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VOA Remodeling Hits Snags

by Charles Taylor

Washington DC ... A 19-studio renovation at Voice of America not only is running behind schedule, but possibly is more than \$1 million over its projected budget, according to an internal audit completed in March.

The Office of Inspector General of the USIA, VOA's parent agency, conducted an investigation into allegations made by the National Federation of Federal Employees (NFFE) Local 1418, the VOA's technicians' union. The union maintained that there were numerous problems with the total massive modernization program that has been proceeding at VOA headquarters.

The OIG study includes results from a review of VOA from July 1987 to January 1988, based on visual observations and oral and documentary evidence obtained from Local 1418 officials and VOA technicians and managers.

The OIG report generally did not sup-

port the NFFE allegations, but did cite problems with the 19-studio reconstruction, which has been proceeding since May of last year.

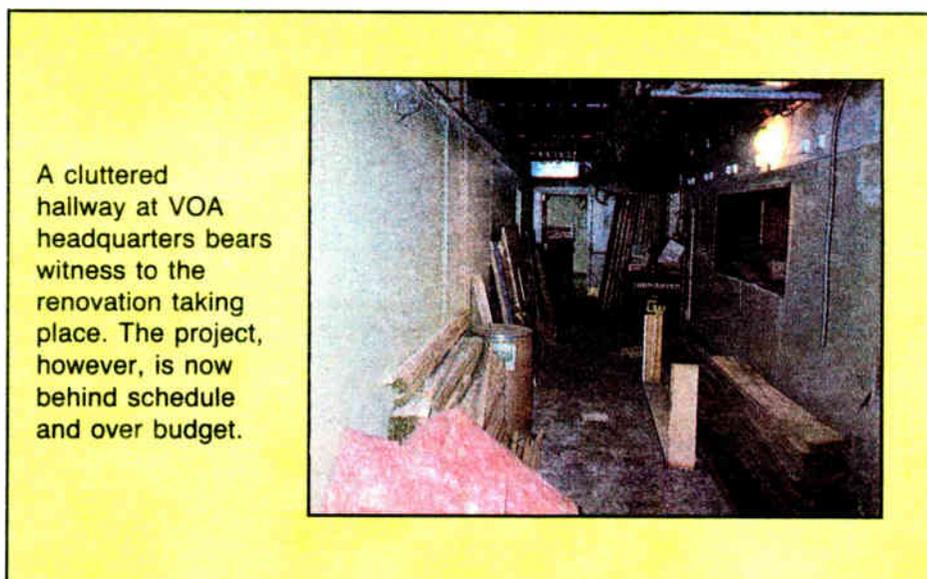
The OIG stated that "the contractor notified VOA management that completion of the first phase of the project would be delayed from June to August 1988."

The report also said a "Cure Notice" has been issued to the contractor requiring an indication as to how the problem will be addressed.

Another part of the OIG report said that the 19-studio project is budgeted for \$8 million. When the contract was awarded, Rockville MD-based Grunley-Walsh was named as the contractor for a bid of \$6.6 million.

Several radio equipment companies and contractors said at the time that the figure was unrealistic for the amount of work and equipment involved.

Grunley-Walsh awarded \$3.2 million of the contract for the acquisition of audio



A cluttered hallway at VOA headquarters bears witness to the renovation taking place. The project, however, is now behind schedule and over budget.

gear to Dynalectric Company in Vienna, VA, which subcontracted the work to Chantilly, VA-based Jullien Enterprises. A spokesman at Jullien would not comment on the project.

A VOA official, however, contested the OIG report and said while the project is running late, it is only 1.9% over budget.

First phase delays

The studio renovations include a complete overhaul of 19 broadcast facilities at VOA headquarters here, many dating back to the 1950s. The studios are used for production and the airing of nearly 1,200 hours of programming a week

(continued on page 8)

Support for AM Sync

by Alan Carter

Washington DC ... Broadcast engineers who worked on two AM synchronous transmitter experimental projects say AM synchronous transmission works and they support the FCC approving licenses on an individual basis.

Their support comes despite comments filed asking the Commission to halt any action on synchronous AM until more data can be obtained.

Mark Durenberger, a consulting engineer with KROB in Albuquerque, NM, and Gordy Alsum, a consulting engineer for KROL in Laughlin, NV, said the experiments at the two stations prove AM synchronous transmitters can work successfully and that the Commission should move forward with a Notice of Proposed Rule Making.

Supporting their position is Robert Weirather, director of advanced development for Harris Broadcast Division, who worked with the two engineers. Harris supplied experimental equipment in the initial stages.

Not all encouraged

Not all broadcasters, however, are encouraged with the experimental projects. Several trade groups in comments filed in May recommended that the FCC slowdown or halt proceedings.

The Association for Broadcast Engineering Standards asked the Commission to suspend or terminate proceedings until test results are more complete. The NAB did not want the FCC to issue a rule making until there is "significant

and consistently positive data."

In response to the call for more information, Durenberger asked the FCC in reply comments filed 8 June to specify further data requirements and suggest measurement methodology.

(continued on page 7)

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FCC Says No to Stay

Washington DC ... The FCC has denied a motion by four groups that would have prevented noncommercial educational FMs from feeding translators via satellite or terrestrial microwave.

Three of the four groups, joined by three additional organizations, have lashed back with petitions for reconsideration, arguing that the FCC's denial is shortsighted.

The filings also restated the groups' claim that the translator ruling would create serious technical problems for broadcast stations and for the Commission.

The motion for stay was filed in May by the NAB, National Public Radio (NPR), the National Federation of Community Broadcasters (NFCB) and the Association of Maximum Service Telecasters (MST).

Organizations contesting the denial include the NAB and, in a joint filing, NPR, NFCB, the Intercollegiate Broadcasting System, the Office of Communication of the United Church of Christ, and People for the American Way.

Alternative signal delivery

The issue, contained in Docket 86-112, surrounds the use of satellite or microwave feeds, known as alternative signal delivery, which allow an FM station to increase its coverage area substantially over feeding a translator from the station's over-the-air signal.

The FCC approved the use of alternative signal delivery in March following an earlier petition from The Moody Bible Institute of Chicago. The groups opposed the ruling and filed

(continued on page 3)

REGULATORY NEWS

FCC Eyes Simpler Certification

by Charles Taylor

Washington DC ... While equipment manufacturers generally support an FCC plan to simplify the certification process for transmission equipment, some organizations maintain that the Commission lacks sufficient research to substantiate such changes.

The impetus for the suggested amendment, contained in Docket 87-552, is based, in part, on the FCC's desire to extend deregulation in the industry. The Commission also hopes to reduce unnecessary paper work and testing in equipment authorizations, according to the Notice of Proposed Rule Making.

The proposal awaits action; reply comments were taken until 26 May.

The Commission currently requires that it test transmission equipment or examine measurement data supplied by applicants. The 87-552 proposal aims to ease the process so that most applicants would simply have to retain measurement data should the FCC have reason to doubt its validity.

No FCC testing or approvals would be necessary before a product could go on sale.

As contained in Parts 73 and 74 of the Commission's Rules and Regulations, the proposal would affect AM and FM transmitters, AM antenna phase monitors, stereophonic exciter-generators, intercity relay transmitters, translators, FM and microwave boosters, and radio frequency transmitters operated at frequencies below 900 MHz.

Television and cable TV transmitter equipment also is included in the proposal.

Not the first time

A similar ruling was passed in 1984 that simplified the equipment authorization procedure for broadcast and broadcast-related equipment and, ac-

ording to the Commission, there was no noted increase in non-compliance.

The FCC therefore said it feels justified in extending the relaxed authorization process to other types of broadcast equipment.

Manufacturers that filed comments supported the proposal, saying that the relaxed authorization standard would not put quality at risk because their products still will be scrutinized by customers.

"The submission of formal reports to the Commission on an early preproduction version of a product does less to insure compliance than the ongoing need to deliver production transmitters that customers can operate successfully in compliance with regulations," said Information Transmission Systems Corp. (ITS Corp.), a McMurray, PA-based manufacturer of broadcast transmitters.

The company also stressed that by eliminating the stringent authorization process, new technology can be applied without delays.

M/A-Com MAC, a manufacturer and dealer of point-to-point microwave equipment in Chelmsford, MA, agreed, noting that without the authorization process, manufacturers "could be expected to save several weeks to several months in getting a new product on the market."

NAB disagrees

The NAB, however, called for the FCC to hold back on the rule change until the Commission can prove that non-compliance did not increase when authorization standards were eased in 1984.

"NAB finds it impossible to accept, at face value, the unsupported statement that the Commission has not found an increase in non-compliance by equipment that was placed under the relaxed authorization programs" in 1984, the organization stated.

The NAB implored the FCC to substantiate its findings since they are "the

essential element of adopting the relaxed authorization procedures."

"If the NAB knows something we do not, I wish they would tell us," responded George Harenberg, an FCC engineer. "They have not told us of any complaints (of non-compliance) and we have not found any. I have not heard of one equipment violation in that area."

Harenberg did not know if a printed report existed with the Commission's statement that non-compliance did not increase with the 1984 relaxation of authorization standards.

The NAB also advised, should the FCC move ahead with the proposal, that all manufacturers be required to submit abbreviated applications with a statement attesting that the equipment has been tested and found to comply with appropriate regulations, instead of following the FCC's intention to ask for verification only if compliance is in question.

For more information on Docket 87-552, contact George Harenberg at the FCC, 202-653-6288.

AMs Blasted By Cubans

Cuba, in apparent protest to passage by Congress of support for TV Marti, blasted two AM channels with deliberate interference for one week-end in mid-June. The NAB reported complaints from AM stations on 1040 and 1160 kHz and estimated the power of the Cuban broadcasts to be 200-300 kW, according to NAB Science & Technology VP Michael Rau. He said the NAB was alerting other stations on those channels and wanted to generate protests to the FCC and the State Department in the hopes of "killing TV Marti."

FCC Clips

FM downgrades

Comments were mixed on an FCC proposal to eliminate the rule making proceeding for requests to reclassify an FM allotment to a lower class, docket MM 88-118.

The Commission proposed that existing licensees can obtain authorization to operate at lower station classes on the same channels by filing construction permit applications for minor modification of existing facilities requesting a downgrade.

The FCC also proposed to permit applicants for vacant allotments, on a first-come, first-served basis to request in their construction permit applications, permission to operate on the channel at a lower station class than that allotted.

The NAB recommended a number of safeguards for the FCC to include in a Report and Order.

The NAB noted the measure might be used as a "bootstrap" precedent for a future effort toward eliminating the Table of Allotments. It could also be used in and adopting a contour protection/demand system for FM radio station allocation.

Capitol Broadcasting Corporation, licensee of eight FM stations, supported the proposed ruling. It said the current two-stage processing system is excessively time-consuming and delays provisions of modified, and presumably improved, service to the public.

Reply comments were due 21 June. For more information, contact Robert Hayne in the FCC's Mass Media Bureau, 202-634-6530.

Drug testing

The FCC is working on mandatory drug testing for commissioners and certain employees as required by the White House and Congress.

Testing would be "random" and affect division chiefs and those in higher positions, according to an FCC spokesperson. "Some secretaries" would be subject to testing, but no employees represented by unions, she said.

Employees would be given 30-day notice before the procedure takes effect.

For additional information, contact the FCC at 202-632-5050.

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Stay Denied for Translator Feeds

(continued from page 1)
a request for a stay.

The motion for stay was denied, according to FCC documents, because the groups failed to demonstrate any irreparable damage the ruling might cause and because their allegations were "nothing beyond pure speculation."

In a press release, the NAB claimed "the alternative signal delivery rule will deplete currently limited noncommercial educational FM spectrum, undermine localism and community access to local spectrum, create a land-rush application process and lead to interference on the reserved FM band and to Channel 6 television stations."

"This rule change is a substantive policy change which is unwarranted, arbitrary and capricious," the association said.

Following the stay denial, NAB's Deputy General Counsel Barry Umansky commented that the organization was "very disappointed. Absent the stay, hundreds, even more of these translators, all satellite-fed, could be licensed by the Commission," he said.

NPR still opposed

An NPR spokesperson said the group remained hopeful that the FCC will modify its alternative signal delivery ruling.

"In NPR's petition for reconsideration, we suggested conditions such as distance limitations between the primary station and (non-commercial educational) translators, which would maintain the traditional functions of translators and also assure consistency with im-

portant communications policies," the spokesperson said.

Greg DePriest, vice president of MST—the only one of the four groups to file the motion for stay that did not petition for reconsideration—said the organization does not contemplate further action following the stay defeat, though it remains solidly against the alternative signal delivery ruling.

"There are a number of outstanding interference issues that exist today because the Commission failed to recognize them at the time it made certain decisions," DePriest said. The denial of a stay, he said "represents the genesis of another set of interference issues that a later Commission is going to have to deal with if they refuse to take action today."

"It's like the clock is ticking now," DePriest maintained, "it may tick a long time, it may tick a short time, but ultimately, interference is going to be caused and the Commission's resources are going to be called in. They can preclude all of that by taking the time to do this right now."

Moody stands by ruling

Moody Bible Institute maintained in comments filed on the motion for stay that the organizations have been rehashing the same arguments—which Moody does not find credible—since the issue first erupted.

Moody initiated the issue in 1981 when it asked the FCC for a permanent rule making allowing it to feed its translator by methods other than over-the-air feeds.

"It is not apparent to Moody how the

Commission's modest expansion of the FM translator rules will suddenly cause 'irreparable' injury to 'public radio,' " the filing said. "Certainly, petitioners have not demonstrated such a potential."

Moody also contended that since translators are authorized on a secondary basis to full-service stations, non-commercial educational FM translators cannot deplete the availability of channels for full-power noncommercial FM stations, including those for public radio stations.

Also, Moody said, a grant of the stay would deny members of the public the opportunity to receive new or improved noncommercial FM service.

Commenting on the stay denial, Jim Goodrich, Moody's assistant to the VP, said, "Obviously, we're happy. We didn't feel there was any merit to the stay. We felt their arguments were more or less the same things they've been saying for seven years. We're very pleased."

The issue now is enduring a comments filing period on the groups' petition for reconsideration.

The noncommercial FM translator issue is contained in FCC Docket MM 86-112. For more information, contact Tatsu Kondo at the FCC, 202-632-6302; Jim Goodrich at Moody, 312-329-4302; or Barry Umansky at the NAB, 202-429-5456.

NAB Files For AM Antenna Project Permit

by Charles Taylor

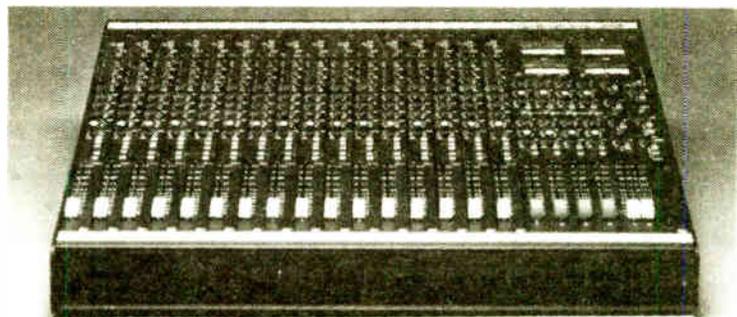
Washington DC ... The NAB has filed an application with the FCC for an experimental AM radio station in Beltsville, MD, that will be used to test an anti-skywave antenna.

The facility, which will operate with a frequency of 1660 and use power up to 5 kW, will be designed to confirm whether new theoretical antenna designs will be able to achieve separate control over skywave and ground-wave signals.

Originally, the test site was to be used for the testing of two antenna designs, but now the NAB is taking a wait-and-see attitude on one of the designs. It is also considering other antenna designs for testing.

The primary antenna being tested is a two-element array designed by Ogden Prestholdt, a consultant for the Washington, DC-based engineering firm of A.D. Ring & Associates.

The station application is one of the remaining steps forward for a project (continued on page 15)



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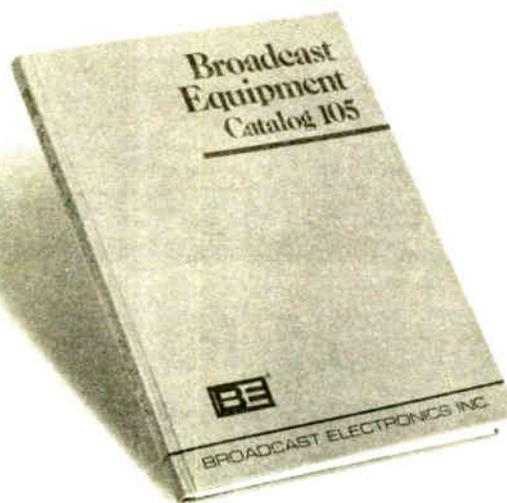


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Disc & DAT In That Toddlin' Town

by Judith Gross

Falls Church VA ... Chicago was hopping last month as close to 100,000 electronics zealots piled into town for the summer **Consumer Electronics Show**.

It's my kind of town anyway (as Old Blue Eyes says) but at the CES I went on a mission: in search of **AM stereo**, **NRSC**, **FMX** and anything to do with radio.

Once you muddle your way through the cellular and vision phones, fax machines, advanced TV system and computer games, not to mention stun guns, I am happy to report that it is possible to find some **exciting offerings** for radio.

But first an update on **DAT**, which is still the smoldering item, smoldering because first the prospect of Copycode and now the **threat of lawsuits** from the Recording Industry Association of America are keeping the Japanese com-

panies who are ready to sell consumer models from introducing them in the US.

Others are calling their DAT recorder-players "prototypes" and not promising availability any time soon.

Now that the CBS Copycode has been discredited, there's talk of other anti-copying devices, including one called **Unicopy** which the RIAA is pushing.

The Home Recording Rights Coalition is fighting back with a matching legal defense fund for any company that gets sued by RIAA upon introducing a DAT recorder here.

I'm inclined to agree with Len Feldman, editor of *Audio* magazine who has testified on the whole boondoggle before Congress. He cites the lawsuit Sony got into when it first introduced **consumer VCRs**.

It was the same argument: home taping of movies infringes on copyrights. Sony finally **emerged victorious**, but only after considerable expense in the courts—thus the fear on the part of the DAT manufacturers.

Len says he'd like to see companies just go ahead and **start selling** them. Can the RIAA sue them all? Will they sue them at all? Stay tuned for the next thrilling development.

☆☆☆

AM stereo was present at the CES. OK, you had to go looking for it. So I packed a lunch, got out my binoculars and went on an **AM stereo expedition**.

Motorola was there showing its excitors ... a fairly gutsy move considering it's not a show attended widely by broadcasters.

I found **six companies** actively marketing AM stereo radios at the show: **Blaupunkt**, **Mitsubishi**, **Philips**, **Sherwood**, **Bevada** (Soundtech) who told me by the way that AM stereo is one of their more popular products, and **Sunkyong**.

Now that's out of a total of **33 companies**, including car dealers, which market AM stereo radios. So who says there aren't any radios out there?

By the way, **don't ask** what system all



Li'l Red Corvette

these radios are, OK? Walking around to the companies selling AM stereo at the CES, it was fairly obvious that there is **no "standards war"** as far as they're concerned. I'm serious. They don't even mention it. They sell AM stereo radios, period. It's obvious what system.

The niftiest AM stereo radio had to be the one in **Sherwood's** snazzy red Corvette. The '62 'Vette was restored by *Hot Rod* magazine and Sherwood put in its **CRD 350** sound system which includes AM stereo. They guys at the booth told me, yes, they do promote this feature in the 'Vette.

The car is going on the road and will be in Miami/Ft. Lauderdale on 9 July, Columbia, SC 16 July and Dallas/Ft. Worth 23 July. If you're nearby, get your listeners to show up and **bombard them** with requests to hear AM stereo.

☆☆☆

I see where **Motorola** has now gone to the courts to ask them to resolve the patent dispute with **Leonard Kahn**. Honestly, can't you guys just get your lawyers to sit down and iron the whole thing out? **Let's make a deal**, anything,

we're all tired of this war.

Ran into Les Tyler of **dbx**, the company with the lower-case name. Seems the company has been bought by **Carillon Technologies**, the very same San Bruno, CA firm which purchased **Finial**.

You remember **Finial** and its laser turntable, don't you? It played vinyl grooves with a laser beam and was supposed to be a product by now.

Now we have to worry about when we're going to get **NRSC** radios. First the receiver guys agreed to get started when a standard was agreed to. OK, we got a standard with new stations coming on board every day.

Now the receiver companies say they need to have the FCC **make it mandatory**. If this keeps up, they'll want proof that every AM station in the country has gone with the standard before giving us the radios.

Remember the story of **Chicken Little**, who went around yelling "the sky is falling" and got everybody into a panic? Sounded an awful lot like that at the **NRSC meeting** in Chicago after the CES.

The NAB and some NRSC members got into a tither about the FCC not including the **NRSC preemphasis standard** in its mandatory rule making on the standard. They're all set to send out the Cavalry: a delegation to talk to the FCC staff about making sure it's included.

Where did all this come from? **MMB** Chief **Lex Felker** has said several times, on the record, that the Commission is inclined toward including **both** the audio and the transmission portion of the standard and evaluating comments on both. He **never said** they will not include the preemphasis standard. **Chicken Little**, pipe down!

And the NRSC got itself into a sticky moment or two in a brief discussion of **FMX**. The NRSC is co-convened by the NAB and the EIA.

The NAB is one of the **promoters** of **FMX** which is being handled as a private enterprise through NAB's for-profit subsidiary. Seemed embarrassingly close to a **conflict of interest**, so the discussion ended rather abruptly.

One NRSC member was a little taken aback by the quick about face. "Are we now going to skirt around **FMX** like we did AM stereo?" he asked.

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.



panies who are ready to sell consumer models from introducing them in the US.

Pro model DATs can somehow get around the snags, as we saw at the NAB show, but for some reason the companies are still **scared**.

It's a shame because at least one company, **Sony**, was planning to fund improvements to pro DAT models with sales of the consumer machines.

Besides, why shouldn't stations be able to **buy consumer machines** if they want to, the way they did when CDs first became popular?

The companies are playing it safe by introducing **playback-only** models, and

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Circle Reader Service 13 on Page 22

OPINION

Readers' Forum

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New station fees high

Dear RW:

I am writing about one of the craziest things the FCC has done in years. And that is spectrum fees. On one hand they want minority groups and women to apply, but they are preventing many from entering the field because of the high fees.

A fee of \$6,000 is outrageous for a man or woman to pay to get their day in court, and one party will lose their \$6,000. There is also that awesome filing fee of \$1,800.

Where the hell was the NAB? Why didn't they protest these outrageous fees? The best that broadcasters can do is write their congressmen and state their opinions.

I just hope and pray something can be done, or only the rich will control the new 80-90 stations.

Pete K. Hons, Manager
Mainline Communications
Portage PA

Convention info in error

Dear RW:

I have just read the article about the SBE Conference on page 11 of the 1 June issue of *RW*. There is an inaccuracy in the third paragraph of the third column; this tends to give a wrong impression.

As in the past two years (and the next

two) I am responsible for the organization and planning of the technical conference . . . including the evening sessions, after they had already been planned.

This invitation was extended because of our long friendship, and as a symbol of the conference's desire not to shut out participation by the leader of a very long and successful series of "Clinics."

Just for the record I would appreciate your printing this.

Also for the record, I enjoyed *RW* as usual!

John H. Battison
SBE Engineering Conference Chairman
Columbus OH

No McMartin defense

Dear RW:

In response to "In defense of McMartin" by William K. Hoisington in the 1 February issue of *RW*.

Any defense of Mr. McMartin pisses me off. KRCL paid McMartin (of Gunnison fame) \$605 for an NPR satellite coordination channel demod. Ray got the money and we got left holding the bag.

Rumor has it that he did this to a number of customers. Was he selective? Did he just dump on poor/weak outfits (like us) who have no effective recourse and at the same time take care of his more powerful clients? Or am I laboring under a lack of understanding?

The failure of Congress to act expediently on the two vacant FCC commissioner slots smacks of blatant politics.

Inaction on the nominations of Bradley Holmes and Susan Wing (whose names were submitted by the current administration) has left the Commission with only three voices and created a "lame duck" policy-making body.

While it's understandable that lawmakers would want to curry favor with a new administration, commissioners' terms are set up to be independent of election year politicking.

It now appears as if it will be well after early next year, when a new administration takes over and has a chance to settle in, before a full FCC will be seated.

By then, the Commission may have lost its current opportunity to add a minority viewpoint and an additional female voice to its ranks.

Also between now and then, many important radio issues will be due for Commission policy making. Translators, short spacing and directional antennas await action on the FM side and for AM broadcasters there is the entire issue of technical standards for allocations and the new expanded band to consider.

Broadcasters can only wonder how such crucial decisions will be effected by a Commission operating at 60% capacity and under the specter of massive changes from the top down.

The fate of the appointments have fallen into the hands of Senator Daniel Inouye, who chairs the Senate Communications Subcommittee and is responsible for scheduling confirmation hearings.

There is little broadcasters can do except contact him or their own senators requesting action, or at least decrying the politics which have muddied the process.

The Communications Act of 1934 which set up the Commission created it to act in the public interest.

It's difficult to reconcile the politicization which has bogged down the appointment process with that public interest mandate.

—RW

I notice that William Hoisington's defense really touches on the crew with whom he worked rather than the issue of Ray's activities.

Maybe there are people out there in the industry who are taking care of Ray because they like him and hope he will

make good on his debts when he is able to "conduct his business in a professional manner." I'd like to know.

Fuming in Salt Lake City
Lewis Downey, CE
KRCL
Salt Lake City UT

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Field Testing the NRSC Standard

by Richard Mertz

Bethesda MD . . . I want to respond to the letter from Mr. William D. Fawcett, which appeared in the 1 May issue's *Readers' Forum*.

Mr. Fawcett's comments, made after "having witnessed in person" the NAB-NRSC demonstration, shows that he has misunderstood the purpose of the NRSC voluntary standard and has viewed the entire effort as an assault on his company revenues.

Mr. Fawcett's dismissal of the NAB-NRSC demonstration as a demonstration with no control has missed the point. The demonstration is just that: a demonstration assembled to graphically show the protection afforded second adjacent stations.

At the NAB convention, Tom McGinley, Director of Engineering for Cook Inlet Radio Partners and I presented the results of actual, off air, field tests of the NRSC voluntary standard. The tests were conducted using WINX, 1600 kHz in Rockville, MD and WPGC, 1580 kHz in Morningside, MD.

With the NAB's and Mike Rau's encouragement, Tom and I set up our tests as an objective comparison of stations operating with and without the NRSC system. WINX used two identical audio processors from the same manufacturer.

The processor with the NRSC equipment was set up to sound identical to the non-NRSC processor. The outputs from these processors were alternately switched into the WINX transmitter. At WPGC, the NRSC equipment was switched in and out through the same limiter.

Our data was collected in the field at locations where the stations' signal strengths were at 20 dB, 10 dB and 0 dB ratios. The results, both off air spectral photographs and audio, dramatically showed how the NRSC voluntary standard protected second adjacent stations from interference.

Guest Editorial

Reducing this interference effectively extended both stations' usable coverage area. Both WINX and WPGC now enjoy increased usable coverage area as a result of installing NRSC!

It is obvious from his letter that Mr. Fawcett's station is not encumbered by AM or FM competition, narrow bandwidth receivers or second adjacent splatter. His desire for flat response signal tests shows his misunderstanding of the problems with the receivers in the marketplace.

The NRSC voluntary standard of

modified preemphasis and brickwall 10 kHz filter is the standard that the radio manufacturers will, hopefully, adopt making wider bandwidth receivers available to the public. These receivers, using complementary deemphasis would yield a higher quality receiver with flat response and improved signal to noise ratio.

NRSC is a step forward in addressing several of the many problems encountered by AM radio today. At this time compliance with the NRSC standards is voluntary. To realize the full benefits of NRSC, a station, along with its neighbors on the dial, must install the system.

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Mr. Fawcett, please take another look at NRSC. Talk to the management of AM stations in areas where the AM band is as congested as the Capitol Beltway during rush hour. I think you will get a more positive view of this step forward for AM radio.

Richard Mertz is Director of Engineering for United Broadcasting Company. He can be reached at 301-652-7706.

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Engineers Support AM Sync Research

(continued from page 1)

Durenberger told *Radio World* he is not sure why commenters want more details. "I think it is because this whole procedure is viewed as such a high technology, high cost thing, that I think a lot of broadcasters have been scared off by some of the engineers who have said it doesn't work—they say they proved that back in the '40s."

KKOB Chief Engineer Gary Diamond also said he is confused over the call for more information. "Can they define exactly what they want, because everybody is wanting qualitative and quantitative," he said. "We can certainly give the qualitative and the quantitative—people can do it on their desks in their offices."

Alsum said the only additional information he would like to see is on oscillators that stations use to synchronize the signals.

Weirather admitted that more qualitative data is available than quantitative. But he added, "The irony of it is that it is a very expensive project for either the transmitter manufacturers or the stations to do. It is very time consuming, painstaking work."

Nevertheless, Weirather said the experiments prove AM synchronous transmitters work. "That is the bottom line."

Not in true sync

Neither KKOB nor KROL synchronize their transmitters in the true sense of the word. When the transmitters were locked in phase, the result was constant interference in the distortion zone.

"What we elected to do (at KKOB) was to make the frequencies slightly different, very slightly different so there is a fade every 4½ to 5 minutes," Diamond said. "To the average listener, it sounds like everyday regular skywave. It's not as objectional as having a crummy signal all the time."

KKOB's operation uses a microwave from the main transmitter site in Albuquerque to the Sandia Crest electronic site 40 miles away, then to Santa Fe, NM, on a second hop.

"When you start doing that, it's very hard to get exact performance out of your inter-city relay," Durenberger explained. "Any little aberration in the signal can cause problems."

He argued that "in the real world" the studio-to-transmitter link doesn't have to be perfectly matched. "It costs too much, you don't need it. Get it to a situation that doesn't bother the listener and maintain that. You can't drift."

All stations need to complete the process is another modern transmitter with an ICR, Durenberger said. "No special audio corrector, no special frequency tolerance."

"Our position is," he continued, "if a broadcaster wants to create interference in his own coverage area, he should be allowed to do so."

The KKOB interference zone falls in an unpopulated area, a situation that Diamond said doesn't bother him nor listeners. "For all the hullabaloo over the interference zone, we've received no negative comments about it since it has been on the air."

Individual decisions

Diamond admitted stations will have to evaluate their individual situations before going with synchronous AM. "If there is an area that they really honestly want to cover, and feel like they have to cover and they can afford to compromise a small area, then it's a decision they'll have to make for themselves—as long as it doesn't interfere with any other radio station."

KROL's interference zone is "about seven miles of absolutely nothing," Alsum said. But the distortion lasts about one to two seconds out of every 27 seconds, he said.

The system operates with two oscillators that are programmable to any frequency, Alsum explained.

As for their application, Alsum said synchronous transmitters are beneficial in the west where there are "vast areas of white area."

KROL hopes to receive a permanent license to operate, Alsum said. "I think there are areas where dual synchronous transmitters would be very appropriate today, but they shouldn't be just granted as they come into the Commission."

The FCC docket for synchronous transmitters is MM 87-6; contact Gary Thayer, 202-632-7010. Contact Mark Durenberger at 612-882-0041, Gary Diamond at 505-243-4411, Gordy Alsum at 702-298-1989, and Robert Weirather at 217-222-8200.

WINZ to Test Synchronous AM

by Alan Carter

Miami FL ... Even with illegal Cuban interference flooding the airwaves here, WINZ-AM wants to conduct tests to see if the station can afford additional interference from a synchronous transmitter operation so it can expand its coverage area.

WINZ corporate Chief Engineer Rick Edwards planned to apply for special temporary authority to do a quick check. The eventual goal is to expand the signal from Miami into northern Ft. Lauderdale and southwest Palm Beach.

"I don't know whether it's going to work down here where we have such a problem with the illegal Cuban interference," Edwards said. "If it comes out being 50-50, we will do it. That's horrible odds, but we will do it."

Edwards visited KKOB's AM synchronous operations in Albuquerque, NM, and was quite impressed. KKOB has conducted experimental tests for the FCC's continuing inquiry into AM synchronous transmitters.

Edwards, like KKOB Chief Engineer Gary Diamond, compared the fade in the interference zone caused by synchronizing the transmitters to skywave. "Never in any of the listening

that I did, did I find that objectional," Edwards said. "I would not have punched off the station during that time period."

The KKOB fade lasts 12 seconds from cycle to cycle, Edwards said. During that period, eight seconds are full quality, he explained, and four seconds were going into fade. "Only one second of the fade was what I consider objectional."

What Edwards is particularly interested in determining at WINZ is the effect a synchronous transmitter will have in the station's 26 mV free contour. KKOB operates with a 4.3 mV free contour.

Edwards will conduct his quick test on two or three nights by using a transmitter plugged into an outlet in his garage at home and running an energized wire in the backyard.

"This would show us how deep the null will be and how objectional the interference will be," Edwards said.

"Whatever we do, we will create some interference in the area in which we already have a decent signal," he continued. "We have to determine whether that's justified—what the tradeoffs will be."

Contact Rick Edwards at 305-624-6101.

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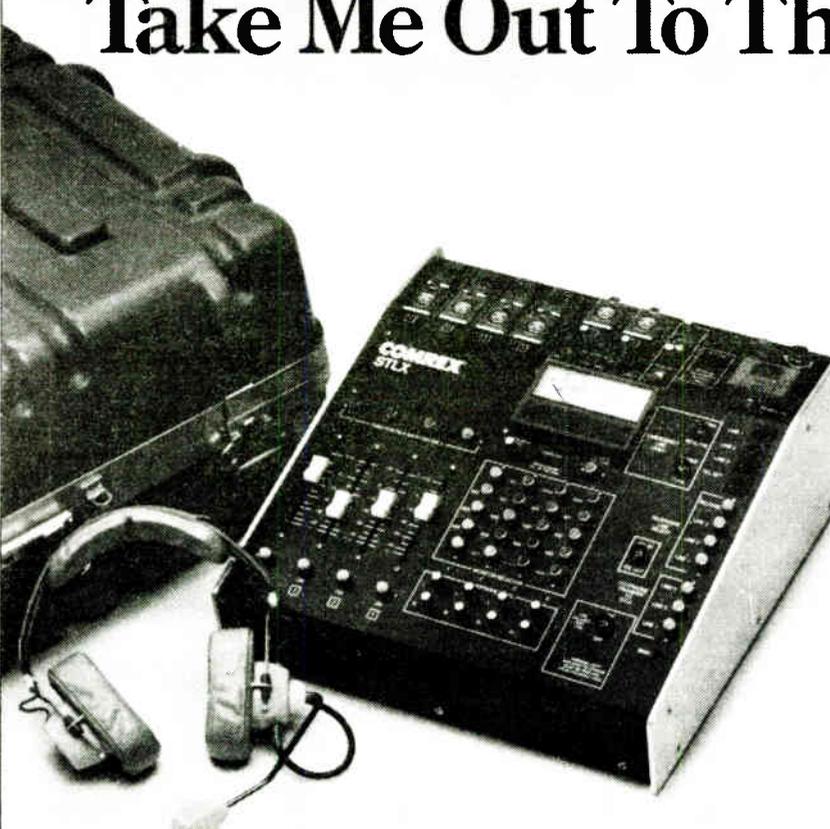
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VOA Project Behind Schedule

(continued from page 1)
44 languages.

Included in the project are the installation of new electronics and associated wiring, complete rejuvenation of each studio's floors, ceilings, walls, cabinetry and adjacent corridors, and an updated heating/air conditioning and electrical power system.

The renovation contract signed 18 May 1987 was to be completed in 20 months.

But the first phase, covering nine of the 19 studios, which was expected to be completed in May, now is scheduled to be finished in August. A second phase to renovate the remaining 10 studios is likely to begin in September, according to Bob Peterson, a member of the VOA's audio and studio engineering division and the authorized representative of the contracting officer.

"The carpentry work is being completed right now and most of the electronics have been procured," Peterson said. "It took longer than expected for the audio consoles and some of the custom equipment. That's the only reason for the delay."

In a follow-up discussion with the VOA, the Office of Public Affairs clarified that statement, saying that it was the contractor, and not any individual equipment supplier who was behind in the delivery schedule.

Chuck Sanata, a project manager at Grunley-Walsh, the general contractor, said, "The problem with the consoles is that they're a custom-made item and it took longer to get the components than we anticipated. The first console will be on the job July 20 and the completion for Phase I will be the end of August."

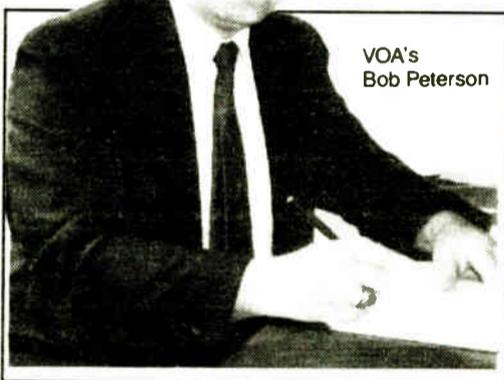
Bill Owen, president of Harrison Systems, which is supplying consoles for the 19 studios, maintained that Harrison is not behind schedule in its obligation and said the company continues to have a good relationship with the VOA.

As of 1 May, the NFFE stated that incomplete work on Phase 1 included the

insulation process involving HVAC ducts, interiors of walls and ceilings, painting, wall covering, floor covering, carpentry, construction of custom tables, wiring runs from the main frame to the individual studios/control rooms and installation of broadcast equipment.

Reasonably confident

As a result, "we are reasonably confident that the first phase of the studio renovation completed by 1988 deadline revised by the response Peterson noted that the



VOA's
Bob Peterson

deadline still is within reach, however.

"Fabrication of equipment, cabinetry, cable assemblies and so forth is being accomplished off-site and our contractor has assured us that he can meet the projected completion date," he said.

Even if the project runs past the deadline, the only real liability will be inconvenience, because all contract work was awarded on a fixed-price contract basis, Peterson said.

"We're paying the same amount. It's just taking longer for them to do the work than was planned."

Since its signing, the original contract value of \$6.63 million has been increased by 1.9% for "miscellaneous modifications," Peterson said. "I think we've done well in holding down change orders."

The report published by OIG, however, noted that the original projected cost of the 19-studio renovation is \$7.9 million with an actual/estimated project cost of \$8 million.

According to VOA Office of Public Affairs, the figure was furnished for the OIG report by the organization's acting director of broadcasting.

"I'm not sure where that (\$8 million) figure comes from," Peterson responded. "The cost of our current construction contract, including change orders, is less than \$7 million and we don't anticipate any significant increases. Both VOA and the construction contractor are making efforts to control costs and I believe those efforts have been very successful."

There were snags, however, in the project's earlier stages, that threatened adherence to its budget and schedule.

A delay was reported in the fall of 1987 when asbestos was discovered in the floor tiles of the old studio facility.

Contract disputes

A more involved conflict occurred when, in February 1987, one of the project's contractors asked to be released from its contract. The company said PCBs actually were leaking from wires in one of the studios.

Falls Church, VA-based Multiphase Consulting, an engineering and consulting firm, asked to be paid for the portion of the work it had performed. But VOA refused, saying the claim was unsubstantiated and that the firm would receive payment only after all work was completed.

Ten months later—in late December 1987—following further correspondence between VOA and Multiphase, VOA agreed to pay the company \$1,800 for its portion of the job, valued in total at \$7,650.

Multi-Phase was replaced by Broadcast Systems Installation, of Los Angeles,

which completed the wiring work on schedule, according to Richard Majestic, division chief of VOA's special projects division.

Phase II

With those problems behind, Peterson and his crew are looking toward the second phase, in which the remaining 10 studios will be renovated.

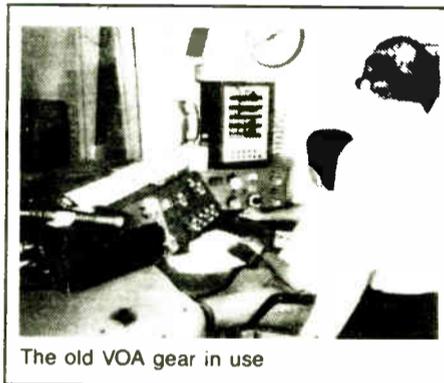
"They will take less time," Peterson said, "because the (broadcast) equipment will have already been procured by the contractor. The second series shouldn't have any surprises, such as the asbestos in the floor tiles. It should be routine construction."

Still, it seems unlikely that the project will be completed by the now-scheduled January 1989. "I'm not sure if the contractor has time to do the work in that time," Peterson said. "There may be a month or two slippage. We'll know better as the work progresses."

All for naught?

Threatening to place a damper on the entire project however, is talk that in 1994, after all the renovation, the organization might move from its present facility to a location that would unite VOA with the USIA.

A commission appointed by President



The old VOA gear in use

Reagan has approved construction of a 2.1-million-square-foot office building at the corners of 13th and 14th Street NW and Pennsylvania Avenue in Washington DC.

The Government Services Administration has signed an agreement that it should house some parts of the U.S. Department of Justice that are spread around the District in the new building, taking up the majority of the building's 1.5 million to 1.7 million square feet of office space.

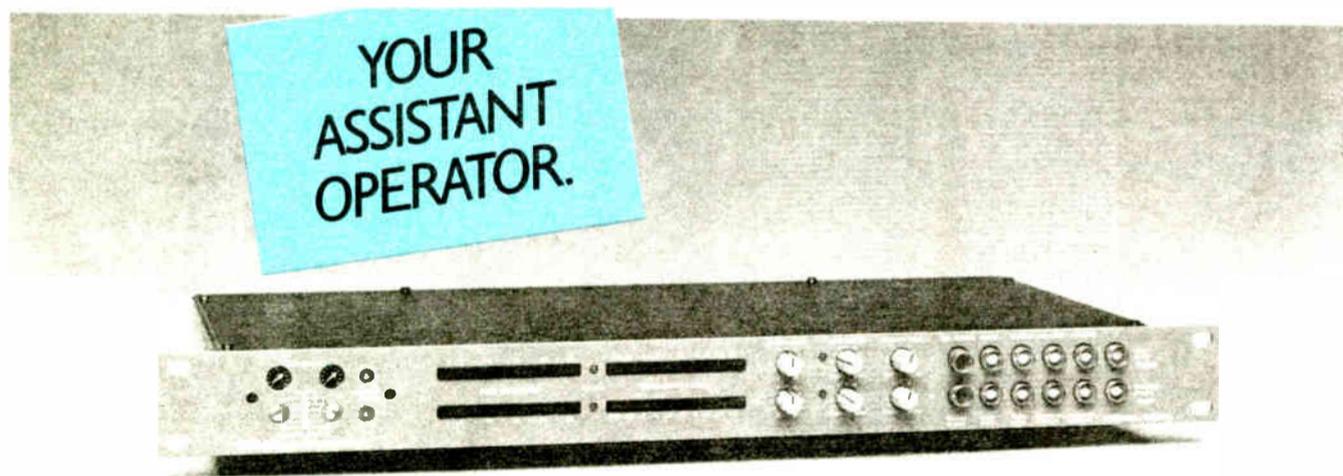
Meanwhile, "the director of USIA, who is a statutory member of the commission, has indicated in a statement that the agency (USIA) would like very much to be considered as a tenant for the building," said Richard Roth, USIA's head of administration and technology. But in order for this to happen, "someone is going to have to change GSA's mind," he commented.

"We're making an effort and we feel we have a good case, but there's no set process for developing a tenancy," Roth said. "It's hard to speculate."

For Peterson, speculation can only be taken so far. "Sure if it happens, there'll be disappointment. But right now, I'm building these studios as best as I can and hopefully for as long as we're here, they'll do good service."

"If we ever happen to move, a lot of the equipment could go over. We'd just have to build some new physical facilities," he said.

For more information, contact Bob Peterson at VOA, 202-485-9579; Gary Marco at the NFFE, 202-479-7029; and the USIA Office of Inspector General at 202-485-7931.



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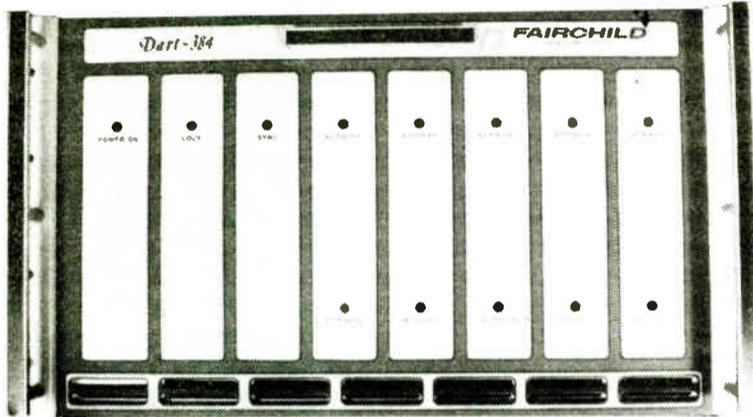
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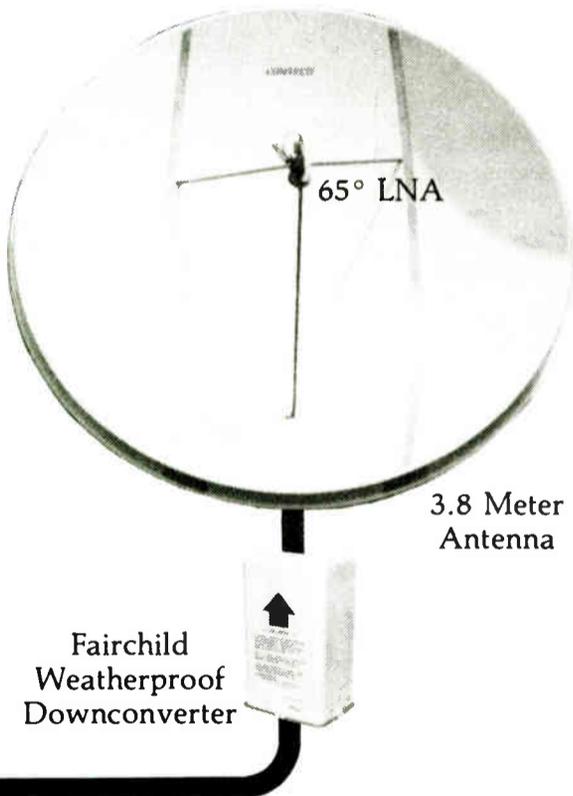
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Deadline Extended in FM Antenna Filings

by Alan Carter

Washington DC ... The FCC has extended the comment deadline for a proposal that would allow broadcasters to use short-spaced FM transmitting antenna sites and allow short-spaced stations to use FM directional antennas.

On a motion filed by Greater Media, the Commission extended the comment deadline from 27 May to 5 August and the reply comment deadline from 27 June to 5 September. The Notice of Proposed Rule Making in MM 87-121 was adopted 25 February.

Greater Media argued that the complexity of the issue required more time for broadcasters to make their review. According to the FCC order granting the extension, the broadcast group stated that the notice apparently indicated a transition to a demand-based allocation system that is premised upon contour protection, rather than mileage separations and a Table of Allotments.

Supporting that argument, Greater Media contended that the action proposes to introduce use of directional antennas in the allocation process, to allow short-spaced stations to accept interference, and to reduce the contour protection standard applicable to Class B stations.

Although granting the motion for extension, the Commission noted that Greater Media overstated the intent of the proceeding. "Nonetheless, in light of

the depth and complexity of the proposed interference protection standards, directional antenna issues, and other related technical matters ... , we believe that additional time for filing comments is warranted, and that the public interest would be served by a grant of Greater Media's request," the FCC wrote.

Under the proposal, which stems from a Notice of Inquiry issued in May 1987, any short-spaced facility would be required to provide a signal of 3.16 mV/m over the community of license.

Existing stations and allotments would be protected from interference to the theoretical limit of maximum permitted facilities, while short-spaced facilities would be protected to actual service area contours only. A uniform 1 mV/m contour protection is proposed for all stations, including Class Bs.

Commercial FM stations under current rules must comply with minimum distance separations, except for stations that existed prior to the adoption of the current table of assignments and for stations using designated antenna farms.

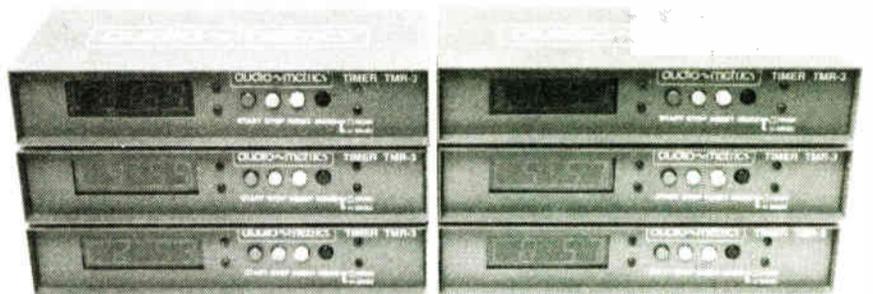
Broadcaster comments on the notice of inquiry were mixed. Many supported the proposal but warned that directional antennas should not be used on a widespread basis.

The NAB argued against the proposal, saying it could increase clutter and interference on the FM band.

For information on MM 87-121, contact Bernard Gordon at the FCC, 202-632-9660.

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FCC Nominees Still in Limbo

by Alan Carter

Washington DC . . . The FCC will have to continue operating with two vacancies as confirmation of White House nominees for the posts remains bogged down in political quagmire.

Confirmation hearings have not been scheduled, and there are no indications as to when attorney Susan Wing and FCC staff member Bradley Holmes will get their day on Capitol Hill.

The FCC has operated with only three commissioners since December 1987 when Mimi Dawson became deputy secretary of transportation. The other commissioner spot has been open since



Susan Wing

April 1987 when Dennis Patrick became chairman after the resignation of former chairman Mark Fowler.

Sen. Ernest Hollings (D-SC), chairman of the Commerce Committee that holds the hearings, is not interested in moving the process forward. He has said he does not believe the Senate will approve either nominee.

A spokesperson for Sen. Daniel Inouye (D-HI), chairman of the communications subcommittee with which hearings are coordinated, said in mid-June there is no word on what will happen. "We haven't been told not to schedule hearings, but we haven't been told to schedule hearings," the spokesperson said.

He also pointed out that time may be running out because Congress is scheduled to adjourn 8 October.

President Reagan also may have assured Hollings that he wouldn't "do a backdoor thing" with the nominees, according to Pluria Marshall, chairman of the National Black Media Coalition.

The Holmes and Wing nominations are "dead," Marshall said. "They've got so many tradeoffs."

Wing declined to comment on the situation.

Holmes said he is "disappointed that I haven't had an opportunity to have a

full and fair hearing."

Holmes, currently chief of the Policy and Rules Division of the FCC's Mass Media Bureau, was nominated in November 1987 to fill the unexpired term of Fowler which ends June 1990. Wing, an attorney with the firm of Hogan & Hartson, was nominated in December to replace Dawson for a term that expired

June 1988.

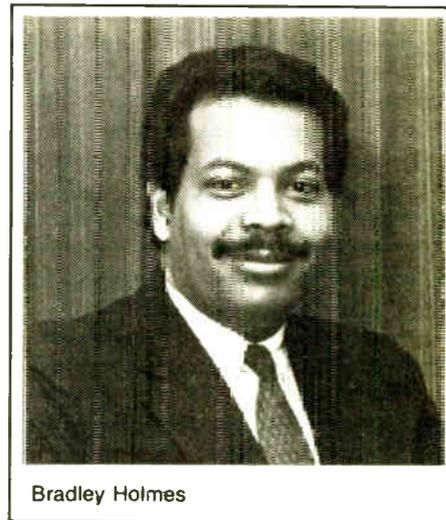
At the 1988 NAB convention in Las Vegas, President Reagan criticized Congress for not scheduling confirmation hearings.

"Until these nominations are confirmed by the Senate, the FCC cannot operate

effectively—yet for all these months, the Senate has failed even to hold confirmation hearings, much less bring the nomination to a vote," Reagan said.

At that time, the President linked the slowdown with his veto of the Fairness Doctrine legislation. However, he upheld his action, saying, "There is no reason to substitute the judgment of Washington bureaucrats for that of professional broadcasters."

Holmes said he is "disappointed that I haven't had an opportunity to have a full and fair hearing."



Bradley Holmes

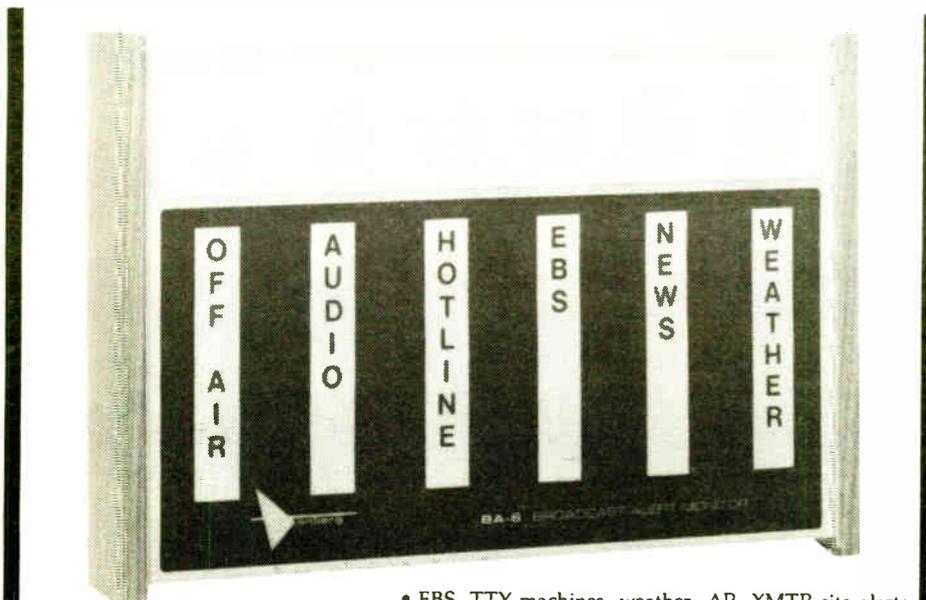
In addition to Patrick, serving on the Commission are James Quello and Patricia Dennis.

Although Patrick's job as chairman is at the pleasure of the President, his appointment to the FCC isn't up until June 1992. Quello, who is serving his third term, was appointed until 1991. Dennis is filling the unexpired term of Henry Rivera, which is up in June 1989.

New commissioners, under recent rule changes, will be appointed for five-year terms.

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

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FlexPatch™, a feature which gives a certain amount of built-in redundancy, rates particularly high: "Many Class A stations don't have the money for two transmitters," Larry says. "With FlexPatch, impedance matched stages allow patching of the exciter to the PA in case of IPA failure. And the FM-3.5K still delivers 1200 watts of power! It's a wonder that this hasn't been part of quality transmitter design before."

"Single phase power is a real cost and headache saver, especially in remote transmitter installations. And automatic VSWR foldback is an excellent peace-of-mind feature that could save feedline, transmitter or antenna."

"The FM-3.5K installs easily, has extensive status indicators and is remote-control ready. It's one of the finest transmitters in this power range I have seen," he adds.

Find out more about the Harris FM-3.5K. Call now for your free brochure: 1-800-4-HARRIS, Extension 3007. Or write to Harris Broadcast Division, Radio Sales, P.O. Box 4290, Quincy, Illinois 62305-4290.



NRSC Briefed on Listening Test

by Judith Gross

Chicago IL ... Current FCC interference protection contours are sufficient for co-channel AM stations but woefully inadequate for adjacent channels, according to psychoacoustic listening tests

The B. Angell study, which has been used as the basis for the NAB's comments on the FCC review of AM allotment criteria, interviewed 500 individuals over 18 years old living in Burlington, VT; Jacksonville, FL; Chicago; Wichita, KS and Los Angeles.



B. Angell's Joseph Adler (standing) and Katherine Buckley (center) address the NRSC.

conducted for the NAB.

In addition, listeners generally accept much less interference on talk segments than they do on music, and interference tolerance can vary according to the type of music a station plays.

The preliminary findings of a study by Chicago-based B. Angell & Associates were revealed to the NRSC in a June meeting held at the close of the summer Consumer Electronics Show here.

Participants had to own at least one radio and listen at least an hour but not more than 10 hours a day. Also at least a quarter of those surveyed had to be AM listeners.

Two types of station interference—adjacent and co-channel—were tested. Monophonic AM recordings with each type of interference were created by the NAB using DAT tape recorded first-generation onto a cassette.

The rooms in which the listening tests were conducted were equalized for a flat response using pink noise.

Three music formats and a talk segment were tested. The music formats were AOR/Urban/CHR, Country/AC and Easy Listening/Beautiful. The News/Talk segments were tested with both talk and music interference.

The B. Angell study tested a variety of desired to undesired signal strengths in a wideband mode of 9 kHz and narrowband mode of 6 kHz.

Overall, the study reported that the minimum acceptable interference ratio of desired to undesired signals (D/U) was 26 dB in the wideband mode for co-channels. Any co-channel signals with a D/U ratio of 22 dB (wide) or 28 dB (narrow) or less were found to be unacceptable.

Stan Salek, NAB staff engineer, pointed out that those figures correspond to the FCC's current allocation policy for co-channel station protection contours.

However, for adjacent channels the minimum acceptable D/U interference ratio was 16 dB which Salek pointed out is far greater than the 0 dB allowed (not required) by the FCC in its current adjacent channel allocations policy.

Adjacent channels with a D/U ratio of 12 dB (wide) and 6 dB (narrow) or less were found to be unacceptable.

In specific formats, however, the acceptable and unacceptable figures differed widely, with music interference to news/talk segments drawing the least interference tolerance from listeners.

In addition to the results of the listening tests, the prospects of an FCC rule

making on a mandatory NRSC standard came up for discussion.

Members voiced concern that the Commission would include only the RF mask transmission standard (NRSC 2) and not the preemphasis and 10 kHz stopband audio standard (NRSC 1) in a rule making proposal.

The NAB has filed a petition for a mandatory NRSC 1 with the Commission which has received widespread industry support but has declined to do the same with NRSC 2 until methods of verification and other problems are solved.

Receiver manufacturers present supported the idea of including both portions in a mandatory rule making in order to encourage the marketing of wideband NRSC radios.

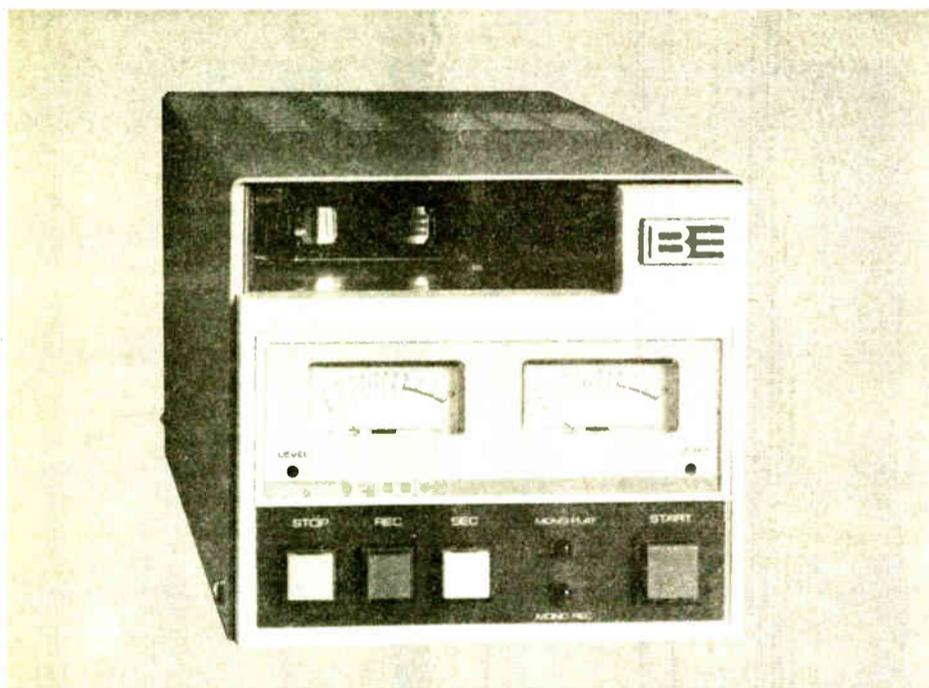
NRSC chairman Charles Morgan of Susquehanna Radio Corp. asked for a delegation of receiver manufacturers and broadcasters to meet with FCC staff and encourage the inclusion of both portions of the NRSC standard.

But Mass Media Bureau chief Alex Felker told *Radio World* that the Commission's intentions on the NRSC standard had not changed since it said a rule making would be forthcoming.

Felker said that while the Commission was more inclined to look at "outputs" rather than "inputs," both the transmission and audio portions of the standard would likely be included in a rule making.

"My recommendation would be to consider a range of alternatives," Felker said. He explained that the FCC would examine comments on the NRSC and "ultimately decide on the basis of what best serves the public."

For more NRSC information contact Stan Salek at the NAB, 202-429-5346 or Eb Tingley at the EIA 202-457-4975.



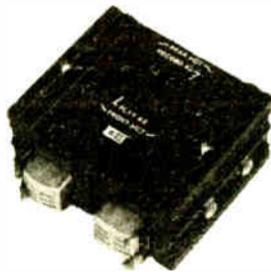
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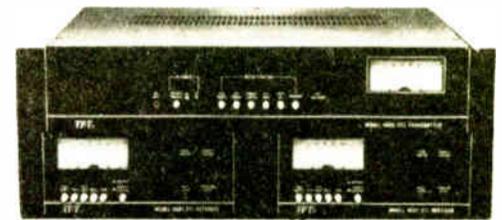
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Circle Reader Service 35 on Page 22

FMX Makes A Showing at CES

by Judith Gross

Chicago IL ... Broadcast Technology Partners, proponents of the FMX stereo extension system for FM continued to drum up support for the system with news of more equipment and receiver manufacturers as well as broadcasters adopting the new technology.

But at least one spokesman from the consumer side of the industry has criticized FMX's developers for working behind closed doors on a technology which is attempting to set an industry standard.

BTP showed more than a dozen prototype receivers in a suite at the summer Consumer Electronics Show held here in

come from broadcasters who plan to adopt the system. In April CBS announced that its 11 FM stations would make the conversion. Two other groups, Gannett with 10 FM stations and Buckley Broadcasting with nine stations have also announced plans to switch to FMX.

Torick and BTP expressed continued optimism about FMX's acceptance and released a list of 22 stations which have already converted, including the 11 CBS FMs.

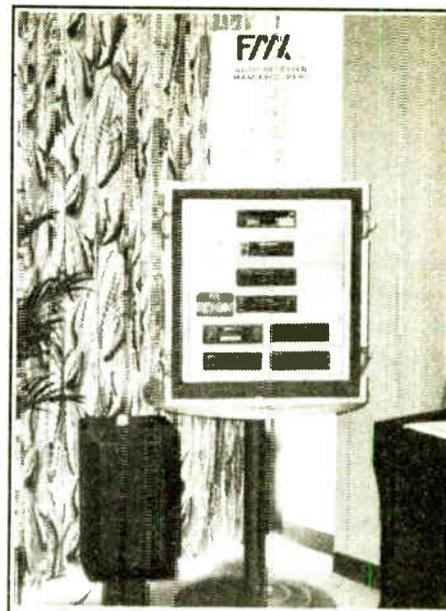
But at an NRSC meeting held after the CES, Eb Tingley of the Electronic Industries Association and a co-convenor of the NRSC, lamented the fact that FMX had not been subject to more industry scrutiny.

"As a private development, it's a business, so its performance and limitations are not a matter of public record. As a standards making body, there is a concern," Tingley said.

He added that FMX was the first enhancement of its kind which had not been developed "in a goldfish bowl" and said he hoped its developers "would go public" with it.

Some NRSC members suggested examining it in future NRSC meetings, but other members raised the possibility of a conflict of interest, since NAB is both a co-developer of the FMX system and a co-convenor of the committee.

Contact Broadcast Technology Partners at 203-622-2804 for information on FMX.



FMX receiver prototypes at CES

In April CBS announced that its 11 FM stations would make the (FMX) conversion.

June. There were home units from Denon, Fisher Luxman Magnum Dynalab and Sansui, and auto radios from Alpine, Denon, Clarion, Concord, Eclipse, Kenwood, Sansui, Sparkomatic Sanyo and Technics.

One manufacturer, NAD Electronics, already has a limited supply of FMX receivers available, although the company is not yet ready to offer them on a widescale basis, according to FMX co-developer Emil Torick.

Torick said he anticipated FMX receivers to be on the market by "early next year." He explained that two companies which had announced plans to manufacture FMX decoder chips, Sanyo and Sprague, are anticipating production runs of the ICs later this year.

A third chip manufacturer, Motorola, recently announced plans to manufacture FMX IC decoders and have them available next year.

More good news for FMX has come in the availability of test equipment for receiver manufacturers. RE Instruments is producing a programmable FMX test generator and another firm, Kikusui is offering an FMX multiplex signal generator.

On the broadcast side of things, Inovonics currently offers FMX exciters while Aphex, Orban and CRL are still evaluating the system since its modifications to correct problems which surfaced when the technology was first introduced in 1986.

A fifth manufacturer, Texar, has also announced plans to make FMX an option on its processors.

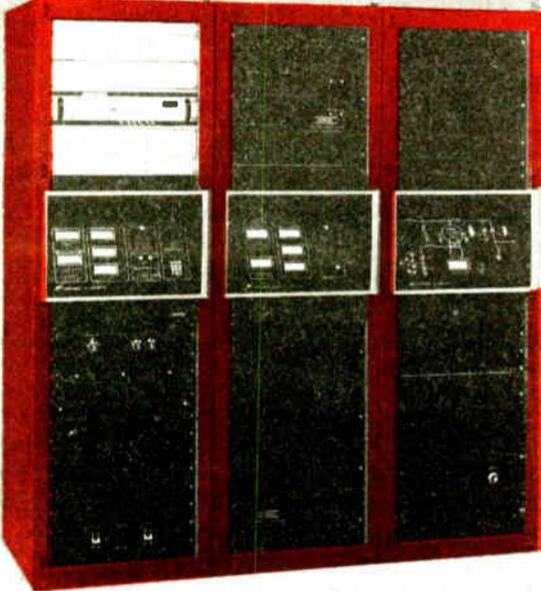
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NAB Awaits AM Audience Surveys

by Alan Carter

Washington DC ... The NAB is awaiting results on two non-technical studies aimed at helping AM. One is examining listener expectations and beliefs and a second addresses program formats.

These two are in addition to the psychoacoustic tests done by Chicago-based B. Angell and Associates which were included in the association's comments to the FCC on AM technical standards.

NAB officials, at a briefing following the May Executive Committee meeting, noted various preliminary findings in a listener study being conducted by Bill Moyes of The Research Group. Among them was evidence of a "significant" erosion in the number of AM listeners.

Listenership between 1986 and 1987 declined from a low of 3% among 18 to 24 year olds to a high of 11% for those 35 to 44 and 55 to 64, according to research Moyes. Other declines included: 10% for ages 12 to 17; 6% for ages 25 to

"Would you listen to an AM station if it had fewer interruptions, providing the fidelity was there?"

34, and 10%, ages 45 to 54.

Radio Board Chairman Jerry Lyman, president RKO Radio, called the numbers "staggering"—in particular the decrease in listeners 40 to 50 years old.

Tangible evidence

Moyes is conducting one of NAB's projects to provide "tangible" evidence on why people are not listening to AM, Lyman said. "We are very optimistic this research project will take the whole topic of AM improvements outside the industry's insider viewpoint," Lyman said.

Moyes has completed the first phase of the NAB project, using focus groups and one-on-one interviews. The second

phase will be a strategic study of 1,800 adults over 18 years old. A third phase, not yet funded, would involve on-the-spot testing.

Among the areas Moyes is examining are strongly held negatives on AM and what would encourage people to listen to it more. Other questions look at the term "AM stereo," asking whether it is the best term to describe improved fidelity stereophonic AM and how AM is perceived overall.

Lyman said a typical question might be: "Would you listen to an AM station if it had fewer interruptions, providing the fidelity was there?"

"The whole AM problem is a problem this association is trying to deal with," Lyman said.

The final results of Moyes' work will be available in September at the NAB's Radio '88 Convention in Washington.

The second study is a survey of program directors by Jon Perikhal, a program consultant, on a wide spectrum of formats on the future of radio programming. It will also be released at the fall radio convention.

High costs

The research projects, and work on the "Super Radio," is costing NAB \$150,000, according to officials.

Additionally, the NAB is spending \$300,000 on the Radio Futures Committee project, being conducted jointly with the Radio Advertising Bureau. RAB's share is also \$300,000.

These and other unbudgeted projects for work on HDTV that total about \$1 million has forced the NAB to examine ways to increase revenue, including a possible dues increase, according to officials. NAB officials will examine the subject further at the Joint Board of Directors meeting 21-24 June.

"Never before have we undertaken this number of six-figure projects," said Joint Board Chairman Wally Jorgensen.

Officials said NAB now is drawing money from its reserves.

For more information, contact NAB public affairs office at 202-429-5350.

Motorola Files for AM Stereo Court Action

Chicago IL ... Motorola has filed a complaint against Hazeltine Research and Leonard Kahn here in federal court asking the court to resolve a patent dispute over AM stereo circuitry.

Motorola filed for a declaratory judgment 27 May in US District Court for the Northern District of Illinois. The action comes a month after Kahn filed a patent infringement suit against General Motors, which purchases integrated circuits from Motorola for use in AM stereo car radios.

Hazeltine, based in Elmhurst, IL, owns exclusive rights to patent 4,018,944 entitled "Compatible AM Stereophonic Receivers" of ISB stereo. But Kahn, who is the inventor, claims limited rights to enforce certain claims of the patent.

Motorola asked the court to stop Hazeltine and Kahn from making claim on the patent against Motorola, GM or any other Motorola customers, according to the court filing. Motorola also requested that the court award the company court costs and legal fees.

Kahn refused to comment to Radio World. Leonard Stark, a New York attorney representing Kahn in his suit against GM also declined to comment. Hazeltine does not comment on pending litigation, according to Edward Onders, associate general counsel of Hazeltine Corp., of which Hazeltine Research is a wholly-owned subsidiary.

Supporting the request in the filing, Motorola asked the court to rule that the patent is invalid and void, and thus, Motorola has not infringed on the patent. The claim is based on statutory requirements concerning patents, according to the filing.

Motorola also asked the court to consider the patent unenforceable "because of the defendants' inequitable conduct and misuse."

Motorola argued that "no product made, used or sold by Motorola" is applicable under the patent at question. "... Neither Motorola nor its customers infringe the '944 Patent," the company stated.

In his suit against GM, Kahn alleged that GM infringed on two claims of the patent with respect to single-system AM stereo radio receivers that incorporate Delco part number DM-235 or Motorola part number MC13020P integrated circuits.

He argued that GM marketed AM stereo radio receivers using the DM-235, developed jointly with Motorola, in competition with a multisystem car radio. Motorola's C-QUAM AM stereo is used in GM's Delco radios.

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."

For information from Motorola, contact the corporate public relations department at 312-576-5304. Contact Leonard Kahn at 516-222-2221 and Hazeltine Corp. at 516-261-7000.

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NAB Antenna Project Under Way

(continued from page 3)

that has approached reality through a slow, deliberate process. In June, a lease for the test site was prepared on property owned by Washington's Howard University.

Once the radio application is approved, construction of the antenna is expected to begin, said Stan Salek, NAB staff engineer.

"Essentially, all of the planning has been done. It's time to build it now," he said. "Once the permit is granted, the actual construction phase can go into motion rather quickly."

The construction phase probably will take a few months, he said, though the onset of winter could cause delays.

"Depending on how quickly the application is granted, the work could start before winter," Salek said. "If it gets too close, it may be partially constructed this year with completion in the spring. Depending on how far it can be constructed this year, maybe some things can also be done in the winter."

The radio application will endure for two years, during which time the Prestholdt design will be tested, though other new antenna designs may be tested if time permits, Salek said.

Until recently, a monopole-ring radiator antenna designed by Richard Biby of Communications Engineering Services in Arlington, VA, was to be included in testing.

The Biby antenna was originally planned for a separate testing site in Loudoun County. The scale of the antenna was reduced after NEC computer modeling by the Naval Post Graduate School, among others, alleged that the antenna would behave differently than predicted by Biby.

Biby later informed the NAB he wished to withdraw from the project because he felt the timetable for it would interfere with his consulting work and family. The NAB then said the Biby antenna might be constructed on the Belts-

ville site once the Prestholdt antenna was completed and tested.

Michael Rau, VP of Science & Technol-

ogy said the Biby antenna may still be included, time permitting. "If we have time toward the latter part of the test period we'll invite Dick (Biby) to partici-

pate. We don't have any plans right now," Rau said.

He added, "There's some dispute

"The feeling here is that we've got a better shot coming up with something usable by doing the Prestholdt antenna first."

from the industry whether the antenna is worth putting into real life. The feeling here is that we've got a better shot coming up with something us-

able by doing the Prestholdt antenna first."

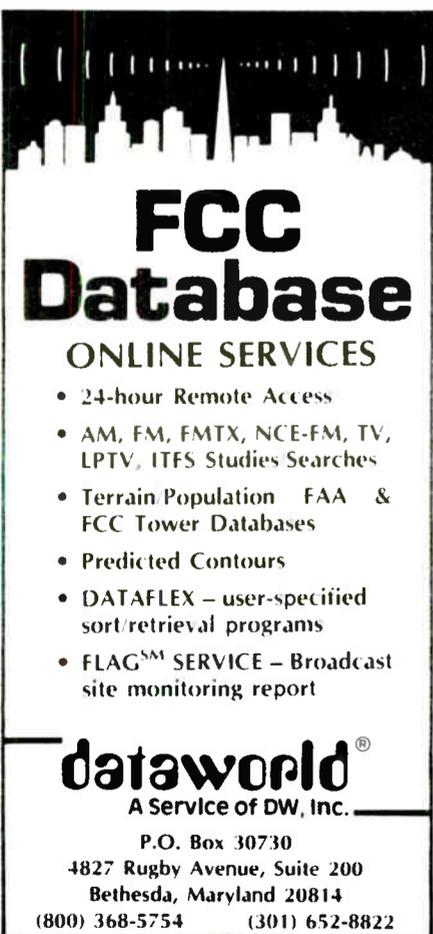
able by doing the Prestholdt antenna first."

Biby, although not directly informed of the shift in the NAB's position, countered that it was only at the NAB's insistence that he participated in the project from the beginning.

"I did not ask for the NAB's support. Frankly, I didn't want the NAB's support," Biby said, adding, "when I feel that it's the proper time and the proper place for testing, I will probably do it on my own."

Among the other anti-skywave antenna designs the NAB is considering is a concept developed by Ron Rackley and Harold Kassens of the consulting firm duTreil, Lundin and Rackley. It's a low-profile antenna with a low angle of radiation.

Contact Stan Salek at the NAB, 202-429-5346.



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When Winning Becomes Losing

by John "Q" Shepler

Rockford IL . . . You round the corner to the reception room and there he is, already red in the face. It's the station's top client and he's furious at you.

Immediately you tense. Battle stations. What's this guy going to do?

The client draws a bead on you. His neck is pulsating. Then he unleashes a non-stop string of expletives and accusations.

"Incompetent jerks . . . you ruined my grand opening with your junk equipment!"

That did it. This madman needs to be put in his place. Still in control, you avoid the expletives. "Hey, is it my fault it rained and we had to move inside? Anybody knows you can't get a VHF signal out of a lousy tin building like yours."

You've got him for a second. He steps back, gathering his thoughts. Then his eye catches the GM hustling down the hall and he moves slowly in that direction, maintaining an icy stare but no further words. The two of them disappear into the GM's office.

With some satisfaction you stop pumping adrenaline and make your way back to the production studio.

Later that afternoon, the GM calls a meeting to solemnly explain that the poor results of the last remote resulted in a lost contract. You suppress a snicker. Then comes an unexpected blow.

The unanticipated loss of revenue will result in some near-term belt tightening, including postponement of the new studio project. You feel like that crazed cli-

ent just came back and kicked you in the stomach.

When winning is losing

Sometimes you think you've come out on top of a confrontation but you really haven't. All you achieved was a moment's victory. Your adversary took revenge later and emerged the true victor. It's called "winning the battle and losing the war."

Yes, there are times when it just doesn't pay to win. In fact you almost never win an argument with anyone who is a customer. The customer may not always be right, but customers can and do take their business elsewhere.

Customers aren't limited to just the station's advertisers. Anyone who listens to the station is a customer. An angry listener will flip to another station in an instant, and may go so far as to complain to the station owner or write disparaging letters to the newspaper.

How about bosses? There is nothing so personally threatening as an irate boss. When the top dog comes unglued—look out. You could get canned just for looking in the wrong direction.

Even your peers can cause problems. The PD and CE are pretty much equals in the eyes of station management. When that relationship turns sour you can find yourself in a war that can destroy both of you.

Say you manage to get the upper hand and force the other guy out. You'll be hailed as the victor, right? Not hardly. An ugly power struggle like that will taint

your own reputation for a long time

Take it from someone who's been there. The spoils of war aren't nearly as sweet as you might think.

Keep it cool

The best way to win these battles is to never let them happen. Build relationships so that you get early warnings of trouble and then work to defuse the problems before they escalate into something uncontrollable.

Q-Tips

Take the irate client. By the time he stormed through the station's front door the best opportunities for preventing a crisis had already evaporated.

What could have been done? That day of the remote when you were setting up. The clouds were threatening, right? You could have taken the client aside, right then, and said something.

"It looks like the weather could really turn on us. That could present some problems because if we have to move indoors the relay signal back to the station won't be strong enough to get out of the building.

"However I've planned for that contingency and can get back on the air using your business telephone line. The sound quality will be quite a bit different but we can certainly keep the grand opening celebration going."

You are now off the hook. Sure, the client's going to be crushed when a flash

flood washes away the biggest party of his life. But he can't get too mad at somebody who not only warned him but had a plan ready to salvage the situation.

It's not always this easy. You may not have seen the storm coming either. In fact you may have been dragged away from a baseball game on your day off, just to find out that the part-timer running the remote ran inside and left the transmitter to drown in the cloudburst. You're just as hacked off as the client.

Even after the event though, there are still opportunities to salvage something of the situation. When Mr. Red Face blasts through the door, let him lose it for a minute.

Be as polite and attentive as you can. *Don't argue!*

When the tirade is over, offer to sit down with him and the GM and see what you can work out. GMs are good at this. You probably won't have to do much besides apologize a couple of times and nod sympathetically.

In the end, he'll probably wind up with a make-good remote, a bunch of freebie spots and you'll fix his broken PA system, gratis. Two months later, all is forgiven and he's spending more than ever. Victory.

Techniques to save the day

There are some other ways to defuse those tense situations. First, get away to cool off. If you can avoid a confrontation until emotions subside more options will seem to be available.

Stay away—let someone who is not
(continued on next page)

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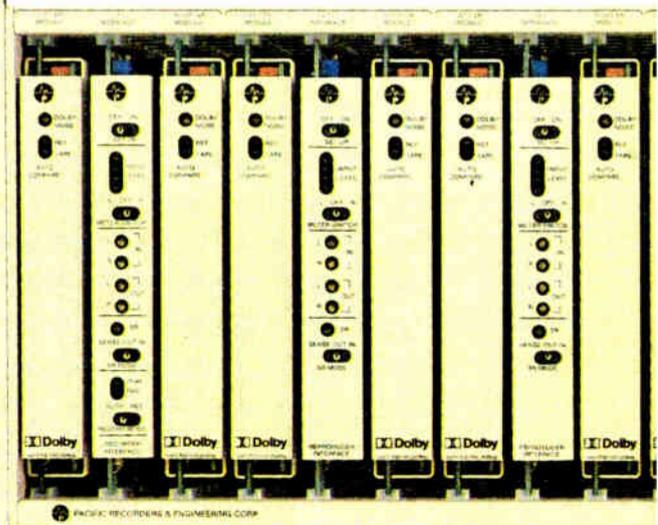
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Practicing the Art of Negotiation

(continued from previous page) emotionally involved work on the problem.

When you do make your first approach, try humor. A good laugh, especially if it's on yourself, evaporates a lot of tension.

Be agreeable. Tell the other person he's right and you're wrong. Even if it's the other way around.

Pay compliments and give lots of strokes. It's hard to argue with someone who is saying nice things about you.

Be helpful—do as many small favors as you can think of. Bring coffee, tack up a new receiving antenna, re-boot the accountant's PC that just crashed.

Offer alternatives. If you can't get the AM back on, play the listener's favorite song on the FM.

Do extra work such as staying late to change all of the pinch rollers, even though only one ate the last copy of the PD's favorite oldie.

When confrontation is necessary

There are times when no amount of cooperation or appeasement will keep you out of trouble. In fact, bullies feed on what they see as weakness and move in for the kill.

Your challenger may be a peer, such as a PD who thinks all engineers are geeks. It may be the all-night wimp who is out to get you for telling his girlfriend she couldn't crash in the transmitter room.

Maybe it's the engineer at the rinky-dink outfit across town who's after your job. Maybe it's you who has to blow the whistle on some wrongdoing

at the station.

Regardless, you either defend yourself or lose. I'll still suggest maintaining your professional cool as long as possible. This is especially important in heated discussions where the manager doesn't know who's right and is still trying to sort things out.

Present your case calmly and logically. Stick to the facts. Forget name calling. But . . . don't be afraid of telling it exactly like it is.

Don't be so passive that you decline to mention that this other individual was drinking beer and throwing empty cans

at the lightning gaps last night. Or that you and a witness saw him stealing CDs from the music library.

Or that you did indeed clean the transmitter last month and here's the maintenance log to prove it.

You know you're in the right, but the attacks persist. Your foe is just too conniving. He's thought up a whole pack of lies and is rattling them off, one by one. Now it's war!

Go ahead, raise your voice. Point fingers. Get red in the face. Turn the attack around. Make accusations. Get him so defensive that he starts tripping up

When one lie starts to contradict another, you've got em'.

Hopefully, your major confrontations will be few and far between. You'll have them, though. We all do. In those times you need the self-confidence to stand up and defend yourself and your principles to whatever extent is required. Then when the dust clears, you can continue your journey down the road of success.

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

Moving a Transmitter, All Uphill

by Tim McCartney

Boise ID . . . KBSU's transmitter move to a mountain top concluded in May 1988, complete with challenges unique to the location of a transmitter and antenna at 7,000 feet.

Working on the project from the conceptual stage several years ago to the very end this year was John H. Runkle of Radio Tower Co., Boise, ID. He and his crew were also involved in many of the major phases of installation on Deer Point Mountain.

The project began as soon as local regulations would allow: the day after the end of ski season. The next day John and his crew used a mid-sized bulldozer to plow huge amounts of snow along the 2.7 mile mountain road.

Three days later the path resembled a narrow cut along a winding road but was, indeed, passable to four-wheel drive vehicles.

Fortunately, many of the other "electronics site users" (National Forest Service lingo) helped with the road opening expenses.

Then on day number four 50-mile-per-hour winds hampered, but did not stop, transportation of the equipment to the top. This included a 10 kW transmitter, 6-bay FM antenna with radomes, a 60' mast to support the antenna bays, 270' of three" heliax, an 8' STL dish and related smaller items.

The photos of this move show a bulldozer pulling a pickup truck pulling a trailer up the mountain road. John and his crew needed that "something extra"

for this one.

Subsequent nastier weather halted all outdoor work for 10 days while indoor efforts continued.

Inside tasks

The contractors for the sheet metal exhaust system, electrical power and dehydrator shelf mounting marched easily through their work.

A custom-designed mounting bracket was needed to suspend the four-port RF switcher from the ceiling. A local welder braved tough weather to do the job—as it so happened, he loved the back country and was only too happy to come to the mountain.

The RF plumbing work involved considerable rigid line cutting and fitting. A **(continued on page 18)**

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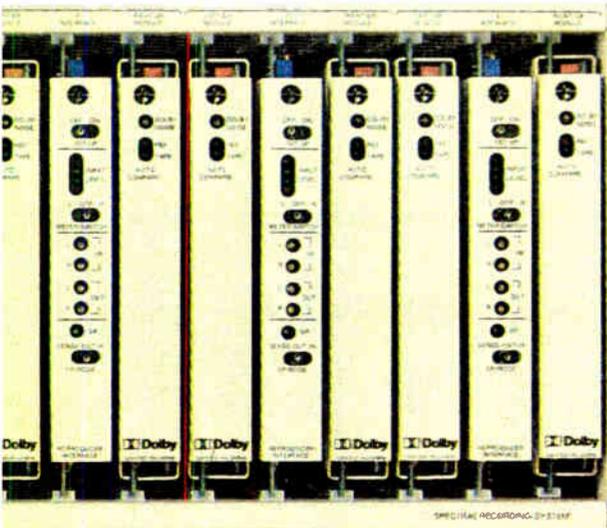


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KBSU's Uphill Climb To Its New Location

(continued from page 17)

rented 4" pipe cutter and hacksaw transformed a 25' rigid line piece into custom sections.

The design called for the switcher to pass RF to the antenna from either the main or back-up transmitter, while the unit not in service is terminated by a reject load. The low pass filter protruding from the main transmitter complicated matters with the introduction of several 90° angles.

One's engineering theory is tested when instructions on the rigid line piece advise "Locate this side towards antenna." How many engineers have ever paid attention to which direction their rigid line faces?

An RF specialist who knows more than I suggested that the manufacturer may have so designated the section for multiple stacking of rigid line pieces, but he wasn't sure either. Despite the minor mystery the advice was followed.

And today the label sits in clear view for all to ponder over. Rather than call the manufacturer to ask why, this approach is far more entertaining.

RF testing

The first RF tests into the reject load were flawless. Fortunately, by this time Mother Nature had seen fit to allow us three good weekdays so that the tower crew could complete its work.

The bad spell of weather was actually wonderful news for Idaho, as some of

the drought's damage was dampened. Thus we had to be happy that our antenna installation was delayed.

KBSU's antenna was to be the eighth FM antenna on the existing 220' self-supporting tower, which is topped by one 40' TV antenna.

Interestingly enough, this structure is the lower half of the former Mt. Sutro tower in San Francisco, which now is home to the marvelous candelabra structure. The top half of this tower now stands somewhere in Montana.

Our mid-point location on this tower required the design and construction of a mast to support the bays. So, a 60' mast of 6 5/8" outer diameter pipe was designed, assembled, sandblasted and galvanized. It was built in three 20' sections for final assembly on the tower.

Putting up the antenna

As for the antenna installation, the rigger took a ride one bay at a time to the final destination on the mast. My lone tower work contribution—from the ground—was to pull a rope so that the rigger and the bay did not hit the tower or the five-bay antenna mounted below our location.

Then the transmission line was rolled off its spool (total weight of 1,300 pounds) down the mountain road until all 270' were laying on the road. The spool was placed in the middle of the road so nobody would drive over our heliax!

The line was hoisted, attached to the

antenna center feed, and fastened to the tower. Once the other end was pulled inside the building, the excess was cut and the flange installed.

The center conductor of the line required careful handling, since it contained RF energy from the other antennas on the tower despite a temporary lowering to 30% power of those stations on the tower.

Next the line was bolted to the RF switcher. The antenna and line were bled and attached to the dehydrator. Then, it was time to put RF into the system. VSWR was less than 1.1:1 and the system worked great!

... it seems that the manufacturers aren't very good about in-house communications.

Coordination with the local channel 6 TV station then began, even before audio modulated the carrier. Noncommercial FM stations in channel 6 TV markets have special FCC requirements to coordinate interference problems.

In our case KBSU was collocated with the channel 6 antenna and, so far, no problems!

Some STL problems

Then, the STL system was completed and aligned. The last remaining 950 MHz band frequency to the mountain worked great. But there was a problem, since the STL transmitter was running at roughly half-power upon installation, and dropping daily.

The manufacturer sent in a new IPA module which resolved the problem just in time. Then, another STL problem appeared: a periodic instant audio cutout, which was later traced to a defective pulse code modulator in the digital STL portion (hop number one) of the system.

A subsequent failure of our fail-safe system periodically dropped the exciter output, again just for an instant.

Meanwhile, the new equipment and construction brought in engineers from other stations to observe and compare experiences.

Our problems paled by comparison with one of the TV stations' experiences in the 1970s. Its engineering staff had used up a full six months in the effort to bring a new transmitter to proper operation.

In the interim the manufacturer was politely invited to come and remove its transmitter, thank you. So, in the "relative" world, we did all right.

Good service, but ...

In general, the manufacturers were excellent on service. It was, as usual, entertaining to observe them discuss problems frankly while simultaneously demonstrating the high quality of their equipment.

Acts of diplomacy varied with honest responses such as "we've had some problems with that module recently," and a large dance to the sidestep with "that's never happened before."

On the basis of observations from these problems, it seems that the manufacturers aren't very good about in-house communications.

If a technician testing our unit at the factory pulls a jumper wire, the customer service technician fails to learn about this little procedure. The result is too much wasted time and money by both the station and the manufacturer.

With all of that said and done, the project is now complete, the signal is strong, and the audio is great. So, it was worth it. And, the new listeners to public radio programming in a previously unserved region are elated.

This Deer Point Mountain location holds major challenges and rewards alike, as KBSU now begins RF operations at 7,000'.

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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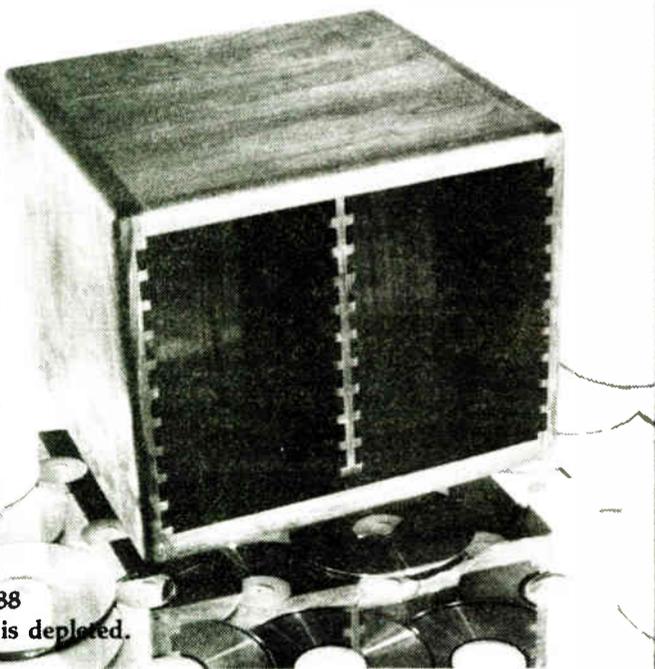
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Keeping Track of Your EBS Tests

by Harold Hallikainen

San Luis Obispo CA . . . Last month we started our review of the station log requirements. Thanks for all the calls on that article!

We'll continue by looking at the "lower right" half of the sample log we printed last month. Dig out the 1 June issue of **Radio World** for the sample log, or give me a call.

Rule 73.931(d) requires a station to insure it is not signing on into an emergency. This is generally done by listening to the EBS receiver. The fact that this was done is not required to be logged, but doing so demonstrates compliance.

Rule 73.1820(a)(1)(iii) requires the logging of EBS tests received and transmitted. EBS tests are to be transmitted once a week on a random basis between 8:30 AM and local sunset.

You should receive an EBS test once a week from your monitor assignment. Failure to receive this test indicates something is wrong with the EBS system. The problem (whether with your receiver or the other station's equipment) should be fixed as soon as possible.

You should also receive EBS test transmissions twice a month from AP and UPI [73.961(b)]. You are required to log the wire service and network EBS tests in the station log by 73.962(e)(4). The FCC may ask for these logs to verify the operation of EBS.

Chief operator log review

Finally, 73.1870(c)(3) requires the chief operator to make a log entry once a week indicating that the logs have been

reviewed.

This review is to insure that the station logs are being completed properly, and that the station has been operating within the terms of its license and the FCC Rules. The chief operator is to take any required corrective action, and to notify the station licensee of any repetitive problems.

As part of this review, insure that all log entries have a signature indicating who made the entry. Make sure an EBS

Insight on Rules

test was transmitted and one was received during the week.

Make sure you get two EBS tests from each wire service during a month. You also need to see that a daily tower light inspection was completed; that all carrier on/off and power/pattern change times are within the terms of the station license and that the power and pattern parameters are within the terms of license.

Maintenance and inspection

Not all the old maintenance log requirements have been moved over to the station log. It would be a good idea to log all transmitter system inspections, remote meter calibrations, frequency and subcarrier level checks, etc., although they are not specifically required to be logged.

This is a case where measurements are required, but the recording of the results are not required. Record-

ing the results demonstrates an effort to comply with the 'as often as necessary' requirements.

Stations that normally determine power by the direct method but temporarily determine power by the indirect method due to failure of a meter or a change in antenna resistance must log the date of commencement and termination of indirect power determination in the station log [73.61].

Rule 73.932(d) requires entries in the station log showing the failure or repair of EBS transmitting and receiving equipment.

Stations operating with PSRA or PSSA with such low power that the antenna monitor does not work are required to take antenna monitor readings immediately prior to changing to PSRA or PSSA [73.99(1)]. The rules do not say to log the readings, but it might be a good idea.

Finally, logs must be retained for two years, but the Commission may require you to retain them longer [73.1840(a)]. Logs may be kept on microfilm or other data storage systems. Suitable equipment for viewing the logs must be available to the FCC [73.1840(b)].

Log corrections

Since all log entries are accompanied by a signature attesting to their accuracy,

it would seem unlikely that log corrections would be required.

However, should they be required, they must be made by striking out the erroneous portion (not erasing or obliterating it!), making the correction, and an explanation on the log as to why the correction is required.

Such corrections are to be made by the operator who made the log entry, the station chief operator, station manager, or an officer of the licensee (typically an officer of the licensee corporation). The person making the correction also needs to sign and date the correction.

In talking with station engineers around the country, I've found several have thought that the "logs were eliminated."

Although the logging requirements have been relaxed substantially (back in 1978), the logs are still required, and there are several required entries. Make sure your station is complying.

Next month we'll look at operator requirements. The chief operator requirements first appeared when the FCC allowed "lesser grade operators" (those with less than a First Class Radiotelephone license) to operate directional stations. Now, all stations must have a designated chief operator.

"Til then, keep it legal!

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

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What to Do About Amplipath

by Joel Bump

Part IV of IV

Canyon Lake CA . . . In the first 3 parts of this series, we have covered AM noise, its effects, its sources and pitfalls in common measurements .

In this final segment we'll examine what to do about it on a daily basis.

Just how much is enough? I have heard discussions between engineers about how to get that extra dB of AM noise attenuation (from 59 to 60, or perhaps 65 to 66).

Yet I have also heard an engineer for a transmitter manufacturer purportedly quoted as saying "Nobody needs more than 35 dB attenuation in any FM transmitter."

Transmitters vary

During the development of Radio Design Labs' ACM-1 Noise Monitor, I have had occasion to observe the performance of many transmitters.

The name brand of the transmitter is not nearly as important as the specific design.

Some similar models may perform well with broadband drivers, while doing poorly when the driver stage is "narrowed up" to get more power from the transmitter.

Most transmitters are capable of -35 to -45 dB attenuation. Occasionally I find one which won't do better than -25 dB, although performing well in other areas.

From time to time one is encountered which will do in the 50s. The very rare exception is -60 dB or a little better.

In making many measurements I have found that more than half the transmit-

probably get away with a -30 dB figure, provided no additional subcarriers have been added. (Mind you, I am not advocating -30 dB!)

The greater the fundamental multipath which exists, the greater the need for AM noise attenuation. Also, use of subcarriers dictates that AM noise be well controlled.

I believe the reason many engineers

**. . . an engineer for a transmitter manufacturer purportedly (said)
"nobody needs more than 35 dB attenuation in any FM transmitter."**

ters aren't doing better than -25 dB initially when an accurate peak AM noise monitor is connected!

This even includes major market stations and stations using a variety of "nulling" techniques. A real qualitative AM noise figure is indispensable.

Station tolerance

So just how much is enough? That really depends on the station.

A small station serving a small local community with no real value derived from solid rural highway coverage can

and programmers object to SCA operation is that there has, in the past, been no effective way to control and monitor AM noise. For some stations, this can mean substantial lost revenues.

Controlling AM noise is paramount in keeping crosstalk out of subcarriers. And we must remember that the 38 kHz stereo subcarrier is indeed a subcarrier.

In a very competitive marketplace where critical evaluation is consistently made on a very clean facility, the difference between -50 dB and -60 dB may be noticed.

So a wide variety of opinions may be correct.

In applications where a 67 kHz subcarrier is used in a station with moderate hilly terrain, and given a reasonable expectation of the subcarrier service area, any peak AM noise content greater than

-40 dB generally seems to be considered noticeable or objectionable.

I know that many engineers have found this to be a worst-case figure for their stations.

Personally, I prefer to see at least -50 dB attainable, due to the normal drift of AM noise in many transmitters.

No "one-shot" tuning

Unfortunately many transmitters will not do better than -45 dB after a great deal of serious tuning and adjusting.

Is the station safe, then, to do a "one-shot" tuning for minimum AM noise and presume all to be well for several months if a -45 dB can be obtained (by an accurate measurement instrument)?

Quite the contrary! I have observed several transmitters which are reasonably stable in long-term AM noise operation.

It is not unusual to see 5 dB or more of change in peak AM noise over the course of a given day.

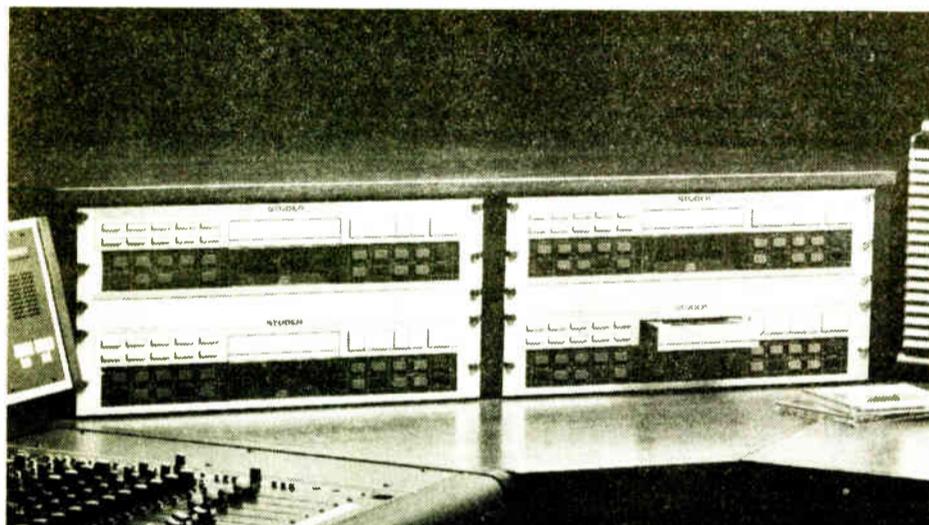
This is in addition to the noticeable long-term drift, which may occur over a period of from one to six months depending on the transmitter and the age of the final tube.

Daily drift may be caused by a variety of factors, such as temperature and changes in AC main voltage.

Transmitters with automatic power control may exhibit greater changes, particularly in tetrode amplifiers if the screen voltage is adjusted to maintain power output.

Unless the AM noise is well into the -50 dBs the effect of the power controller may be considerably worse than the insignificant loss of a few percentage points of power.

The solutions the station engineer may
(continued on page 24)



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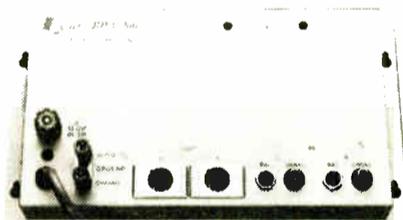
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Circle Reader Service 24 on Page 22

Vandalized Station Back On Air

by Charles Taylor

Danbury CT . . . When stations WDAQ-FM and WLAD-AM suddenly popped off the air at 5:06 PM on 22 April, it didn't take long for police and the station's operations manager to discover the problem.

At the transmitter set-up 1½ miles from the station, vandals had set fire to four transmitters, causing a total of \$250,000 worth of damage.

But thanks to quick thinking from station personnel and a helping hand from the local radio engineering community, both stations were back in operation after only seven hours of down time.

"I was in the process of installing a new transmitter in New Haven about an hour away when I found out about the fire," said Tom Osenkowsky, CE for the stations and a radio engineering consultant. "I spent that next hour breaking just about every speed limit on every road and wondering what we were going to do. You try to put together in your mind how to get an AM and an FM signal on the air."

Bad news

Upon his return, Osenkowsky found out how serious things were. Two juveniles playing with matches and aerosol cans had ignited a fire potent enough to destroy the stations' Harris SX-1A and Harris FM 3.5K transmitters, a Gates 2.5H3 backup FM transmitter, a Collins 20-V3 AM transmitter, remote control equipment and processing equipment from Texar and Orban.

By this time, word had spread throughout the engineering community and a number of local CEs pulled together to figure out how to generate signals for the stations.

"We drove up and saw the place was a total loss and then went back to (our) station and picked up whatever we could think of that we might need—coaxial cable, telephone wire, equalizers, limiters, drop cords—randomly thinking and grabbing," said Pat Carlone, one of about 25 people involved in helping get the stations back on, and VP of engineering for Housatonic Valley Broadcasting Co., owner of WINE-AM and WRKI-FM in Brookfield, CT.

Back on the air

To revive the AM frequency, Osenkowsky pulled from the garage a 1949 vintage Gates BC250-GY transmitter, which he had used for back-up at the

We drove up and saw the place was a total loss and then went back to (our) station and picked up whatever we could think of that we might need.

stations until 1985. Fortunately, the Gates transmitter "fired up on the first shot," said Osenkowsky. "We just hit the plates and the thing ran."

For the FM, Osenkowsky used a test transmitter with a power of 150 W, cannibalizing a Gates TE3 exciter borrowed from WXCJ-FM, the local college radio

station, and a stereo generator to kick the station back on the air. Normally, the FM operates at 3,000 W, the AM at 1,000 W.

To feed the transmitter power to the stations, the team cut the defunct lines leading to the transmitter from the station and spliced a connection from the Gates transmitter to the lines. Crews

from the telephone company and power company also were on hand. "It looked like a big rescue mission there with all the red beacon lights spinning," said Carlone.

Both stations ushered themselves back onto the airwaves without much fanfare. The next day, however, WLAD-AM decided to muster some publicity from its brush with calamity by aiming a "Memory Weekend" feature at songs with fire as a common theme.

Osenkowsky said that afternoon air talent Jay Kelly gave away smoke alarms and burnt toast to callers responding to the sound of a crackling fire.

(continued on page 24)

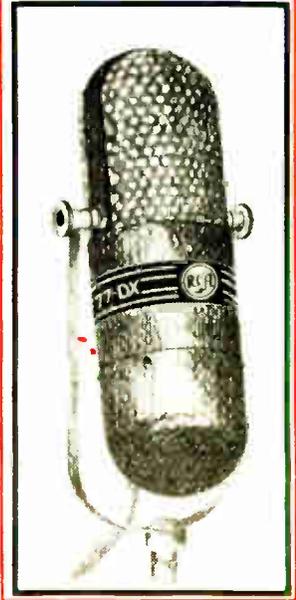
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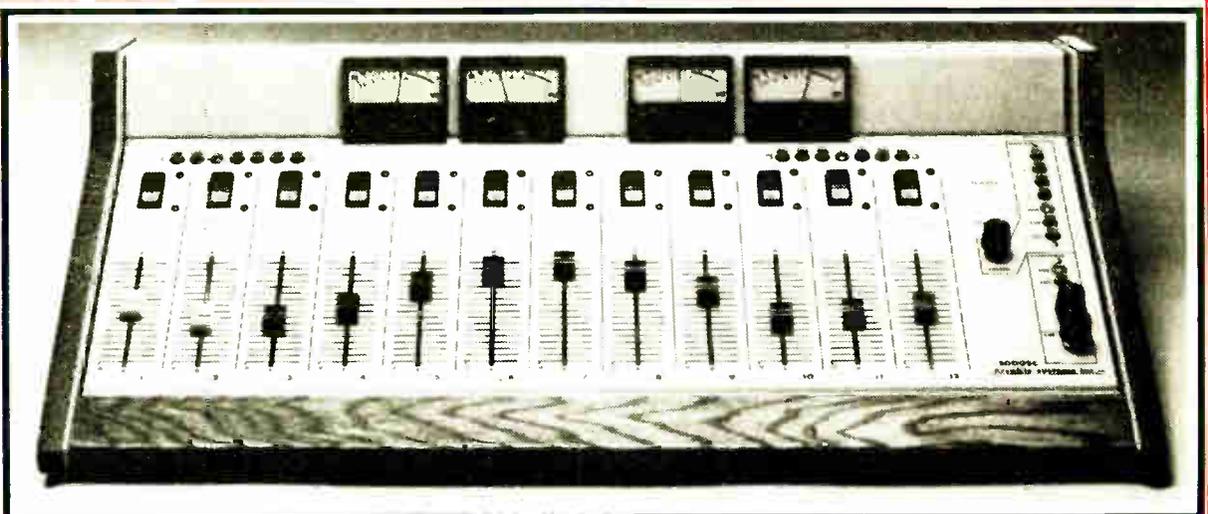
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A Different Kind of Jack Field

by James Greenwood

Carmel CA ... Most of us who deal with broadcast audio use jack fields to facilitate testing, trouble-shooting, substitution of good components for faulty ones and so on.

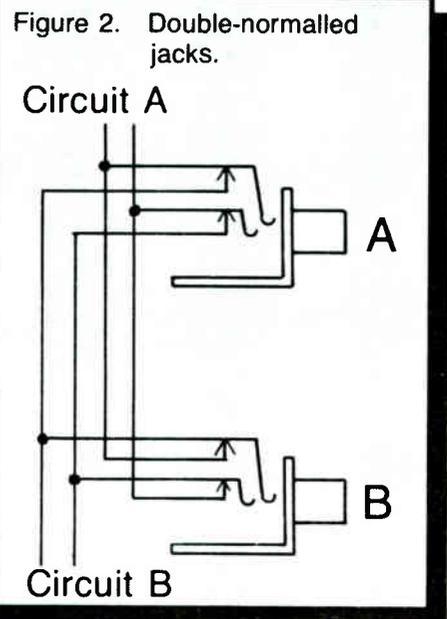
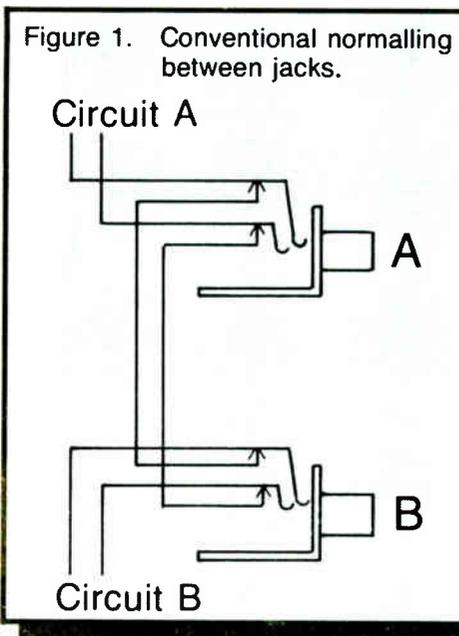
The usual method of making connections to and between jacks is shown in Figure 1. A plug inserted into jack A provides connection to circuit A. At the same time it breaks the connection be-

Also occasionally someone may put a plug in the wrong jack and interrupt a live circuit. When any of these things happens a key component intended for locating and correcting trouble becomes a source of problems itself.

Jack field with a difference

Some years ago I happened on a jack field with a difference, and the result is shown in Figures 2 and 3.

Notice that between the two jacks



tween circuits A and B.

The use of jacks in this way was borrowed by early broadcasters from the telephone industry. (At least one radio receiver in the early 1920's used jacks in this manner between audio stages.) The system has been so effective that it is used today with only minor modifications.

The liberal use of jacks provides great convenience and flexibility but it includes a hidden cost. Over a period of time dirt accumulates and contacts oxidize. And if used often the jacks get out of adjustment.

which are "double-normalled" the signal has two paths from jack A to jack B.

Dirt, corrosion or patching errors in any single jack will not interrupt the signal.

"But," you say, "when you are patching out a faulty component, it is necessary to break the path." True. When you really intend to break the path, you insert one end of a patch cord (or merely a plug) into jack B as well.

Maybe you don't have enough patching errors or jack failures to worry about—there still are other benefits.

There are times when you may need

The liberal use of jacks provides great convenience and flexibility but it includes a hidden cost.

to tap into a live circuit without interrupting it for monitoring, providing an additional feed or measuring level, observing the signal on a 'scope, etc.

A common method is to use a multiple (three or more jacks connected in parallel but not to anything else). A three-way patch cord can also be used.

Monitor jacks are sometimes included in an installation. A monitor jack is a jack with no connection to its normal contacts with its springs connected to a point in a circuit where the need for occasional monitoring or measuring has been anticipated.

But there may not be one at the point where it is needed. However, in a double-normalled jack field, every jack may be used as a monitor jack.

More good reasons

The advantages of double-normalling go on. Since monitor and multiple jacks are no longer needed the complete jack field can consist of twin rows of jacks

double-normalled top-to-bottom.

Then there are no monitor or multiple jacks to disturb the sequence or limit the complete utilization of the jacks or complicate their labelling.

I hope by now you see some of the advantages of a double-normalled jack field, but the convenience of this system cannot be completely appreciated until you have installed and used it.

In application

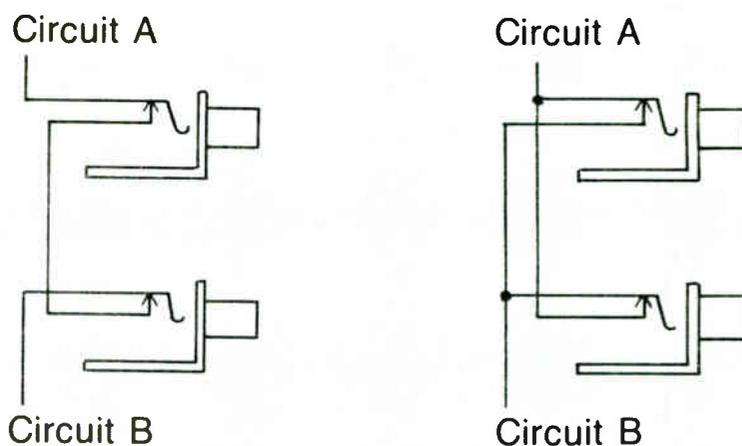
As a start I recommend that you try it in any expansion you plan, whenever you install a new double row of jacks. That is the way I first tried it. There was no confusion whatever. Just be sure to label the new jack strip "double-normalled" and explain the features to anyone who might use it.

A few years after this initial installation we built a complete new control room and used this wiring exclusively.

I do not know who originated this ingenious jack wiring system. It was at WISN in Milwaukee that I discovered it, in an installation which I believe was made by Don Weller, a consulting engineer, but I never had the opportunity to compliment him on it.

James Greenwood is a retired PE living in Carmel, CA. He was formerly with WTAE Pittsburgh.

Figure 3. Single-line drawing comparison of jack-normalling systems.



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CONTRACT ENGINEERING

Taking Notes On Maintenance

by David Hebert

Pasco WA . . . It's been often said that as we get older one of the first things to go is the memory.

I'm sure there are other things that one loses along the way but I can't remember what they are.

In the world of engineering memory is a poor way of doing business.

Endless arrays of unrelated facts and figures get lost in the day to day world of a complex radio operation, and can simply vaporize into thin air when we become responsible for more than one facility.

Probably the most likely victim of this unexplainable phenomenon is the contract engineer. Fortunately there are ways of dealing with this monster to avoid ultimate surrender to it.

Taking notes

In the last several years I have found myself relying more heavily on my notes of previous maintenance sessions than ever before.

These notes help me become more productive for the client and simultaneously help to keep my blood pressure under control.

Equally important, other engineers that follow behind me can be more effective when they call me for a history of a particular situation.

With my notes I can answer their questions in a concrete, factual manner and

help them to avoid some of the pitfalls that I have already fallen into.

There are several ways of jarring our memory banks. An engineer's best friend is the good old maintenance log.

The need for detail

To be useful, an entry must be complete and to the point. For example, an entry logged after a transmitter outage might begin with the time that the engineer arrived on the premises to make the emergency repairs.

A short description of the weather conditions, ambient temperature and any seemingly non-related fact could suddenly become helpful.

The entry could include initial impressions experienced by the engineer upon his arrival. Sensory impressions could include the building temperature, the presence or absence of unusual odor or sound.

A complete set of meter readings can be helpful if the transmitter is even partially functional.

The technician could digress into the nature of the complaint that prompted the call out, both from an operator's point of view and his own observations.

At this point even a narrative could be developed as to any initial impressions felt as the engineer slowly finds the pieces to the puzzle.

As the maintenance session progresses the engineer can take notes as to various "cause and effect" steps taken to

solve the particular problem.

This information can be helpful if included in the station log, but it's important that it be included in the contractor's own personal log of the event.

Beyond crises

OK, the crisis has now passed and the transmitter is back on the air. A closing entry should be made as to the final outcome of the event.

At this point it is helpful for the technician to outline what the final cause was determined to be and how it was corrected.

Equally important is the engineer's prognosis for the problem to repeat itself in the future and any future problems that might be anticipated.

This is a good time to record all meter readings either in the main log or an auxiliary logbook.

A comparison can be made between these readings and those noted during normal operation to determine if further attention is required.

A contract engineer doesn't always have the luxury of dictating to clients whether or not they utilize a maintenance log. A good substitution to this dilemma is to keep one's own personal logbook.

After the fact

When I have finished a maintenance shift I sit down in the quiet of my own office and write down all these facts.

I will sometimes include the names of

those who were with me so I might call upon them for any further information in the future.

A very good way to insure that these readings are duly logged is to have an auxiliary log that might be kept in a ham radio logbook.

These logbooks are helpful because they have several columns that can be used for meter readings, and additional columns can be easily added.

These books can also be easily stored, and having all observed meter readings available in an easy to understand format can help to make one's job much easier.

Effective record keeping can be thought of as leaving a trail through a problem that can be used by any engineer (yourself included) to efficiently journey through a sick piece of equipment.

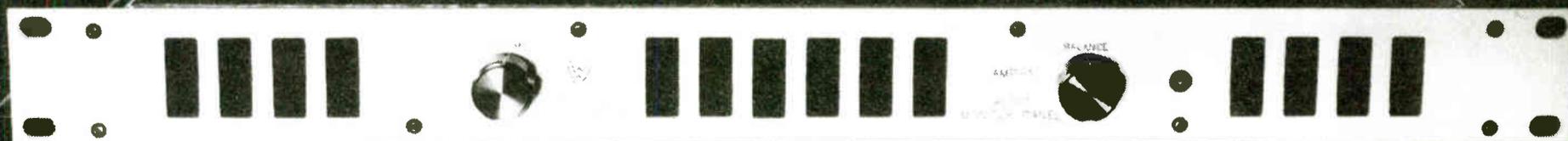
In the event that management requires a post mortem report all facts and figures are there for the taking.

It takes effort and discipline but the rewards are well worth the time. Trusting to memory can be tricky and non-productive.

The information contained in your notes can be used for a different client if you are ever faced with a similar problem.

Dave Hebert is president of Dave Hebert Engineering. He is an occasional contributor to RW and can be reached at 509-545-9672.

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Treating FM Amplipath Noise

(continued from page 20)
choose are sometimes made easier through parameter alarms in many of the newer remote control systems.

Case by case

So the answer to "How much is enough?" really needs to be determined by each station engineer, for his/her particular station.

A number of experiments may be

... establishing upper limits on AM noise is imperative to a responsible maintenance program.

necessary, taking into account terrain, voltage drops, SCA usage, market competition, desired service radius, transmitters capability, automatic power control and the station's commitment to a quality sound.

Understanding AM noise and its control affords the engineering community a unique opportunity to make a real contribution to FM signal consistency industry-wide.

In the specific station, establishing upper limits on AM noise is imperative to

a responsible maintenance program. Keeping those limits may be a bit more difficult.

If the transmitter is co-located to the studios, and the engineer is full-time, the AM noise can be checked daily, once an accurate measurement instrument is installed. Most FMs do not enjoy such a luxury.

Efficient use of time

Many stations have contract engineers, or lengthy trips are required to access the transmitter site.

Frequent checks of AM noise, as imperative as they are, can become very costly.

Periodic regular transmitter tuning can be a partial solution, if the transmitter happens to produce minimum (or at least acceptable) AM noise at peak efficiency.

Use of engineering time is most effective if the engineer's trip to the transmitter comes at the time AM noise is creeping up near the objectionable threshold discussed earlier.

This can be achieved by interfacing the measurement instrument to the remote control and preferably providing an operator alarm.

This way engineering trips can be scheduled as needed—more frequently during certain portions of the tube ag-

ing cycle; less frequently during others.

The result is performance, and consistent performance, of the FM transmitting facility.

Implement basic steps

Everyone benefits, from the licensee to the public, so long as the basic steps are implemented.

First, recognition of the problem. Second, establishment of a proper measurement port and methodology.

Third, establishment of worst-case AM noise limit. Fourth, ongoing surveillance of accurate peak AM noise by remote control.

And fifth, properly timed engineering

trips to the transmitter to implement new tuning methods based on minimum peak AM.

With these steps to control AM noise all the time, competitiveness can be improved, audio quality enhanced and SCA crosstalk improved or eliminated.

As the industry crosses from the awareness stage to the implementation stage, AM noise and amplipath can join the ranks of tube-type limiters as "something we used to have."

Joel Bump is a radio engineer consultant in Southern California and responsible for the design of Radio Design Labs' ACM-1 Noise Monitor. He can be reached at 714-244-3440.

Station Aided After Fire

(continued from page 21)

"It was our way of making the best of the situation and putting it in a positive perspective," Osenkowsky said. "We wanted to show our listeners and our advertisers that we had a commitment to get on the air as soon as possible. We wanted to show that we are strong and that nothing's going to keep us down."

The stations currently are in the rebuilding process, and are operating out of the back of a rented U-Haul truck with a new Harris SX-1 transmitter for the AM, a BE Exciter for AM stereo transmission and a Harris 3.5K for FM transmission.

The stations already have been paid in full by their insurance company for the equipment, according to station general manager Irv Goldstein, though there

was some cost incurred by the stations.

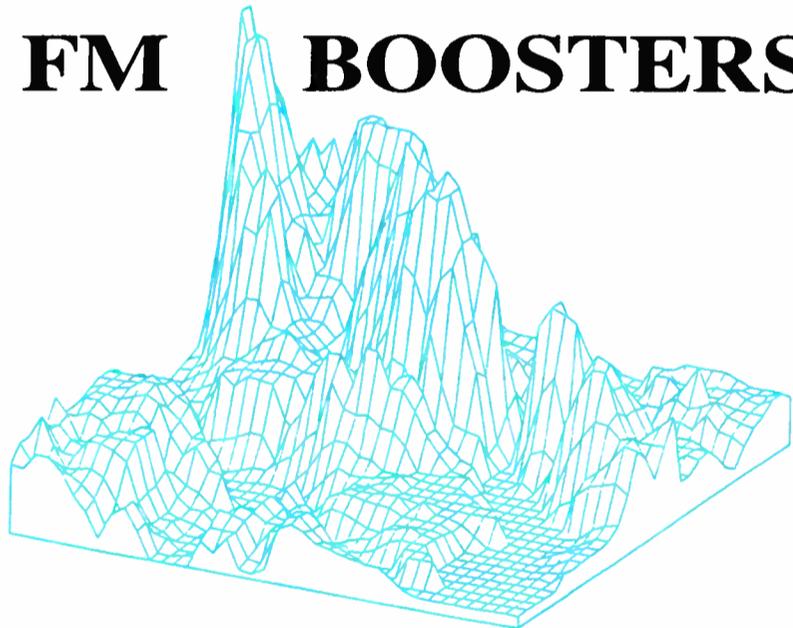
"Back-up transmitters were antiquated and we're going to have to haul away some PCB-contaminated equipment, which isn't covered," he said.

The new transmitters will be encased by a building covered in Rhino-hide which is not only fireproof but is tough enough to resist the force of a bullet fired from a .357 Magnum, according to Osenkowsky.

Building materials are expected to arrive during the last week of June, at which time the transmitters will be moved from the back of the U-Haul into the permanent facility, Goldstein said.

For details, contact Tom Osenkowsky at 203-744-4800.

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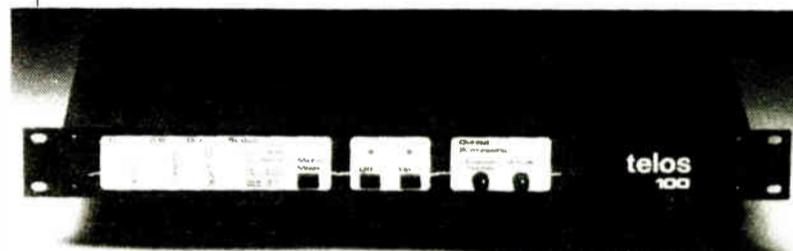
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RCA BA-34 B & C 10 W program/speaker amos (15), not working, gd for parts. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

RCA BA-31 mic preamps (11), condition unknown; RCA rack shelves (6). M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Hifi Audio 1000A (2), two years old, \$2500 each; Crest 3001, \$750. B Rappleye, Bob Steele Productions, 4013 Postgate Terrace Suite 701, Silver Spring MD 20906. 301-871-0132.

Samsui G-7700 stereo receiver, 120 W/chnl, digital tuner w/lots of inputs, \$300. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Heathkit audio amps, Williamson design, Ahec-Peerless output transformers, pair of KT-66 tubes, pair 5881 tubes, used. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

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

Want to Buy

RCA amps, BA-14 series & up; 82-87 series & up. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

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Harris FM44, 4 bay HP, 91.9 MHz, excel cond, 3 yrs old, \$300. H Gibbs, College of Wooster, Wooster OH 44691. 216-263-2000.

Shively 6813NP-3, 3-bay CP antenna w/radomes on 91.1Hz, can be re-tuned, 1 yr old, \$3500. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

RCA TFU-240M UHF TV antenna on chnl 41, \$1500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

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Electro-Impulse CPTN-3000 (3) dummy loads, new 3 kW, DC to 1 GHz, oil filled; air cooled w/manual, \$875 ea/BO. C Waltman, KSAO, POB 910, Oakland CA 94607. 415-836-0910.

Utility 540 tower, 500', 42", on ground, recently painted, w/lighting kit & guy wires; also 375' used Andrew JF-50 3" coax, w/hangers & end fittings, just taken down & in gd cond. BO. T Wortmann, WJAG/KEXL, 309 Braasch Ave, Norfolk NE 68701. 402-371-0780.

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

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

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.

Gates 5 bay, HP, 97.7 MHz, \$1000. G Kenney, BMA 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.

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

HTPG3500 (3), Phylstran guy assemblies, gd cond, BO. E Goetsch, WXPB, 303 W Prospect, Rhinelander 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.

Want to Buy

Edic FM antenna, 1 bay, 91.1 MHz. J Burton, Solid Soul Records, 18019 Homestead Ct, Miami FL 33157. 305-253-8786.

Waveguide transition, WR229 to type N; also equatorial 5100 controller, dish, LNR & waveguide. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Tower, 325' min, handle 3 bay class A antenna, strong enough to support 4' STL dish, pipe or solid rod. G Gault, United AM Bdcg, 3515 Clairmont Ave, Ind. MO 64052. 816-254-5267.

Low band, tuneable to Ch 3; (2) high band VHF, tuneable to Chs 10 or 12. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Scala TVO Series translator antennas for VHF chnls 3, 10, 12; Bogner, B Series or LPS; Scala SL-8 or Parapanels or Lindsey line; any UHF TV chnl thru chnl 70. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

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Fairchild 664 passive EQs (4), no cases, \$25 ea or \$75/all; Langevin EQ 251-B EQ, like new, \$40. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

UREI 31 band graphic EQ, \$400. J Jarjoura, WCIB, POB C, Falmouth MA 02541. 617-548-3102.

ABG custom dubbing ctr, excel cond, \$2000. J Salov, WJGS. 517-366-5364.

Yamaha SPX90 signal processor, nearly new, \$550. G Kelley Jr, WGMK, POB 87, Donaldsonville GA 31746. 912-524-5123.

Yamaha SPX90 digital reverb, \$450; ART DR2A reverb, \$300. W Wawro, WFAA, Comm. Ctr, Dallas TX 75202. 214-977-6260.

dbx II-122 NR system (2), \$75 ea, dbx 222 tape NR system, \$125. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Dubbing system, TT to cart, call for details. J Salov, Northlands Comm, 3431 W Houghton Lake Dr, Houghton Lake MI 48629. 517-366-5364.

Eventide 949 Harmonizer, \$1500. P Dickson, KLSY, 12011 NE 1st St, Bellevue WA 98005. 206-454-1540.

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

McMartin TG-2 EBS gen, gd cond, w/man, \$100; Realistic TM-152 AM stereo receiver, gd cond, not a scratch, \$20; Elgin ERC phone to board interface, gd cond, \$100; McMartin EBS-2/FMR-1, gd cond, w/man, \$100. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

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 Bdcg, 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 Bdcg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

ABC MRP-1 cue command decoder w/pri-er cable, \$500. N King, KMA, Shenandoah IA 51601. 712-246-5270.

Patch bays, 52 jacks, 3 card, normaling, 19" A-1 cond, \$35 + shpg. N Carroll, So Bdcg 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 prep 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 Bdcg, Box 7000, Havre MT 59501. 406-265-7841.

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.

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SMC ESP-1 automation controller w/(4) 350RS Carousels, (3) PR199 Revox, remote control unit, Extel printer, gd working cond, \$11,000 complete. K Hollingsworth, WCSP, 214 E Georgetown St, Crystal Springs MS 29059. 601-892-3000.

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- CBS 410 FM Volumax. \$75.
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- Inovonics 220 compressor. \$100.
- Otari CB102 remote control for MX5050, new. \$100
- Scully 270 reel decks sold as-is or for parts.
- Ampex 440 reel decks sold as-is
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Cetec System 7000, w/real time clock, printed log option, 2 terminals, 2 encode ctrs, 3 R-R, 3 Insta-carts, Audiofile 2A, well maintained, \$28,000/BO. B Troy, KSOP, 1285 W 2320 South, Salt Lake City UT 84119. 801-972-1043.

Control Design CD25G tone gen, never used, \$100. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

SMC ESP-1 w/many extras, complete, less reels & carts, \$2300/BO. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

Harris 9001 computer for automation, excel cond, Brain w/keyboard, terminal screen & printer, 5 yrs old, BO; SMC 252 Carousels (2), needs repair, stereo heads, BO; SMC Carousel interfaces (2), uses BCD to link up SMC automation computer to Carousels, excel cond, BO. P Stover, WJYJ. 703-582-5371.

Automation System: (3) mounted racks, (2) Schafer, (2) Gates Carousel, complete system. T Harrison, KXTD, 301 N Walnut, Broken Arrow OK 74012. 918-258-1000.

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.

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 FP40 w/Canon zoom lens & access, BO over \$1000. M Glaser, MRG Prod, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Hitachi mdl FP1212B w/control units & cables (2), (2) pedestals, ITE tripod, (2) RCA color cameras, 404-458-0828.

Norelco PCP-90 plumbicon color camera, \$500; Houston Fearless studio pedestals, \$350; RCA PK-701 color studio camera, \$995; Norelco PC-70 color studio cameras (4) as is, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

GE PE250 (2) w/RCU's, cables, manual & some used plumbicons, needs work, BO/you ship. D Driessen, WGBA, POB 19094, Green Bay WI 54307. 414-494-2626.

Want to Buy

Sony M3A or M2. V Stover, Stover Photo Svcs, 1305 Sunset Dr, Norwalk IA 50211. 515-981-4217.

CART MACHINES

Want to Sell

ITC PD2, like new PB only, \$1000. R Hunicutt, WMTZ, POB 11594, Augusta GA 90907. 404-860-0943.

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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.

SMC S21, gd cond, \$550; ITC Omega Stereo, perf cond, \$1250/BO; Gates Criterion 80 stereo, gd cond, no cover, \$650/BO. P Way, WQEZ, 2010 San Carlos Blvd, Ft Myers Beach FL 33931. 813-574-5548.

ITC Delta stereo play units, 2 yrs old, excel cond (4), \$1300 ea; cart racks, 500 slot wood cart racks, wall mount, excel cond, BO. J Salov, WJGS. 517-366-5364.

Spotmaster 2000 mono, excel cond, 5 yrs old, secondary tone, R/P, low hrs, used as backup, BO; Collins 212-E Twincart, stereo, fair cond, rack mountable, BO. P Stover, WJYJ. 703-582-5371.

Spotmaster 3200, 5300, one R/P mono, one triple play only, gd cond, \$1000/both. B Huges, KNET, POB 849, Palestine TX 75801. 214-723-2417. aft 7 PM central.

ITC FB-1 phone interface unit (4), \$100 ea or all for \$300. D Murray, POB 5715, Kingsport TN 37663. 615-239-4745.

Spotmaster 2000 mono R/P, \$500. B Bundgaard, KLKS, POB 300, Breezy Pt MN 56472. 218-562-4884.

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

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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 Bdtg, 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 Svcs, POB 1240, Elizabethton TN 37644. 615-543-4849.

Tapecaster 700RP, gd cond, \$225; LPB RCA 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, Remington 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.

Want to Buy

ITC PD2 cart machine. B Bundgaard, KLKS, POB 300, Breezy Pt MN 56472. 218-562-4884.

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.

Recent ITC or BE stereo R/P in gd cond. EE McCoy, KZEN, Box 100, Central City NE 68826. 308-946-3816.

Single play cart decks (2), mono w/1 kHz cue tone. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-9686.

150 Hz tone sensor board for Harris Criterion 90-3, may purchase compl machine. R Rocks, KEMC, Eastern Montana College, 1500 N 30th St, Billings MT 59101. 406-657-2941.

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

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Want to Sell

AVM Ferrograph Series 8 R/P reel deck, \$1800/BO. M Bannon, WATH, POB Drawer C, Athens OH 45701. 614-594-5102.

Otari ARS-1000DC (4), new cond, approx 60 days service, \$1495 ea. Southeast Electronics, Box 41308, Jacksonville FL 32203. 904-356-3000.

Studer A80 MKII slim body, spare remote, gd cond, \$12000. A Milano, Home Base Recd, 147 W 84th St, NY NY 10011. 212-691-7674.

Ampex 600, FT mono, \$200. M Saady, 1st City Recd, 141-60 84th Rd Apt 3E, Briarwood NY 11435. 718-846-2062.

Fostex A-2 2 trk stereo R-R, 5 yrs old, gd cond, \$350; Revox PR99 (2), excel cond, 3.5 yrs old, PB only for automation, \$1000 ea. P Stover, WJYJ. 703-582-5371.

Magnecord 1021, needs some work. T Driggers, Driggers Bdtg, 818 Quail Court, Healdsburg CA 95448. 707-433-9370.

Otari MX5050X (2) 3 yrs old, excel cond, \$1200 ea or \$2000/both. J Salov, Northlands Comm, 3431 W Houghton Lake Dr, Houghton Lake MI 48629. 517-366-5364.

Ampex 350-1 w/FT PB head assembly (2), \$275 ea or \$485/both; Inovonics 377 dual chnl reproduce electr, all IC solid state, excel cond, \$200. K Gordon, Remington Agency, 10622 SW 100 St, Miami FL 33176. 305-271-1671.

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Ampex AG4408 FT, clean, \$500; Revox A77, gd cond, \$400. B Mountjoy, WHMJ, POB 1240, Elizabethton TN 37644. 615-543-5849.

Fostex 80 multitrack w/remote control, \$1600. W Wawro, WFAA, Comm Ctr, Dallas TX 75202. 214-977-6260.

Revox A-77, excel cond, 3.75 & 7.5, \$350; Teac 2 chnl A-6100, gd cond, \$250; Technics RS1500US, 10.5", 3.75-7.5-15 ips, like new, \$800 firm. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Scully 280 (2) stereo, Ruslang cabinets, as is, complete, \$1000 ea. T McGinley, WPGC, POB 10239, Wash DC 20018. 301-441-3500.

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

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, Bdt Cir, Palm Springs CA 92262. 619-328-1104.

Ampex 350-1 rebuilt transport, runs like new. \$375. K Gordon, Remington 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 mach, ex cond, BO; Ampex 351 tube elect (8), ex 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 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 Bdtg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

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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 moderately worn. BO. J Seaman, WWSA, 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, WWSA, POB 752, Rawley Pike, Harrisonburg VA 22801. 703-434-0331.

Ampex ATR700 excel cond, rack mount (2), \$1250 each. 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.

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Want to Buy

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

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

Sony RM16 remote control for TC650 or TC650 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.

CONSOLES

Want to Sell

Tascam Model 3 8 x 4 chan, great cond, \$500. M Shephard, WCWA, 124 N Summit Ste 400, Toledo OH 43604. 419-248-2627.

Gates/Harris Executive 10 pot stereo audio console, like new cond, owners manual, schematics & docs, in use now, \$3500/BO. K Gordon, Remington Agency, 10622 SW 100 St, Miami FL 33176. 305-271-1671.

Bi Amp 1682 16 chnl stereo mixing console, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Peavy 601R 6 chnl mixer, 3 band EQ, brand new, excel cond, XLR & phono & 1/4 inputs, LED VU's rack mountable, \$350; DOD 4 chnl mike mixer, 1 rack space high, EQ & effects on each chnl, \$300. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Shure M267, almost new, \$375. H Sheldon, Sheldon Ent, 6577 E Camino Vista #4, Anaheim Hills CA 92807. 714-974-6841.

Autogram IC 10 stereo (2) 10 chnl, excel cond w/Henry module updates, \$3500 ea. T McGinley, WPGC, POB 10239, Wash DC 20018. 301-441-3500.

RCA BC14AS, 16 input 4 fader stereo, fair cond, approx 12 yrs old, BO. R Heit, WHSV, Rt 33 West, Harnscomb VA 22801. 703-433-9191.

Yamaha M512, gd cond, BO. Dave, Harri-man Comm Ctr. 202-485-3400.

Harris Studioette 80, 4 chnl prod board, \$500. B Mountjoy, WHMJ, POB 1240, Elizabethton TN 37644. 615-543-5849.

Cetec Series 10 stereo/quad console, 10 ch, 26 input, w/sliders, EQ, mic preamps & manual, in use, \$1800/BO. J Hemingway, WGAJ, Box 212, Deerfield MA 01342. 413-773-9649.

Collins 12-2 remote board, needs tubes, \$150; IBM Dictabell w/access, \$25; IBM small Dictabell, \$15; Wollensak R-R, \$25 ea; Sony shotgun mike, complete w/access, \$250;



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Collins 212S-1/260S-1, need manuals & wiring diagrams, photo copies OK, need card extender as well. D Peacock, WTBC, Wiliston VT 05495. 802-878-8118.

RCA 76-C console. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Cetec Series 2000 8 ch stereo, to make matching pair. D Sparano, WVCR, Rte 9, Loudenville NY 12211. 518-783-2990.

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 & Telx headphones for ballgames. D Cotton, WSCB, 73 Marshall St, E Long Meadow MA 01078. 413-525-8216.

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AR3A speakers, \$250 pr. B Mims, WTSU, Troy State Univ, Troy AL 36082. 205-566-3000 x268.

JBL 4311 studio monitor speakers, excel cond, no grills, \$400/pr. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

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Tapco 2200 graphic EQ, gd cond, BO; AKG RX-5 stereo reverb, BO. Dave, Harriman Comm Ctr 202-485-3400.

Fairchild 644B EC modules (2), BO. P Sibley, 138 E 78th, NY NY 10016. 212-986-2219.

Technics 1100A dir drive TT w/teararm & dust cov, var 2 spd; Stanton 310 preamps (2), new Stanton 881S carts & styli, Stanton 681 carts & styli & new Discwasher diskkit, BO. B Royster, KQM Bldg, 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.

Want to Buy

RCA mixers, OP7/OP6/BN-2 etc. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

SAE 5000 pop & click filter or other make unit that will remove pops & clicks in records. S Grenzow, Galactic Radio, 9697 E Mineral, Englewood CO 80112. 303-792-3111.

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

LIMITERS

Want to Sell

Symetrix CL150 (2), \$150 ea. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Mod Sciences CP803 composite clipper, \$500. B Bundgaard, KLKS, POB 300, Breezy Pt MN 56472. 218-562-4884.

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CRL APP300 gd cond, two avail, \$300 ea or \$550/pr & shpg. B Russell, KCMR, 1657 High Dr, Simi Valley CA 93063. 805-583-5263.

Orban 8000, \$1500. A Sablier, Vision Int, 13114 Valleywood Ct, Silver Spring MD 20906. 301-933-8181

Modulation Sciences composite clipper, new, \$350. J Krautz, KJKL TV, 183 Jane Dr, Syracuse NY 13219.

DAP 310 & 610, gd cond, approx 18 mos old. CE, KROC, 122 4th St SW, Rochester MN 55902. 507-286-1010.

BE FM 601 stereo AGC/limiter, excel cond, \$600. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

CBS Audimax 445 & CBS Volumax 411 stereo audio processors, \$350 ea or \$650/both. W Borneman, WBVO, Box 177, Boyertown PA 19512. 215-369-1075.

Orban 8100A w/8100AST, in use now, w/chassis, \$3450; CRL SEP800, in serv, ster unit, \$1000; Apex aural exciter type B, mint cond, \$695. P Palagonia, KTKT, 1920 W Cooper St, Tucson AZ 85745. 602-622-6711.

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

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

Harris 994-6543-001 AM Solid Statesman lim; Harris FM Solid Statesman lim, Kahn SP 58-1 Symetra 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 Bldg, POB 7008, Columbus GA 31908. 404-323-8127.

Spotmaster CLA-20-40 compressor/limiters, rack mounted (3), gd cond. J Seaman, WWSA, 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, WNL1, 51 S Main, Clearwater FL 34625. 813-446-0957.

Dorrough DAP-310 w/lop high freq boost card, excel cond, \$500 + shpg; CRL compl AM processing sys, like new cond, \$1000 plus shpg. R Gwyn, WLFA, POB 746, Lafayette LA 70528. 404-638-3276.

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

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

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 Bldg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

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

RCA BK-6B lavalier w/instruction book, new, never used, in storage 18 yrs. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Sony ECM22 (2), electret condenser mic, \$35. M Saady, 1st City Recd, 141-60 84th Rd Apt 3E, Briarwood NY 11435. 718-846-2062.

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.

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.

Eddor PM-5 wireless mic w/ST-3B receiver, \$250. G Barnett, KWXY, Bldg Ctr, Palm Springs CA 92262. 619-328-1104.

Want to Buy

RCA mics, 44s any mdl working or not & 77s any mdl working or not. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Old mics for WMOP museum. J Kirk, WMOP, POB 1136, Ocala FL 32678. 904-732-2010.

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

MISCELLANEOUS

Want to Sell

Catalogs, 50 yrs worth, inc RCA Bldg News, Radio Masters, GR, HP, Tek, Dumont, Cameradio, McGee, Burstein-Applebee, 36 pg list for 45¢ SASE. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Staco variable auto transformer, new, 3 A type 291, 120 VAC in, 1-120 VAC out, \$20; (5) RCA patch bays, 2 row, 24 x 1/4" sleeve/tp normallized jax per row, \$15 ea/\$50 all. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

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, normalised stereo dbl row patch bays to Xmas trees, also punch blocks. B Royster, KQM Bldg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Zenith 3 phase automatic xfer switch 25 kW, \$500. K Dick, WVVA, Rt 460 Bypass, Bluefield WV 24701. 304-325-5487.

Bud 6' equip racks w/back doors (4); Stanton TV rack w/rear rails & back door; (2) Bud 7' telco type racks; many new alum & ham-mertone grey blank rack panels & rack screws. B Royster, KQM Bldg, 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, McMarin, UREI Mod One console, Criterion 80 cart equip. B Royster, KQM Bldg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

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 diskettes for record/music library files, free shipping, \$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 Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Sennheiser replacement cords, pads & elements for HD-414/424 headphones, new replacement 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 Bldg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

Excalibur, Switchcraft 6, 10 & 20 dB H parts, many new Switchcraft A3M, A3F XLR connectors; new Sony ECM-30 mic in case, lavalier electret condenser mike. B Royster, KQM Bldg, 1019 Cordova St, San Diego CA 92107. 619-223-3413.

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.

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RCA disc recorders, 72DX, 72D, 73B, etc. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Old On-Air sign, vintage if possible. J Evans, Evans Assoc, 2301 Totem Tr, Minnetonka MN 55343. 612-544-1104.

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.

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.

Want to Buy

FM mod monitor, Belar pref. S Roach, KARY, 509-882-3500.

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.

RECEIVERS & TRANSCEIVERS

Want to Sell

Hallcrafters SX-115, mint, stored in original carton 25 yrs, also matching xmtr HT-32A stored with it. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

GE mobile phone, ET-74E, ER-48C, head EC 79A13, 7 chnls, like new, \$750; GE MVP series, 1 base, 2 mobiles, 1 hand held portable, 466.225 TX, 461.225 RX, gd cond. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

Motorola HT-200 VHF handheld transceivers (2) w/charger, \$200/lot. N Bealy, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

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Want to Buy

Motorola Motac CB transceivers, 2000 or 4000 series in gd working cond. K Linden, Multiphase, 3605 Michael Court, Annandale VA 22003. 703-698-9449

REMOTE & MICROWAVE EQUIP.

Want to Sell

Microwave Assoc MA6G & MA6GW, 8 xmtrs & 12 rcvrs, w/dishes, power supplies, common carrier 6 GHz, working system, gd cond, 8 yrs old. \$55,000 complete. L Rafford, County Microwave, 5 Burnell Dr, Ayrmouth ME 04096. 207-846-3462.

Moseley MRC 1600 STL subcarrier control. 92 kHz SCA telemetry return. \$2500. B Harm, KIYS, 821 Vista, Boise ID 83702. 208-343-5991.

S-A 15 kHz dual audio card, will trade for 7.5 kHz audio card. D Grant, WLAV, 50 Louis NW, 3rd Fl Trade Ctr #no333, Grand Rapids MI 49503. 616-456-5461.

Fairchild DART 384 digital satellite receiver w/dual 15 kHz audio card & down converter. \$4500. Comtech 3.8 m dish antenna w/AZEL mount, feedhorn & 90° LNA, \$1950 plus \$125 crating fee. G Jones, POB 231, Uvalde TX 78802. 512-278-1102.

Marti MR30/150 RPU receiver, 161.73 MHz, \$100. M Ripley, KOZE, POB 936, Lewiston ID 82501. 208-743-2502.

Gabriel 2-8' dual polarized, high perf dishes on freq 6425-7125 & Cablewave 8' dish, on 13 GHz, feed horn damaged. L Mintzmyer, KOOD, Bunker Hill KS 67626. 913-483-6990.

Gentner Microtel 1, almost new, telco line mixer. \$150. H Sheldon, Sheldon Ent, 6577 E Camino Cista #4, Anaheim Hills CA 92807. 714-974-6841.

Mobile telephones & 2-way radios, great for news, Johnson Fleetcom 528 & Fleetcom II. T Harrison, KXTD, 301 N Walnut, Broken Arrow OK 74012. 918-258-1000.

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 Kenney, 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. 601-264-8250.

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, good condition, \$125. N Bealy, 3438 Galeston Avenue, Indianapolis IN 46236. 317-897-6255.

Moseley SCG-8, TAU-2, SCS-2, etc. Best Offer. B Royster, KQM Broadcasting, 1019 Cordova Street, San Diego CA 92107. 619-223-3413.

TFT 7610, 7615, 7630 remote control 30 channel, \$3000. T Toenges, Route 1 Box 149, St Marys KS 66536. 913-437-6549.

Want to Buy

Comrex TLX, rack mounted frequency extender encoder. J Vukelich, Broadcast Services, 4551 N Flag Ave, Mpls MN. 612-537-1431.

Microdyne PCDR5 SSCP demod. M Wilson, WGRK, POB 246, Greensburg KY 47243. 502-932-7402.

Wegener set up for SMN, any format. D Stebbins, KZZN, Box 192, Littlefield TX 79339. 806-385-4474.

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.

S-A digital 7.5 kHz card. R Vanderlinden, WVIN, POB 72, Bath NY 14810. 607-776-3326.

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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 Brcdct Eng, AM/FM, 14 yrs exper. Write RW, POB 1214, Falls Church VA 22041. Attn: Box 5-1-88.

HELP WANTED

Contract Eng desires to sell engineering service. 8AM, 2FM under contract. Positive cash flow. Phi Baker. 404-232-4698.

CE wated for top rated AM/FM combo located on Colorado's western slopes. Prefer SBE certified. Send detailed resume & salary requirements to Mike Elliott, Dir of Eng., First Star Corp., POB 30181, Lincoln NE 68503.

Salesman to sell satellite uplink services both data & video. Must be exper w/gd contacts. Based in Dallas, Chicago or LA for rapidly growing company w/both Intelsat & domestic services. 1-800-DATA-LIN.

CE needed for AM/FM in Tallahassee FL. SBE cert. & 5 yrs exper required. Send resume to Bruce Timm, POB 1874, Tallahassee FL 32302.

Small Market Midwestern Network Affiliate has an immediate opening for a TV maintenance engineer. Applicant must have UHF transmitter experience, and be familiar with U-matic tape, microwave ENG, & broadcast video systems. Interested applicants should send resume & salary requirements. Station is an equal opportunity employer. Women & minorities are encouraged to apply. Send to Radio World, POB 1214, Falls Church VA 22041. Attn: Box 7-2-88RW.

Chief Engineer-AMDA-2 & FM Class B. Must have good maintenance & construction skills, able to drive & set up remote bdc van, & keep orderly documentation. Experience not important if able to learn. EOE. Send resume to WFMD/WFRE, Dir of Eng., POB 151, Frederick MD 21701.

SCHAFFER DIGITAL
is looking for a qualified engineer to fill the position of **VP of ENGINEERING**
Outstanding opportunity exists for an engineer with knowledge covering video, digital, analog and computer technology as it applies to the broadcast industry. The position includes responsibility for system quality control, customer relations and on-going research and development. Send resume to Paul C. Schaffer
Schaffer Digital, 5801 Soledad Mountain Road, La Jolla, CA 92037

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Broadcast Equipment Exchange

REMOTE . . . WTS

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 rcvr. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

STATIONS

Want to Sell

FM Class A, AM daytimer, w/3 acres land, 3 bdrm h/w in combo w/studio & offices, 750 sq ft xmtr bldg, automated, all equip in 1st class working order, \$350K/neg, retiring. JP Robillard, 1803 N First E St, Haynesville LA 7103E. 318-624-0105.

FM CP's Wanted

Clients seek CP's any size market.

Small, medium, large. Will consider FM upgrades, too!

Don Nahley
1-404-576-4488

LPTV's (2) N. Minn./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.

LPTV, Santa Barbara, help build for share or buy for \$50,000. G Erway, KBOG, Rt 2 Box 26B, Cordell OK 73632. 405-832-5432.

FM CP, Illinois, small market. P Martin, PMA Mktg, 4359 S Howell Ste 106, Milwaukee WI 53207. 414-482-2638.

Atlanta area, 1 kW DT AM station, approx 4 acre tower site, recently renov 1500 sq ft ofc bldg on approx 1/4 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).

Looking for AM, FM or CP in east for right price/terms. H Kozlowski, 703-631-0197.

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 15000 cash. B Umberger, WNL, 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.

CCA SG1D stereo gen, BO. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

SWITCHERS (VIDEO)

Want to Sell

Javelin HSS-40VP 4 pos video switcher w/phase indicator, \$25. L James, Best Elec, 611 N Greer Blvd, Durburgh TX 75686. 214-856-2892.

Panasonic WJ5000T w/sync gen, \$350. R Larson, Metropolis Video, 316 S Maple, Oak Park IL 60302. 312-848-3172.

Want to Buy

Video switcher. W-13-BH TV, 1155 Old Postage Rd, St Ignace MI 49781. 906-643-8686.

TAPES, CARTRIDGES & REELS

Want to Sell

Plastic reels, hundreds of empty 7.5", BO; Ampex 641 tape, in boxes, \$1/reel; Maxell UD-35-90, \$2/reel. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

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 Bakely 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 Svcs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

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 Svcs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

AA3 Audiopaks (15), (94) Aristocarts, cleaned, w/o tape or pads, \$75. B Boyer, WMOP, POB 1136, Ocala FL 32678. 904-732-2010.

R-R tapes, 10.5". BO. Paul Jensen, WKPL, 608-348-2775.

Audio tape, 10.5" metal reels, approx 250, w/o hubs, excel cond, \$2.50 ea. R McDaniel, KJRG, POB 567, Newton KS 67114. 316-283-5150.

Capitol AA3 & AA4, (2000) various lengths, most 330, 430, 530's, recently removed, new pads, in lots of 225, \$400 per box of 225. J Salov, Northlands Comm, 3431 W Houghton Lake Dr, Houghton Lake MI 48629. 517-366-5364.

Fidelipac carts, (50) various lengths, standard tape. T Driggers, Driggers Bdctg, 816 Quail Court, Healdsburg CA 95448. 707-433-9370.

Audiopac AA3 & AA4, all lengths & shells for rebuild. D Grimm, WBLY, 117 S Fountain Ste 301, Springfield OH 45502. 513-324-5643.

Aristocarts, thousands of various lengths, many rebuilt w/new pads & HOLN tape, \$1.50 ea. B Russell, KCMR, 1657 High Dr, Simi Valley CA 93063. 805-583-5263.

Blank cassettes for air checks, (90) 5 min, \$50/BO. M Gehring, WVEN, 7 Crestview Dr, Oil City PA 16301. 814-432-2188.

Std library transcriptions, (250) 16". B Diffe, WRXO, Roxboro NC 27573. 919-599-0266.

Aristocart Type A & Audiopac 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 Cir, Palm Springs CA 92282. 619-328-1104.

Fidelipac carts, (150) 10.5 minute, new, \$2 ea. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.

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.

Want to Buy

Transcriptions 16", especially RCA Thesaurus, also airchecks, acetate or pressed. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

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 Sala-zar, MRC, POB 3246, Laredo TX 78044. 512-722-6832.

TAX DEDUCT. EQUIP.

Stereo gen, stereo mon, stereo console. R Shearer, KNBU, Baker Univer, Baldwin City KS 66006. 913-594-6451.

Eng student desiring donation of old bdct equip (anything) in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

FM RPU for new school, prefer Marti working or repairable cond, will pay all shipping. R Dezzulolo, WGAO, 99 Main, Franklin MA 02038. 617-528-4210.

Stereo gen, proc equipment, R-R recorders, FM exciter at 91.5 for tax deduct donation, working cond or not. D Chapman, WJCC, Jamestown Comm College, 525 Falconer St, Jamestown NY 14701. 716-483-0302.

Educ non-profit FM seeks donation of useable R-R PB, 5-8 chnl audio console & automation equip. M Gaunt, WHCB, POB 2061, Bristol TN 37621. 615-878-6279.

Educ FM looking for equip donations, prefer operational equip but anything repairable will be accepted, xmtr, console, cart carousel, etc. Mr. Harvey, Bdct Learning Cir, POB 1610, Delray NJ 08075. 215-279-9000.

AM xmtr, 250 W for missionary station in South America. J Cunningham, YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Donations wanted for listener supported station, need AM xmtr & tower (any cond), call weekdays after 5 PM & weekends. B Sallade, Stardust Prod, 6 Robbie Ridge Apt 4, Milford OH 45150. 513-831-0973.

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, WLXC, 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.

TEST EQUIPMENT

Want to Sell

Potomac SD/RX-31 synthesizer/detector, excel cond, \$1500; Delta OIB-1 operating bridge, excel cond, \$1500. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

GR 916-A RF bridge, \$350; Potomac FIM-41 field intensity meter, \$1500; Delta OIB-3 impedance bridge, \$1500. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 after 5 PM.

H-P 400-D AC voltmeter, \$30; GR 1422ME variable standard capacitor, \$300; GR 1650-A RCL bridge, \$200; B&W 410 noise & dist meter, \$50. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 aft 5 PM.

CBS Audimax (2) 440A, \$350 ea. T McGinley, WPGC, POB 10239, Wash DC 20018. 301-441-3500.

Klark Teknik DN60 spectrum analyzer, 31 band w/peak & average hold, 3 memories, cal mic, \$1300. J Jarjoura, WCIB, POB C, Falmouth MA 02541. 617-548-3102.

Tek 527 tube type waveform monitors, \$150 as is. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

HP 3308B tube type dist analyzer, \$150. T Weeden, WMTV, 615 Forward Dr, Madison WI 53711. 608-274-1515.

Potomac FIM-41 field strength meter, 540 kHz to 5 MHz, excel cond. J Seaman, WSWA, 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.

B&K 520B transistor tester, like new, \$125, composite gain set for audio proof, plug in pads, \$ 100; B&W 400 noise & dist meter, excellent condition, \$200; Heathkit IT-28 capacitor checker, like new, \$25. R Johnson, 207 Sioux Tr, Georgetown KY 40324. 502-863-9387.



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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

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Name _____ Title _____

Company/Station _____

Address _____

City _____ State _____ Zip _____

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Broadcast Equipment Exchange

TEST . . . WTS

Tek 1L30 plug-in spectrum analyzer, 925 MHz to 10.4 GHz tunable, fits Tek 530, 540, 550, 550 & 580 w/adaptor, \$850. B Kicker-son, WEAG, POB 520, Stanke FL 32091. 904-964-5001.

Delta OIB-1 operating impedance bridge, gd cond, w/external custom null amp, \$800; GR 1330-A bridge osc, gd cond, \$500; Tenmar general purpose scope, excel cond, \$125. N Beatty, 3438 N Galeston Ave, Indianapolis IN 46236. 317-897-6255.

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.

TRANSMITTERS

Want to Sell

QEI 775 ATS system, automatic xmtr control w/alarms point control, excel cond, 4 yrs old, FCC approved for walk-away, BO; RCA BT-5B 5 kW FM, solid state exciter, new final & driver, spares, needs some repair, BO. P Stover, WJYJ. 703-582-5371.

Collins 250 W AM, gd oper cond, \$1200; RCA BTE-15 exciter, low hrs, like new, \$850. J Krautz, KJKL TV, 183 Jane Dr, Syracuse NY 13219.

Harris FM 25K driver modules plus many other parts, \$300 ea. R Dietherich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

RCA BTA-5SS solid state 5 kW AM, some damaged output transistors, BO. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

Motorola C-QUAM AM stereo system, inc (2) stereo gen & mod mon, perfect cond, \$6000. J Swett, KCLS, POB 640, Flagstaff AZ 86002. 602-526-1975.

TTC/Wilkinson FM25000E 25 kW FM xmtr on 100.5 MHz, 4 yrs old, removed 4/88 in gd cond, has FME10 exciter. J Sands, KMZQ, 2880 E Flamingo #F, Las Vegas NV 89121. 702-731-5100.

Gates 250GY in service, excel cond. B Pirtle, KTER, Box 190, Terrell TX 75160. 214-563-2646.

OVER 110 AM AND FM TRANSMITTERS

AMs: 50kw, 10kw, 5kw, 2.5kw, 1kw. FMs: 40kw, 25kw, 20kw, 10kw, 5kw, 1kw. All Manufacturers, All powers, All working, All spares, All inst. books.

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BESCO INTERNACIONAL
5946 Club Oaks Drive
Dallas, TX 75248

214-630-3600
214-226-8967

Gates BC5 plate transformer, gd cond, trade or BO. C Freinwald, KBSG, POB 5200, Tacoma WA 98405. 206-383-9700.

GE 4BT1B1, 1 kW FM, unknown cond, w/manual, \$600. J Murron, KIUP, PO Drawer P, Durango CO 81302. 303-247-4464.

SUPER-GEN

This high-performance FM Stereo Generator has selectable pre-emphasis, overshoot-controlled lowpass filters, digital pilot/subcarrier synthesis and built-in overmod protection. CBS/NAB's "FMX" system is available as a plug-in option.

Inovonics
SANTA CRUZ, CA (408) 458-0552

GE XT1A, 1 kW AM, 1300 kHz, great for back-up or spares, complete w/manuals, BO. P Hunn, WZZZ, 705 W 4th, Westpoint GA 31833. 315-593-1313.

Versa Count V322 10 W FM exciter, w/stereo gen, \$900. J Anuzzi, Randolph Skill Ctr, 551 Roxborough Ave, Phila PA 19128. 215-483-9402.

Radio station equip: GE 4BT1A 250 W FM xmtr & exciter; GE 3000 W FM amp & pwr supply; Moseley SCG3T stereo gen; SEA5700 stereo mixer; (2) Channel Master 6652 TTs; Akai 200D & Teac AR60 R-R's; dual ring antennas & filters; Teac cass deck, all for \$14,000 or will part out. D Bryant, POB 821, Elgin OR 97827. 503-437-0990/0301.

RCA TTU-12 12 kW UHF TV, filterplexer, cooling system, transmission line, \$12,500; Dage 15 input station switcher, \$2000. C Geilendorfer, WTJR, Box 7112, Quincy IL 62303. 217-228-1275.

Gates FM-1C, 1 kW in gd cond; Gates FM5B 5 kW FM, working cond. W Carnes, KIRT, POB 8234, Jacksonville TX 75766. 214-586-2162.

Halicrafters HT-32A, mint cond, stored in original carton 25 yrs, w/matching rcvr SX-115, also in original carton. F Yonker, 7 Old Farms Rd, Saddle River NJ 07458. 201-825-1895.

Gates 1 kW FM1H (M6573) 230 V single phase, spare fan blower, 2 spare 4CX1000A tubes; Gates FMA-4, 300G FM antenna, 96.7, 4 bays hor, 2 bays vert, now in use, bdcgt 24 hrs/day, covers about 60 mi radius, \$3400. Tri-City Bdcgt, POB 1430, Morgan City LA 70381. 504-384-1430.

Gates 500 W, BC500GY xmtr, 220 V single phase w/some spare tubes, now in operation, \$2750. Tri-City Bdcgt, POB 1430, Morgan City LA 70381. 504-384-1430.

Gates BC250L AM on 740 kHz, for parts, most assemblies intact and usable, BO. A Redd, WLVG, 1972 Moss Ave, Cambridge MA 02410. 617-576-2895.

Gates FM250G, gd cond, full set manuals, 91.9 MHz, w/spares, 20 yrs old, \$3500. H Gibbs, College of Wooster, Wooster OH 44691. 216-263-2000 X2767.

Teletronics 3.0 kW, needs work, gd for spare parts or aux xmtr, w/manuals, BO. T McCollugh, KFOX. 213-374-9796.

RCA TTU-12 UHF TV xmtr, 12 kW, no exciter (2), one for parts w/heat exch & 2 duplexers, as is, \$5000. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Wilkinson FM2500 2.5 kW on 100.3 MHz, low hrs. D Fearn, WKSZ, 1001 Baltimore Pike, Media PA 19063. 215-565-8900.

Willcott 500 W (2) units in cabinet. R T Smith, Gospel Spotlight, POB 406, Somerville GA 30768. 404-857-5815.

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.



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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.

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.

Kahn Powerside w/stereo gen, 1310 kHz, works great w/tight directional nulls, \$8000/BO. Dr Hollis, Hollis Bdc, POB 7008, Columbus GA 31908. 404-323-8127.

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 Liebis, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

Want to Buy

Low power carrier xmtrs, 10-25 W, any cond. K Sleeman, WOL, 400 H St NE, Wash DC 20002. 202-675-4800.

TV xmtr, low band VHF tuneable to Ch 3 & high band VHF tuneable to Chs 10 or 12. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

RCA BTA1-5 1 kW AM, for standby. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

CCA FM 10 DST. T Stevens, WHSN. 207-947-3987.

Continental 816R-2 20 kW FM. L Blakeney, WBBN, Rt 2 Box 273B, Taylorsville MS 39168. 601-729-8100.

GE 100 W UHF TV driver, either TT-24A or TT-55A/B; also need spare parts & tubes. J Powley, WIIM TV, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

RCA TTU-2A UHF TV xmtr or parts, parts new or used needed to repair damaged xmtr; RCA TTU-1B UHF TV xmtr or parts. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

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 Klaucek, 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.

TUBES

Want to Sell

807 Tubes, new, \$5.95 ea. N Carlson, Mobile Snd Group, POB 148794, Chicago IL 60614. 312-871-7459.

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, US-DA, 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.

Eimac 3-500Z (2), brand new, \$180/pr. G Barnett, KWXY, Bdc, Ctr, Palm Springs CA 92262. 619-328-1104.

Want to Buy

RCA 6181 & RCA 8501 tubes. J Powley, 1536 Logan Ave, Altoona PA 16602. 814-944-8571.

Aluminum sockets for 833A tubes for Gates BC-1G or equiv. E Riedelbach, KIGO, Box 609, St Anthony ID 83445. 208-624-4451.

T12 1450 kHz crystals for Gates DC1T series. E Slimak, WWAK, POB 1195, Hawthorne FL 32640. 904-481-2310.

TURNTABLES

Want to Sell

Rek-O-Kut 16" tone arm w/Shure cartridge, no stylus, fair cond, \$15. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Technics SL1200 MKII, excel cond, low hrs, comes w/ATI P100 preamp. BO. P Stover, WJYJ. 703-582-5371.

Russco Studio Pro, new, \$300. B Marshall, WT Studios, 2025 S 900 East, Salt Lake City UT 84105. 801-486-4877.

Technics SL1400 MKII, digital speed control, base dust cover, arm & cartridge, \$209. D Solinske, WSYR, 2 Clinton Sq, Syracuse NY 13202. 315-472-9797.

Gates TTs w/tone arms, need some work. T Driggers, Driggers Bdcgt, 818 Quail Court, Healdsburg CA 95448. 707-433-9370.

RCA BA-36A stereo TT preamps (2), vgc, \$45 ea or \$70/both; Shure M64 stereo TT preamp, vgc, \$35. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

Shure M64 phono preamp. BO. P Sibley, 138 E 78th, NY NY 10016. 212-986-2219.

Russco RT-700 (2), direct drive, \$200 ea. M Ripley, KOZE, POB 936, Lewiston ID 82501. 208-743-2502.

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.

SP-10 MK II in trade for (2) SL-1200 MK II. J Klaucek, WSAM, 200 Bloomfield Ave, W Hartford CT 06117. 203-726-9083.

Want to Buy

RCA 16" transcription TTs, lateral/vertical filters, universal arms. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

Gates CB500 or CB77, want motor, will buy whole table. B Moore, KTTK, PO Box 1232, Lebanon MO 65536. 417-588-1435.

VIDEO PROD. EQUIP.

Want to Sell

Telemation TSE-200 SEG, \$500; Panasonic BT51300N 13" color video mon, \$225; Panasonic CT-110M 10" color video mon, \$150; American Data 553A vertical interval color productivity switcher, \$500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Panasonic NV9600 U-matic, \$1600; NV9200A U-matic, \$700. A Chaney, Video Eng, 1415 Oak Knob Way, Sacramento CA 95833. 916-922-3456.

GVG 711C video proc amp, \$500; RCA TTS-1A delay EQ system, \$750. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Sony CVM 1270 color mon/receiver, 12", vgc, \$350; JVC TM-22 U AC/DC port, monitor w/Kangaroo case, new, \$325; JVC AAP-26U supply/charger, \$125. B Dombrowski, Whirlwind Prod, 10356 W Warren Ave, Dearborn MI 48126. 313-584-4038.

Pelco MS512DT switcher, 12 in 1 out, \$125; Telemation TSG-2000 bdcgt sync gen, \$950; Panasonic TR930U dual 9" B&W monitors, \$195. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Want to Buy

GVG proc amp. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

RCA TCR-100A cartridge recorder, 2" (2); also need standards conversion box & RCA TK-47. H Henson, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

Quantafont CG disc storage. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

VIDEO TAPE RECORDERS

Want to Sell

JVC CR-850U, CR6650-RM 86. 3/4" U-matic editing system, excel cond, 250 hrs, BO. R Hiett, WHSV, Rt 33 West, Harrisonburg VA 22801. 703-433-9191.

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Potomac, MD 20854
301-762-2786

IVC 1" VTR, \$500, NEC 3/4" video cassette player, good condition. \$500; JVC 5200U 3/4" video cassette player, like new, \$650. C Haynes, WJMI, PO Box 31235, Jackson MS 39206. 601-948-1515.

Sony BVV1A w/co mponent adapter & case, \$4000/BO. M Glaser, MRG Prod, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

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 Geocaris, Concept Prod, 7878 Big Sky Dr, Madison WI 53719. 608-833-8273.

Want to Buy

Sony Betacam R/P portable for use by non-profit organization. M Glaser, MRG Productions, 679 Nassau Rd, Uniondale NY 11553. 516-489-1071.

Sony 3/4" VTR. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

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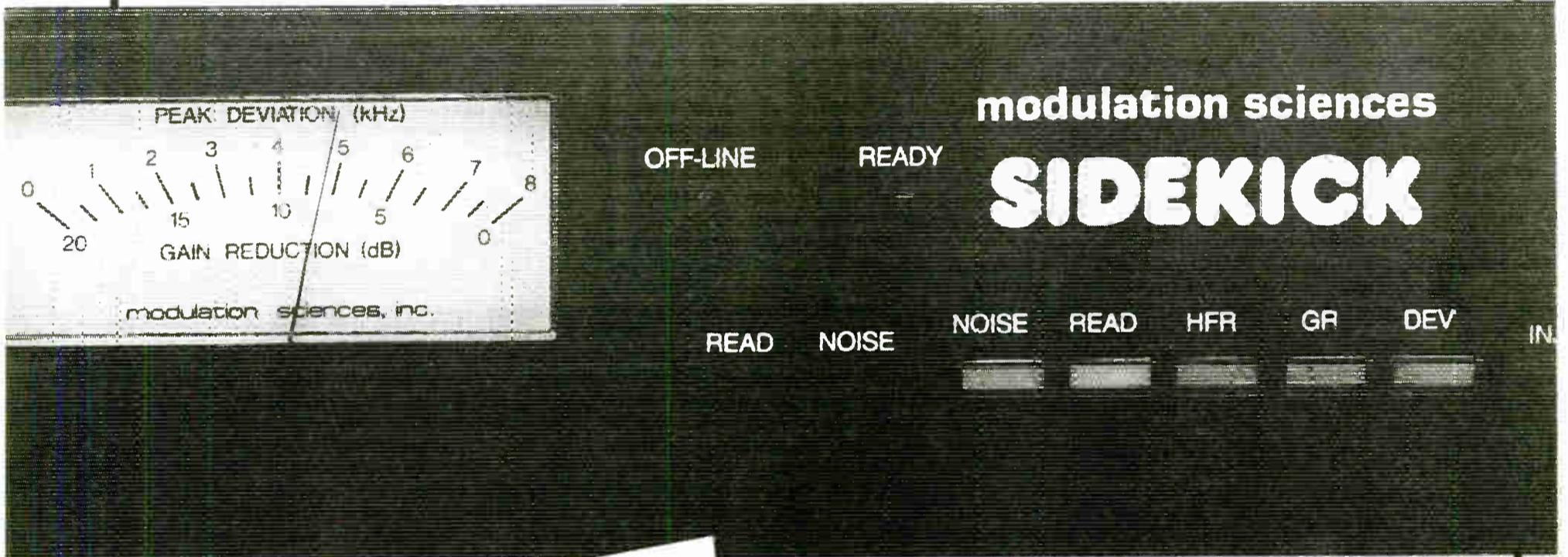
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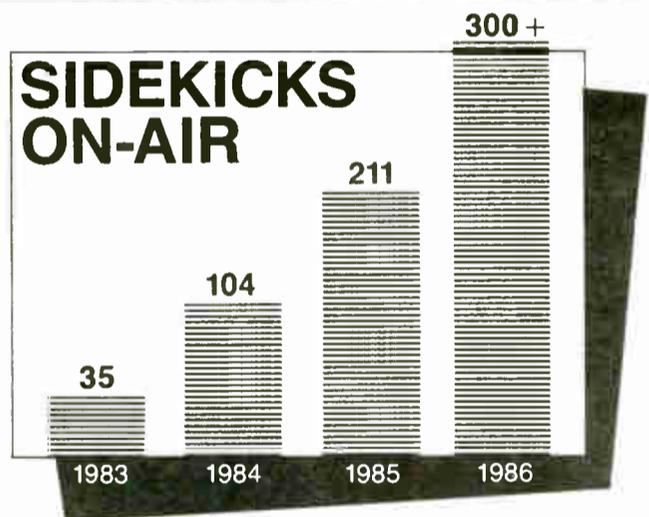
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