), brand new, $180/pr. G Barnett, KWXY, Bdct Ctr, Palm Springs CA 92262. 619-328-1104.

**EIMAC 4-400A** (2), new, BO. C Springer, KLMR, Box 890, Lamar CO 81052. 719-336-2206.

#### Want to Buy

**T12 1450 kHz** crystals for Gates DC1T series. E Slimak, WWAK, POB 1195, Hawthorne FL 32640. 904-481-2310.

**CRT tube, 7TP4,** used in TK10/TK11 RCA viewfinder; also 1850A iconoscope tube & complete iconoscope camera chain. C Harper, 2081 Harmony Ct, Lexington KY 40502. 606-268-8549.

## TURNTABLES

#### Want to Sell

**Gates stereo tonearm** & cartridge, gd cond (2), $100 ea. R Ness, WCSJ, POB 270, Morris IL 60450. 815-942-0022.

**Technics SH-10B3 TT** base, black for SP 10MK2, plastic cover missing, $100. B Umberger, WNLT, 51 S main, Clearwater FL 34625. 813-446-0957.

**Gates CB-77 TT,** $275; Micro-Trak 212 tonearm, $25; Gates M6442 stereo preamp, $75, or all for $350. W Borneman, WBYO, Box 177, Boyertown PA 19512. 215-369-1075.

**SP-10 MK II** in trade for (2) SL-1200 MK II. J Klauck, WSAM, 200 Bloomfield Ave, W Hartford CT 06117. 203-726-9083.

**Russco Studio Pro B,** w/Micro-Trak 303 tonearm, Stanton 500 cartridge (2), $350/all. D Stewart, 615 Oak St, Prescott AR 71857. 501-887-5930.

**Technics SL1100** w/all access, excel cond, $295. J Price, Price Recdg, 2651 Globe Ave, Dallas TX 75228. 214-321-6576.

**Technics SP10MKII** (2), new in boxes, $500 ea. B Henry, KLLK, 12 W Valley St, Willits CA 95490. 707-459-1250.

**Russco Studio Pro,** low usage, $385; Collins corner-shift 12" TT, recond & refinished, $125; (2) Audio-Technica ATP12T tonearms, new, $150 ea; Audio-Technica AT81E stereo phono cartridges (30), $8.50 ea. G Jones, KLXQ, Box 231, Uvalde TX 78802. 512-278-1102.

**Studer A725** CD player w/rack mount digital speed control, $750. J Parker, WUBE, 225 E 6th St, Cincinnati OH 45202. 513-621-6960.

**Audio Technica ATP12T** tone arms (2), excel cond, $100 ea. J Zack, WCZY, 15401 W 10 Mile, Oak Pk MI 48237. 313-967-3750.

#### Want to Buy

**Gates CB500** or CB77, want motor, will buy whole table. B Moore, KTTK, POB 1232, Lebanon MO 65536. 417-588-1435.

## TV FILM EQUIP.

#### Want to Sell

**Singer/Graphlex 16mm projector** w/film chain shutter, like new, $300. H Casteel, Technichrome, 701 Desert Ln Ste 4, Las Vegas NV 89106. 702-386-2844.

#### Want to Buy

**Philco Cinescanner** TV broadcast projector. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

## VIDEO PROD. EQUIP.

**TSC Colonizer** for WR-100 radar, will fit others, sell or trade for coax dummy load over 15 kW, $1500. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**Panasonic 9240,** 9600, A650; JVC BR-8600U, RM-86U; Fortel CCDHP TBC; Hitachi AC/DC waveform mon; & much more video equip, write for details & prices. P Costa, Eastern Snd & Video, 462 Merrimack, Methuen MA 01844.

**TSC Colorizer** for weather radar WR100, will work on others, $1700. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

**RCA TTS-1A** delay EQ system, $750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

**Microtime Digatrol 2** automatic commercial inserter, $1000; Sony BVU 200B bdct editing recorder, gd cond, $1000. G Sive, The Video Connection, 31844 Rancho Amigos, Bonsall CA 92003. 619-749-7662.

**RCA TP76,** trade or sell. JV Salazar, MRC, POB 3246, Laredo TX 78044. 512-722-6832.

**GVG 711C** video proc amp, $500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

**Panasonic WVLK10** lens & filter. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

**Videotek monitor & vectorscope;** Sony 5800 & 5850; Tapco audio mixer; Hitachi camera & CCU; Sony editor & much more inc mixers, speakers, VTR, equip rack, switcher, etc, package or unit prices. W Libby, CFC-TV, 10237 Leesburg Pike, Vienna VA 22180. 703-759-4210.

**Harris 690** frame sync TBC, correct 1", 3/4", etc, excel cond, $4295. D Brennan, Custom Video, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

**Knox K-50** charactor gen, 4 paces, $400. R Tanner, 419-238-4793.

#### Want to Buy

**Tech manual** for video projectors GE PJ7100 & PJ700, reasonable. DMT A/V, Box 9064-RW, Newark NJ 07104. 201-484-5291.

**Video projector** & screen. M Schaaphok, Protestant Radio & TV Ctr, 1727 Clifton Rd NE, Atlanta GA 30329. 404-634-3324.

## VIDEO TAPE RECORDERS

#### Want to Sell

**Panasonic NV9200** 3/4" U-matic VCR, excel cond, $695. A Channey, Video Eng, 1415 Oak Knob Way, Sacramento CA 95833. 916-922-3456.

**Sony SLO 1800** (3) Beta in new cond, extremely low hrs, $650 ea. D Geccaris, Concept Prod, 7878 Big Sky Dr, Madison WI 53719. 608-833-8273.



**Panasonic NV9500** 3/4" R/P, $500 plus UPS. J Baltar, Maine Reel Comm 67 Green, Augusta ME 04330. 207-623-1941.

**Panasonic NV9500** 3/4" editor w/new video head & NVA950 edit controller, excel cond, $850/BO. R Larson, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-348-3172.

**Sony SL2000** portable, no tuner, slip in AC adapter, NiCad pack case, $375. S Hofmann, Theater Arts Dept, Cameron Univ, 2800 W Gore, Lawton OK 73505. 405-581-2428.

**Sony AC340** (2) VTR power supply, battery charger or camera power supply; (2) Sony BP60 camera or VTR battery, excellent condition, BO. T Post, Concept Video Prod, POB 40213, Nashville TN 37204. 615-292-7599.

**Sony AV3600** VTR. B Nason, Lycoming College, Williamsport PA 17701. 717-321-4295.

**Sony VP-1000 player;** (2) Sony VO-1800 R/P; Sony AV-3650 R/P; Sony 3600 R/P; JVC CR-8300U; (3) Concord 800 R/P; (3) Panasonic NU 3020 R/P; (2) Sony portable AV-3400 R/P w/carrying cases; Ampex VR-600 studio VTR, BO. E Hudson, WIYD, 900 River, Palatka FL 32077. 904-325-4556.

**Panasonic NV8500** edit VCR, 2 yrs old, $1800. R Tanner, 419-238-4793.

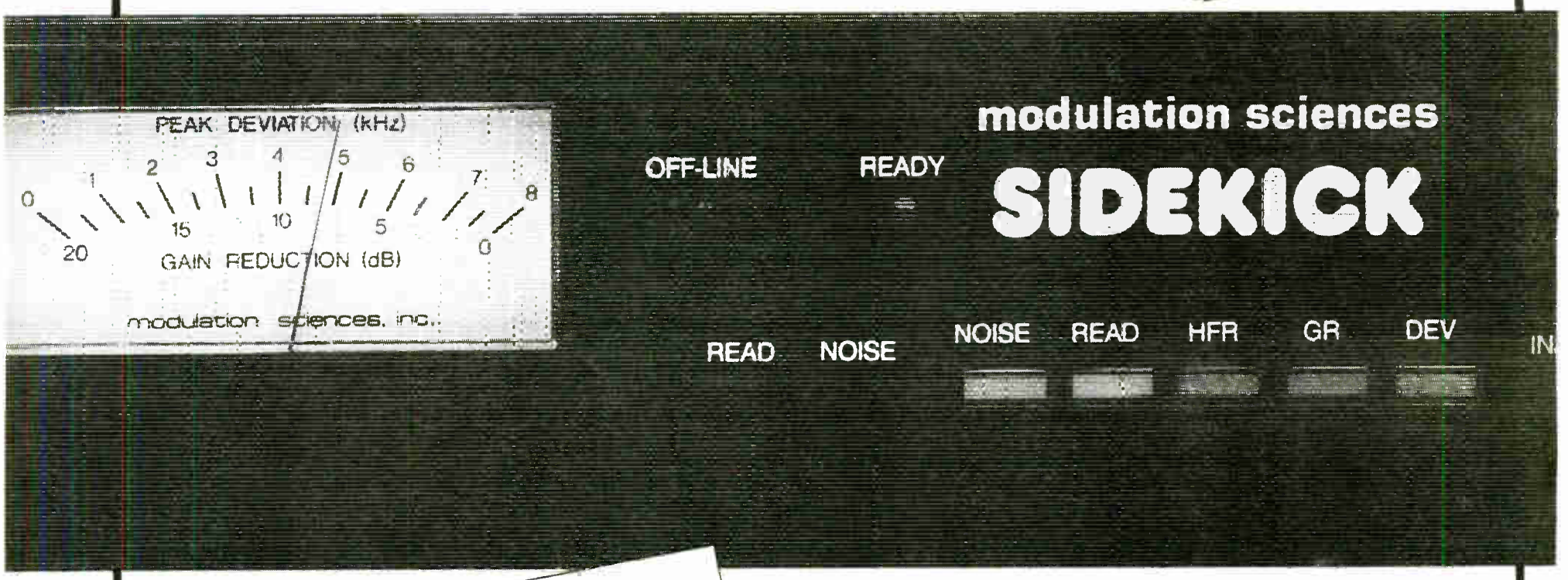
**IVC** 1" VTR, $500; NEC 3/4" video cassette player, $500; JVC 3/4" video cassette player, $650. C Haynes, WJMI, POB 31235, Jackson MS 29306. 601-948-1515.

#### Want to Buy

**Sony or Sanyo** portable consumer Beta 1-2-3 VTR. T Post, Concept Video Prod, POB 40213, Nashville TN 37204. 615-292-7599.

**Sony Betamax** w/orig Beta-1 format speed, any cond, also BVU 100. C Lund, Cycle Snd & Video, 167 Madison St, Waterbury CT 06706. 203-756-7761.

# THE ONE BOX SOLUTION THAT MADE SCA WORK




## RF IDEAS

Broadcast Technologies, Inc.

E.J. PRYOR, JR.

"I have been operating one SCA on 67khz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

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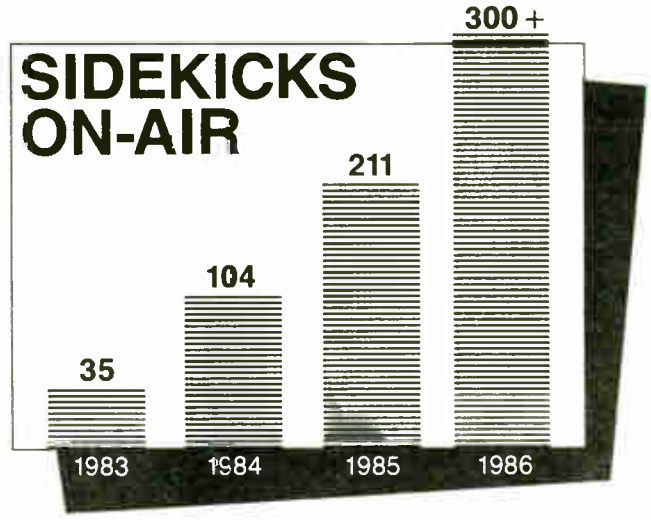


## Here's how Sidekick makes SCA work:

**Sidekick installation is quick, easy, and problem-free:**

- Install at studio or transmitter.
- Insert anywhere in chain via Sidekick's loop-through composite input/output (SCA input NOT required).
- Remote control provisions standard.

**Sidekick's elegant circuit design takes the hassles out of SCA:**

- Sidekick is tweak-free and drift-free.
- Crystal-locked synthesizer is stable over time/temperature.
- Excellent RF and EMI shielding.
- Performance certified by an independent P.E. (to receive a copy, just call).

**Sidekick's "One Box Solution" builds in everything you need:**

- Integrated audio processor for superb SCA performance.
- Noise generator and synchronous AM meter lets you tune transmitter for minimum crosstalk.
- Super-accurate peak & hold SCA deviation monitor.

**30-Market Survey Results:**

**SIDEKICK IS THE #1 CHOICE OF MUSIC SCA OPERATORS.**

From SCA: Radio Subcarrier Report 9/85

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And Get Sidekick Working For You.

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# NEW ARRIVAL

## THE WHEATSTONE A-20


### THE RADIO CONSOLE ENGINEERING AND MANAGEMENT CAN AGREE ON

Finally engineers confined to tight budgets can choose a console that won't compromise station reliability or signal integrity. After all, the A-20 is a Wheatstone console. It borrows from the componentry and design of our larger A-500 consoles, currently installed in major markets all over the country, from frontline independents to national networks.

The A-20 features modular construction, a fully regulated rackmount power supply, logic follow, full machine control and, of course, an all gold contact interface system. This console has two mic channels and eight stereo line channels, each with A/B source select and program/audition bus assign (plus cue switches on the line modules). Standard features include program and audition VU meters, digital timer, and a monitor module for control room and headphone functions. Optional accessories include a studio control module, multiple line selector switch-banks and machine control panels, plus a full family of studio turret components.

The A-20 is a perfect choice for stations planning an upgrade in signal quality and control room image. It is also a natural choice for the newsroom. So profit from Wheatstone's experience and reputation—call us today for immediate action!

Wheatstone® Corporation

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