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Radio '88 Hosts AM Rally

Alan Carter

Washington DC ... Radio broadcasters kicked off Radio '88 with a rally for AM and by honoring excellence in local achievement with the Crystal Radio Awards.

The annual fall radio convention held here in the nation's capital 14-17 September also included exhibits by more than 180 companies—40 of them technical equipment exhibitors—on 37,000 square feet, with a noticeable emphasis on new digital technology.

FCC Commissioner Patricia Dennis and Mass Media Bureau Chief Alex Felker led broadcasters in a rather calm "AM Rally"—minus cheerleaders but with plenty of balloons—extolling the future of the band in spite of its current bleak period.

Broadcasters including Ron Frizzell of WLAM/WKZS, Portland, ME; Al Martine, Martine Broadcasting, Beckley, WV; and Gary Bruce of WHAS, Louisville, KY, also gave the insiders' view with personal stories of success in the business.

Part of the blame for the decline in AM lies on the shoulders of the FCC, Dennis said. In particular, she pointed to the past allocation policies that created interference problems, especially at night.

Programming, technical standards and allocation policies are three areas on which Dennis said she believes broadcasters must concentrate to improve the band.

Some AMs have remained dominant and carved out a programming niche, Dennis said. She questioned the benefits of simulcasting with FM because she said such a policy implied that AM has nothing unique to offer.

Dennis also expressed her support for the NRSC audio and emission standard and her assessment of the new AM band from 1605-1705 kHz as a "rare opportunity" to work with unused spectrum.

She noted her hesitation to authorize low-power in the new band, placing her support toward 5 and 10 kW stations that provide full-market service.

On overall policy, Dennis maintained her support for continued authorization of new stations because she said such action serves the public interest.

Which standard?

Felker also praised the NRSC standard. The Commission has issued a rule

(continued on page 3)

A giant boom box greeted attendees of the NAB's Radio '88 convention in Washington, D.C.

New NAB Radio Unveiled

by Judith Gross

Washington DC ... Amid the ultimate in fanfare, the NAB unveiled—literally—its "ultimate receiver," designed by Richard Sequerra to incorporate the latest in high-tech radio advancements.

A large press conference was held with members of the NAB board and staff and Sequerra himself present to explain how the receiver would help AM and enhance FM.

Radio Board President L. Lowry Mays uncovered the receiver, which was to incorporate the NRSC standard, FMX, continuous tuning from AM to FM, AM stereo (in three separate models) and AM noise-blanking.

In addition, the prototype model had a specially designed shielded loop antenna tuned by a rotating dial on top. An "intensity modulated" tuning indicator was designed to show the optimum setting for an AM station.

But from the start, the Sequerra receiver faced a series of problems which dampened enthusiasm for it at the show and which may hamper its acceptance among consumers and receiver manufacturers.

Delays and glitches

The introduction was delayed by a day while Sequerra continued to work on it. At its unveiling, the AM portion was not

(continued on page 15)

After the Allied Sale

by Charles Taylor

Quincy IL ... While the logistical ramifications of the late August buyout of Allied Broadcast Equipment Corp. by Harris Corp. have been spelled out by the companies, what remains to be seen is how the partnership might affect other broadcast manufacturers and distributors.

The purchase of Allied, the largest US full-line distributor to the international broadcast industry, by Harris on 31 August undoubtedly will influence other manufacturers, many in the industry say, though it will take time to determine how.

Some claim the currently potent Allied will weaken under the wings of Harris, a well-known supplier of broadcast equipment, opening up competition more evenly among smaller companies.

"The sentiment of a lot of manufacturers is that Allied was getting much too strong," said one industry official who did not want to be identified. "If, in fact, Harris is going to botch it all up in a matter of a year or two, and therefore diversify the marketplace again, I'll be delighted."

Others say the buyout of the Allied operations will give Harris products an unfair advantage in the marketplace, leaving companies hesitant to use Allied as a distributor. One manufacturer even questioned the legality of the acquisition.

A number of observers have said that Harris' main interest in the company is to strengthen its own marketing arm.

The power of the force

In any case, many company officials are hesitant to place their names beside their opinions, recognizing the influence that the combined forces possess in the industry. Harris is valued at $2.1 billion, according to the company. Allied's total sales figures exceed $30 million.

(continued on page 17)

AM National Licensing Panned

by Charles Taylor

Washington DC ... A handful of reply comments filed in late August lent additional support and criticism to previously stated opinions regarding the FCC's Fourth Notice of Inquiry to expand the AM band.

The issue, contained in Gen. Docket 84-467, concerns the FCC's rule making to establish 10 new commercial AM channels, from 1605 to 1705 in July 1990.

In June, the Commission presented a full discussion of the ramifications of the expansion and ideas for specific uses.

Comments following in August primarily took jabs at the FCC's concept of allowing single licensees to control portions of the band nationwide.

The idea of giving preference to current daytime stations in the expanded band also was a key issue, garnering a majority of support.

In reply comments due 26 August, four groups responded. The filings mainly added emphasis to views on the national licensing and daytimer preference issues.

The Washington-based National Black Media Coalition argued that the expanded band should be reserved for minority and noncommercial interests and not for national licensing or daytimers.

"The daytimer giveaway sought by the NAB and other commenters would further exacerbate the Commission's eight-year tilt toward incumbent daytimers and away from more meritorious claims of minorities and public broadcasters," the coalition said.

"Daytimers voluntarily chose to operate on their frequencies. Nobody forced them onto the air. At least they have frequencies on which to operate," the group continued.

The NBMC pointed out that while "daytimers may be second-class broadcasters; minorities and noncommercial interests have been third-class in the eyes of the Commission."

Noncommercial preference

WNET, a noncommercial educational station in Newark, NJ, pushed for noncommercial preference in frequency allocation, and suggested that the Commission adopt an allocations scheme that allows several of the 10 available frequencies to be assigned on a reserved basis to the largest markets underserved by high-power educational stations.

The station supported the FCC's proposal to relocate daytimers on the expanded band and opposed the national licensing scheme, primarily because "few public broadcasters can afford to construct and operate a national network of broadcast stations, and many would lack legal authority to do so."

Also, national licensing does not address the problems of an overcrowded educational FM spectrum, which are best rectified by local AM assignments made on an as-needed basis, WNET said.

The National Telecommunications and Information Administration (NTIA) in Washington, encouraged the FCC to utilize AM band expansion to improve the quality of existing AM radio service, not just to add new stations.

This can be accomplished, the organization said, by following proposals to move existing daytimers into the expanded band, allowing them to provide more extensive service to their communities and relieving congestion in the lower band; and by moving second-adjacent stations and translators into the expanded band.

"It is important that the Commission coordinate its efforts to improve AM radio, including the implementation of the expansion band, to achieve expeditiously the revitalization of this service," NTIA said.

Yes to national licensing

Finally, EZ Communications, based in Fairfax, VA, and owner of 10 AM and FM stations nationwide, countered majority opinion in its filing by becoming the first to support the concept of national licensing.

EZ said that national licensing not only is lawful, but is in the public interest. "For the first time, many residents in rural areas could enjoy new and innovative broadcast services on the same basis as urban residents," the group said.

The company went on to observe that national licensing also would serve as incentive to the development of new receivers and to consumers to buy them, more than if stations were licensed piecemeal one at a time with programming that is indistinguishable or identical to other market station formats.

For more information on Docket 84-467, see 1 September RW, page 12, or contact Wilson LaFollette at the FCC, 202-632-5414.

NEWS BRIEFS

NRSC and Class A

Washington DC ... The FCC has set the comment and reply comment deadlines for proposed rule makings on the NRSC standard (Docket MM 88-376) and the Class A power hike (Docket 88-375).

Comments are due 22 November and reply comments 22 December on both.

Training Minorities

Washington DC ... Three broadcast associations will launch a program to encourage minority employment at radio and television stations.

Trainees will be screened by an advisory board and placed on an assignment for one year during which they will be paid at an entry-level scale. At the end of the year, the station will have the first option for hiring the trainee, but that person would be under no obligation to accept the offer.

The program, to begin in the summer of 1989, was proposed by the Radio and Television News Directors Association (RTNDA) and received the support of NAB and the Broadcast Education Association (BEA).

Station Totals

Washington DC ... The most recent figures from the FCC showed there were 10,348 AM and FM stations broadcasting as of 31 July, compared to 10,337 as of 30 June.

The July breakdown included 4914 AMs; 4089 commercial FMs and 1345 educational FMs.

The report also noted there were 1594 FM translators in operation.

NPR Moves on Satellite

Washington DC ... National Public Radio has issued a request for proposals for the space segment of public radio's second generation satellite interconnection system. Proposals are due 1 November.

The current system, inaugurated in 1979, uses a transponder on the Westar IV satellite that is expected to go dark in 1991.

The RFP asked for service and price quotations for both a single C band transponder and two C band transponders to be put into service no later than 1 May 1991 and last a minimum of 10 years.

Money Radio Uplinks

Los Angeles CA ... Money Radio has uplinked to the Satcom I-R satellite to implement a nationwide syndication network, according to Executive VP Vera Gold.

Stations throughout North American, including Alaska and Hawaii, can downlink Money Radio's signal on Satcom I-R's dual polarized transponder 21, to frequency 74.4.

Broadcasting live from the Pacific Stock Exchange building in L.A., Money Radio is a 24-hour, all news/talk broadcasting medium specializing in business, finance and investments.

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Awards, Rally Open Radio '88

(continued from page 1)
making including both the audio and RF emission portions of the standard.

Felker said, however, that while the emission standard may be "more effective" in addressing second adjacent channel interference, the audio portion "does a real good job." He also noted a greater cost in implementing just the emission standard because of the uncertainty of measurement techniques.

Some broadcasters are concerned that the FCC will act on the emission standard and not the audio portion.

Felker also said there is an opportunity for broadcasters to improve skywave and groundwave propagation with new measuring techniques not available 40 and 50 years ago when some FFC rules were written.

Frizzell also questioned the use of simulcasting AM stations on FM, because it encourages broadcasters to neglect the AM.

WHAS's Bruce encouraged AMers to "go above and beyond" what FMs are doing in their market. With the negative perception that AM is no good, AM broadcasters are in the tough position of having to be twice as good as AM if they are going to succeed, he said.

Martine told how he took his station in Beckley, WV, from a losing situation by switching to an oldies format. "We programmed to the community," he said.


(From left) Patricia Diaz Dennis, Alex Feker, Al Martine and Gary Bruce listen as Ron Frizzell speaks during the NAB's AM rally.

. . . Dennis maintained her support for continued authorization of new (AM) stations because she said such action serves the public interest.

At the radio insider level, WLAM/WKZS's Frizzell called the NRSC a very important tool for AM. "It needs to happen fast," Frizzell said, and he suggested the FCC institute strong penalties for stations not complying. He pointed to a survey that found 80 percent of listeners questioned could not tell the difference between an FM signal and an NRSC AM signal.

Crystal awards

Also at the opening of the convention, NAB named the 10 winners of the second annual Crystal Radio Awards to recognize community service and involvement.

The winners were: KTNN, Window Rock, AZ; WAGE, Leesburg, VA; WBAL, Baltimore; WBEL, Beloit, WI; WKKR/WZMG, Auburn, AL; WMT, Cedar Rapids, IA; WTMJ, Milwaukee, WI; WTRE, Greensburg, IN; WWVA, Wheeling, WV, and KVON, Napa Valley, CA.

With a theme of "Radio Is the Future," the NAB introduced the Crystal Awards presentation with a skit featuring Gandar the Wizard and two young companions, looking into the future and discovering radio.

Key NAB officials also used the program to stress important radio issues for the upcoming year.

Among the topics NAB Joint Board Chairman Wally Jorgenson stressed were interference reduction, comparative renewal and FM translators.

Radio Board Chairman L. Lowry Mays focused on the radio industry's need to lobby in Congress for radio-only legislation, a proposition where radio and TV would be separated on legislative regulations.

NAB President and CEO Eddie Fritts called radio an enduring force that is facing immense competition. He said survival in the 1990s will depend on radio broadcasters examining new trends and "targeting the future."

Among the areas Fritts said broadcasters should be concerned about are new taxes that could come from the federal government, including spectrum fees and taxes on advertising and transfer applications.

(Complete Radio '88 coverage will be in the 15 October RW.)

Cheers, Jeers and Radio Wizards

by Judith Gross

Falls Church VA ... Hate to keep harping back to the **Land of Oz** analogy ... but there we were, in the nation's capital for **Radio '88**, and from a distance, DC does sort of resemble the Emerald City.

There's that feel of **un-reality**, for starters. Why else would trade and lobbying organizations spend millions to tell Congress how **real people** out there really think and feel?

This time the **Wizard was Gandar**, a spirit conjured up by the NAB to tell us all that "radio is the future." Thank you, but I thought that's why we were all there to begin with. Talk about **preaching to the converted**.

Anyway the giant boom boxes once again led the way, and the festivities kicked off with what was supposed to be a **rally for AM**.

Things stayed pretty tame, with a lot of the same technical review of AM's problems we've heard in the past.

There was **no rah-rah cheering**, there weren't even hot dogs, pom poms or cheerleaders. At least there *were* balloons. Cheerful red and blue ones proclaiming **"AM Alive."**


Abracadabra: the "ultimate" revealed.

Unfortunately, by all accounts, the rest of the convention and related events were **not happy ones** for AM radio.

There was the NAB's invite to **180 receiver manufacturers** to come and talk about better quality radios for AM. Only seven showed up.

One of those who did attend said his company had **no interest** in making AM radios, period.

The receiver manufacturers, along with the rest of us, did get to hear audio cuts from the **B. Angell** study which asked listeners how much adjacent and co-channel interference was acceptable (26 dB music, 40 dB talk, for adjacent) and the clarity of interference was at times, amazing.

But since the cuts were done with the **NRSC standard** in the audio, one maufacturer pointed out that the B. Angell study also shows that NRSC alone **won't clean up** AM enough to get the better radios on the market. Bitter irony for the NAB, which commissioned the study, if the results also ultimately **undermine** the attempt to promote NRSC.

☆☆☆

And speaking of "ultimate" ... there was the unveiling of the **"ultimate"** radio receiver designed and built by **Richard Sequerra** of (yet another old stomping ground of mine) Bayside, NY.

No sooner had NAB execs whisked off the gold lame cover before a **packed hallway of reporters** (we had to move the event into the hallway because the NAB couldn't get a good signal in the convention center meeting rooms) than it became obvious the receiver was, well, underwhelming, to be kind.

First off, it's a **tabletop model**, with separate speakers. Gee, don't most AM listeners listen in cars these days?


Big wheels rolling Texar to Gentner.

Then, there was **only one prototype**, not the three (each with a different way of decoding the stereo) that had been promised.

Couldn't tell if the Sequerra receiver will be the salvation of AM, because the **AM portion wasn't working**. Neither was what is probably the single most important innovation on the entire receiver, namely the continuous tuning feature. Seems a **faulty chip** was to blame for that.

But then, as one of my colleagues pointed out to me, the clock on the radio was **21 minutes slow** as well.

The whole fiasco had consumer reporters, most of whom were **unfamiliar with the industry issues** involved and most of whom had been dragged down to the press conference (a day late) on the promise of a **radio designed to save AM**, puzzled, skeptical or worse.

The NAB **still owes Sequerra $12,500** on the $25,000 contract for the prototypes, and still wants to get three working models.

But how are they going to get receiver manufacturers interested if they can't **set the public on fire** over the idea? (Heck, even the reporters were yawning!)

This whole thing about talking to the receiver guys needs to be rethought ... you know, **get everybody talking the same language**, for one.

Why doesn't the NAB hire a **promoter-type** who has ties to the consumer industry, like **the FMX people** recently did? No wonder the Car Audio Specialists Association upped and endorsed FMX.

☆☆☆

AM's bad news didn't end there, either. There was the presentation by **Bill Moyes** of the Research Group as to why folks don't tune in AM anymore. It's the **perception of poor quality**, and the words "AM stereo" which only confuses the issue (say "1230 stereo" or "WXYZ stereo" instead).

But it didn't help that those presenting the bad news aren't aiming for **AM's shining success** themselves. They told attendees basically **not to spend money on AM** unless they have an FM firmly in their pockets.

In other words, they only use the AM as a sort of **"loss leader"**, that extra half point on the ratings to rake in a few more bucks from the advertiser.

Maybe it's one case where the messenger of the bad news *should* have been "killed."

If the **sad AM story** has you down, don't feel helpless. **Ron Frizzell** of WLAM up in Maine has written an incisive little article comparing AMers to **passengers aboard the Titanic** after the iceberg hit.

It's in this issue. Read it, then show it to your GM, or if you are a GM, show it to the FCC, Congress, the NAB and anybody else who you think it's time got up and did something decisive for AM. Then *act*.

A few quick tidbits from around the show: **Texar's products** arrived in Salt Lake City in time to appear in the **Gentner booth**.

Three big vans moved the entire Monroeville, PA operation out in Utah in September.

CRL's Bill Ammons said "why wait" for a better quality AM receiver. He built his own, taking a receiver and widening the IF bandwidth, adding NRSC and C-QUAM stereo. Sounded great.

Some **new products** were at the show, including a stereo noise generator and preemphasis monitor for the NRSC standard from Delta's; some FM and AM gear from Harris, including a module from the very first DX-50 digital transmitter.

That first unit, by the way, has already been sold to KFBK, the Group W station in Sacramento. And there were many other interesting products at Radio '88. You can read all about it next issue. Heading off to **Denver** next ... it's one show after another.

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

OPINION

Readers' Forum

If you have comments for *Radio World*, call us at 800-336-3045 or send a letter to Readers Forum (Radio World, Box 1214, Falls Church VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

NAB on FM2

Dear RW:

I wish to respond to Larry Tighe's guest editorial printed in the 1 August edition of **Radio World.**

First, when several NAB staff members met with Mr. Tighe in April of this year we extended him an invitation to work within NAB committees and try to establish some kind of NAB policy on the FM2 issue. He never responded.

Based on the flow of communications to NAB over the last year, the fact is that FM2 has not had a great deal of industry support. If it did, perhaps NAB could be more responsive to Mr. Tighe's concerns.

Second, as of today NAB has spent more out-of-pocket money on AM improvement than any other NAB initiative, including HDTV.

While $700,000 has been budgeted to fund an industry Advanced Television Test Center (ATTC), at least that much—and perhaps more—has or will be spent on AM improvement and NAB's share of the NAB/RAB Radio Futures Committee project.

Mr. Tighe is mistaken when he suggests that NAB's priorities (at least to the extent they can be measured by dollars) lie more with the future of television than with the future of radio.

Finally, Mr. Tighe's various statements that NAB is dominated by "big dues payers" are simply not true. One NAB constituency does not have any more "domination" capability than any other NAB constituency.

Every "dues payer"—daytimers, clear channel operators, Class A FM stations, large markets, medium markets, small markets, associate memebers, convention attendees and exhibitors—has an important role in NAB affairs.

It should also be noted that, if anything, NAB provides more service to smaller stations than larger stations.

For example, most of the phone calls to, and member service activities of the NAB Science & Technology Department are on behalf of smaller stations. Radio membership has grown steadily and is near record high levels; we must be doing something right.

I repeat my invitation to Mr. Tighe: Come present FM2 to our committees. If FM2 is such a terrific solution for AM broadcasters Mr. Tighe should have no problem selling his proposal among his peers.

But something more than rhetoric is needed to invoke what Mr. Tighe calls NAB "muscle": facts and a plan of action. Developing policy on behalf of an entire industry deserves no less.

Michael C. Rau
VP Science & Technology, NAB
Washington DC

Class A coverage

Dear **RW:**

Thank you very much for the coverage you have given the Class A broadcasters in the New Jersey effort to achieve a power hike to 6000 watts.

I have been involved in this effort from the first days when the issue was raised by John Furr and John Barger of Clear Channel Communications, back in the fall of 1986.

Your publication was the first, long before *Broadcasting* and the others, to recognize our movement with an article 1 June, 1987. You have covered us all the way through our days of reversals and slow going.

Now we are a growing cause. Finally Class A broadcasters are beginning to realize we really have a chance to win a unilateral power increase. Our engineering is sound, our opposition emotional and weakly documented, and we really feel we can succeed without NAB.

The so-called NAB "compromise" position is no such thing. It is a position which discriminates against over 800 Class A stations. Most of these stations are located in the populated areas of the country where the Class A power increase is needed the most.

And even for the stations that could be helped by the NAB proposal, a layer of expensive and troublesome case-by-case FCC paper work is added to the process, precluding many of the small stations from taking advantage of the proposal.

This fall the Class A broadcasters will mount the most vigorous comment campaign the Commission has seen in a long time. Organizational meetings are being held now, legislators are getting involved, the hat is being passed.

True we are the "little guys." We don't have the money or the clout of the Bs and Cs or the NAB, but we are building a very strong belief in the urgency of our causes. Most of all, we know we can win!

Michael C. Rice, President
Nutmeg Broadcasting Company
Willimantic CT

Friday "massacres" more common

Dear **RW**

In response to your mention in 1 September's *Earwaves* concerning former KVLT CE Troy Langham's "Black Friday," let me fill you in on some background information about the "volatile" Tulsa market.

"Black Fridays" are nothing new here, as I personally have seen the same thing happen to other staffs at other stations during the last five years.

I have even personally experienced the humiliation of a "clean sweep" within the last 18 months. A "clean sweep" Mr. Langham was aware was coming and conveniently "forgot" to tell those of us involved, even though he was assisting the new manager in looking for a replacement engineering staff.

I was fortunate and able to come out on my feet, eventually owning two sucessful radio properties in Oklahoma and landing here as a partner and as the General Manager/CE of KBIX-AM and soon to be built KBIX-FM.

Mr. Langham has been sucessful in his quest for gainful employment. I understand he is now the CE of KQMJ Henryetta, OK. I hope he is breathing easier now.

So, as you can see, sad stories and Black Fridays are nothing new to broadcasting in Tulsa and we have all learned to take one day at a time.

Scott Clark, GM/CE
KBIX
Muskogee OK

Bell Tolls For AMs

A warning bell was sounded during Radio '88 for AMers—and anyone else concerned about AM's future.

Underneath the pro-radio messages of the convention program were a series of unrelated—and unintentional—reminders that AM is in trouble and the time has come for decisive action.

The bell was heard in the sparse showing of receiver manufacturers who attended an NAB meeting designed to spark interest in better quality AM radios. It was heard during an AM rally that rehashed the technical problems plaguing the band without providing leadership or concrete plans to undo the damage already done.

It was sounded again with the trouble-plagued unveiling of the "ultimate" radio which failed to work properly, failed to excite the enthusiasm hoped for, and lacked the necessary follow-up to promote its technical advances to receiver manufacturers and listeners.

And the warning bell was heard twice in a report on the public's attitudes towards AM. First came further evidence of declining listnership because the band is perceived as a low-fidelity service.

And second, there was the attitude of those presenting the findings—namely, that it's acceptable to consider an AM station a second-class property as long as you own an FM.

No one person or set of circumstances is to blame for the constant reminders of AM's troubles which plagued the show. And fault-finding is not going to help save AM.

The months of fact-finding, technical review comments and task forces are past; the data is in. Now it's time for the leading AM stations to call an emergency meeting and take action.

While technical relief needs to be mandated by the FCC, it's clear that the Commission will only act when it is sent a message stating precisely what is needed to help. But AM's problems can no longer be solved by technical means alone. It's time for owners, managers and programmers to act in unison and to get the public in on the process too.

AMers should either select whatever organization is most responsive and can do them the most good (the FCC's RAC, NAB, RAB, etc.), or decide to start their own AM-only group to get the job done.

The mis-steps and missed cues at Radio '88 show that the best efforts being put forth currently are just not enough.

For anyone who still cares about AM's future, time is running out.

—RW

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ERRATA

*In the story Transducer Operating Specs: The Basics of Mic Application (September 1, 1988 **RW**), the captions for Figures 2 and 3 were reversed.*

Also the author was misidentified as Bill, rather than Bruce Bartlett.

We regret these errors.

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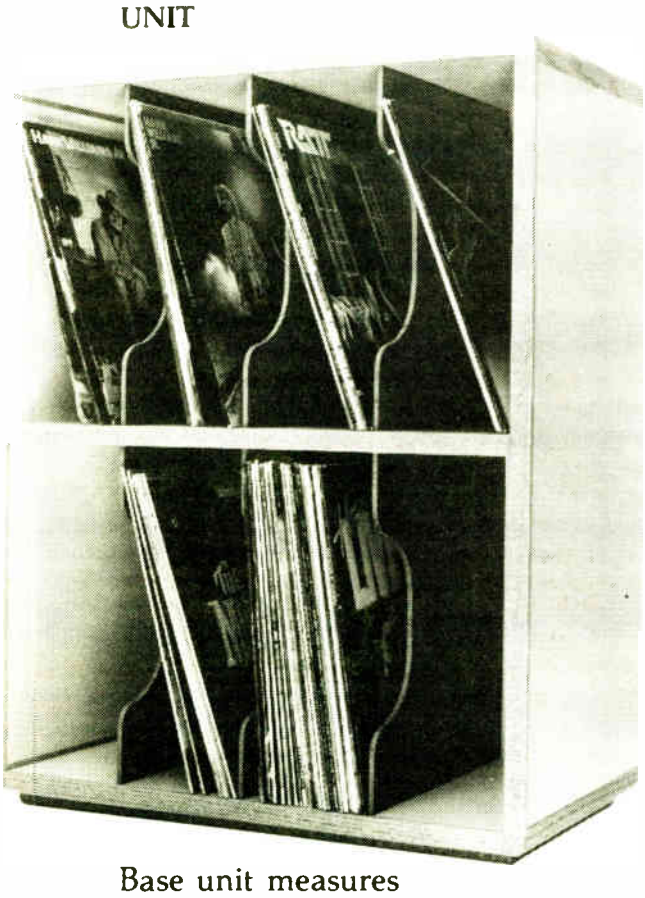

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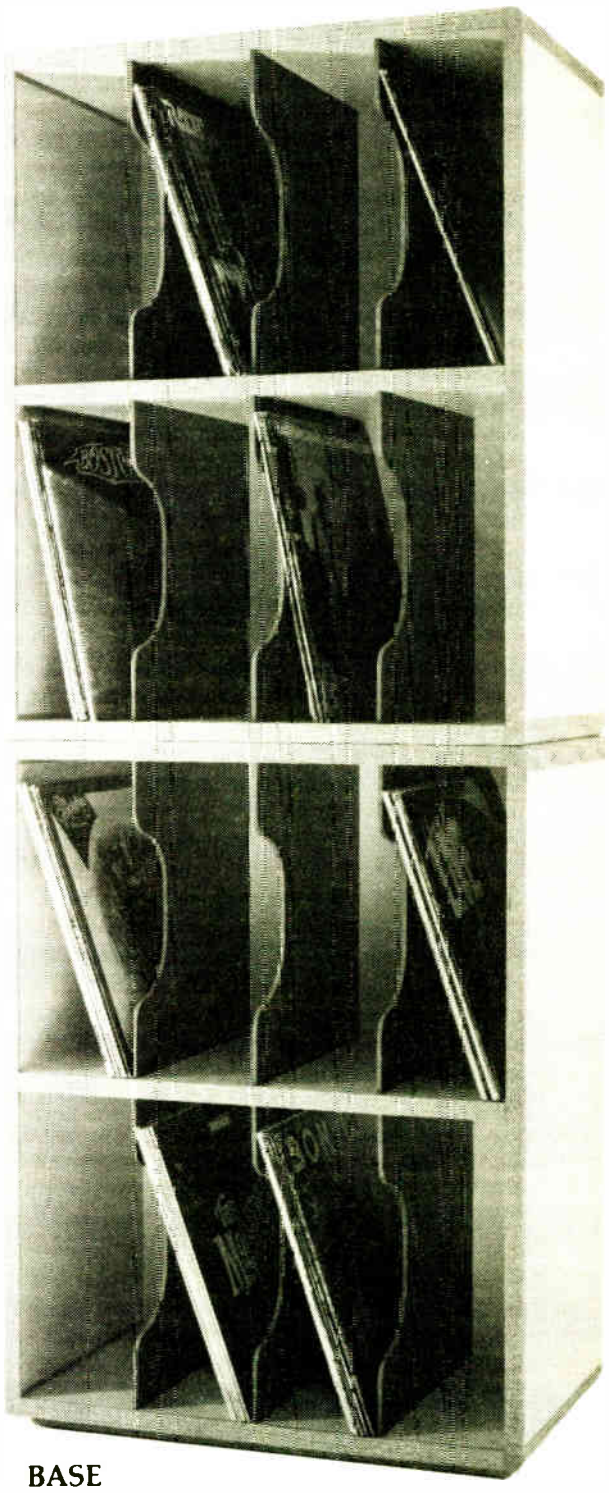

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Fatal Air Crash Totals FM Tower

by Charles Taylor

Valdosta GA ... A single-engine airplane crashed into a radio and TV tower here in mid-August, killing the pilot, demolishing the tower and leaving WJYF-FM off the air and without revenue for nearly three weeks.

The TV station broadcasting from the tower, WVGA, was expected to begin broadcasting at the beginning of this month after being down since the crash.

The accident occurred when Frank Blaydes, a Cairo, GA physician, was attempting to land a rented Cessna 172 at the Adel, GA airport between 2:45 and 3 AM 17 August.

Dense fog prevented him from landing at Valdosta Regional airport about 25 miles away. A sheriff's report said he may have thought the lights on the radio antenna were airport runway lights at Adel.

Visibility was estimated at less than 700'. The broadcast tower stood 950'.

"The plane ran into one of the guy wires evidently and when it snapped the wire, it set up some kind of vibrations and the tower just fell over," said WVGA-TV Station Manager Marvin Keene. "It was completely demolished, from ground level up. It was taken right off at the base and then fell onto the transmitter building."

Damage to WJYF-FM was estimated at $15,000, according to Clyde Scott, the station's contract engineer. Destroyed were a single bay Jampro antenna and feed line, microwave dish feed line, directional coupler inside the transmitter building, the auto power board in the transmitter and other "nickel and dime" components, Scott said.

Insurance will cover those items, though station officials were negotiating about costs incurred to modify equipment for alternative transmission.

Cause discovered hours later

The 24-hour FM was thrown off the air at the time of the accident but station officials didn't discover why until several hours later, said David Handy, president and owner of Tift Area Radio Inc., which operates WJYF-FM and WTIF-AM.

The overnight operator tried to bring the station back up after it was knocked off, then called Scott when his efforts failed.

"But (Scott) was at work (at another station) and we had to wait until he got off," Handy said. "Meanwhile, the folks (at WVGA-TV) were coming in to sign on at 6 AM and nothing happened. They called their engineer and both he and (Scott) arrived from different directions at the tower site about the same time just as daybreak was coming."

By then, police had roped off the site and the cause of the power outage was more than obvious.

WJYF at first intended to broadcast the FM's signal from the nearby tower of its sister WTIF-AM. The FCC nixed that idea.

Then officials at stations WDDQ-FM and WBIT-AM agreed to share their antenna for transmission of WJYF. The station's studios and antenna are located in Adel about four miles from the crash site.

Scott modified the power to the WDDQ antenna by adding plate voltage to the station's CCA-5000 transmitter, producing a three-phase, 5 kW signal instead of the single-phase, 2 kW transmission signal that was broadcast from the previous site. Also, instead of broadcasting from 800', the stand-by antenna was perched at 220'.

Plan runs astray

But the plan went astray when Scott found that WJYF's microwave hook-up could not be attached to the antenna, leaving no way to transmit the station's signal from the studio to the tower. Undaunted, WDDQ/WBIT offered WJYF studio space to air its easy-listening programming.

"They had an FM control room that was being used for one newscast a day," Scott said, "with a four-channel stereo board sitting there and a couple of cart machines. I pulled two of the ITC-750s out of (WJYF's) automation rack, ran them down there and put in another rack, wired them in through this console, into audio processing gear, pressed the button and we were on."

The station returned to the air at 1:30 PM 3 September, 18 days after losing power. Scott estimated that it is operating at about ⅔ its normal power.

Once the new tower is built by WVGA, which is estimated for completion at the end of October, WJYF will utilize the opportunity to alter its transmission pattern to improve signal quality, according to Scott.

"We had tremendous coverge for a Class A, but it had a lot of holes in it," he said. "Plus we were right up against a 5' phase on the tower so it was extremely distorted signal pattern-wise."

Scott hopes to extend the tower phase by installing the station's microwave feed about 10' or 15' away from the sides of the tower. Also, he is planning to broadcast from a lower altitude— 500' to 600' instead of the former 800'—at a higher power.

In the meantime, Handy is crossing fingers that being off the air for such a period of time won't permanently harm listenership.

"This FM was at a tall point (in the county) when it went on the air in November 1986. The easy-listening format is one-of-a-kind in the market area," serving three counties, he said.

"That's what made it so appealing to me to purchase the station, which I finally did July 1st."

Fortunately, he said, the easy-listening audience is loyal to the format, so he anticipates little trouble in getting listeners back as the station endures its transition before returning to full power.

Said Handy, "One lady told me that she just left her dial set and she hasn't listened to anything since."

For more information about the accident, contact David Handy at WJYF, 912-382-1346; or Marvin Keene at WVGA-TV, 912-242-4444.

Gentner Buys Texar

Salt Lake City UT ... The latest player in the whirlwind of acquisitions hitting the broadcast equipment industry is Gentner Electronics Corp. which has entered the audio processing market with the purchase of Texar, Inc.

Gentner President Russell Gentner said the deal was an asset purchase and that Texar was acquired in a cash transaction.

The entire Monroeville, PA Texar operation was moved on 3 September to the new, larger facility recently occupied by Gentner in Salt Lake City.

Several parts of the manufacturing facility were shipped to the Gentner plant by overnight express, according to Gentner "to permit uninterrupted delivery of Texar products and service."

As of 1 September all Gentner dealers were authorized to sell Texar products and the standard Gentner warranty applies to those products retroactive from 1 September, 1987, Gentner said.

Gentner will continue to manufacture and market Texar's products, such as the successful Audio Prism processing unit, Gentner said. The company will retain Texar founder and President Glen Clark as a consultant to the firm.

"Basically it's going to be business as usual for Texar; it will just be located in Salt Lake City," noted Gentner, who added "all prices will stay the same."


Gentner's new expanded facility in Salt Lake City

Gentner also said the company would hire a specific manager to handle the Texar product line, noting that Gentner recently beefed up its R&D staff by filling three positions.

Yet to be revealed by Gentner is the status of Texar's latest product, Lazer. A primitive prototype of the new processor appeared at this year's NAB show, but has yet to be completed as a product. Gentner said an announcement on Lazer's status would be forthcoming.

(continued on page 14)

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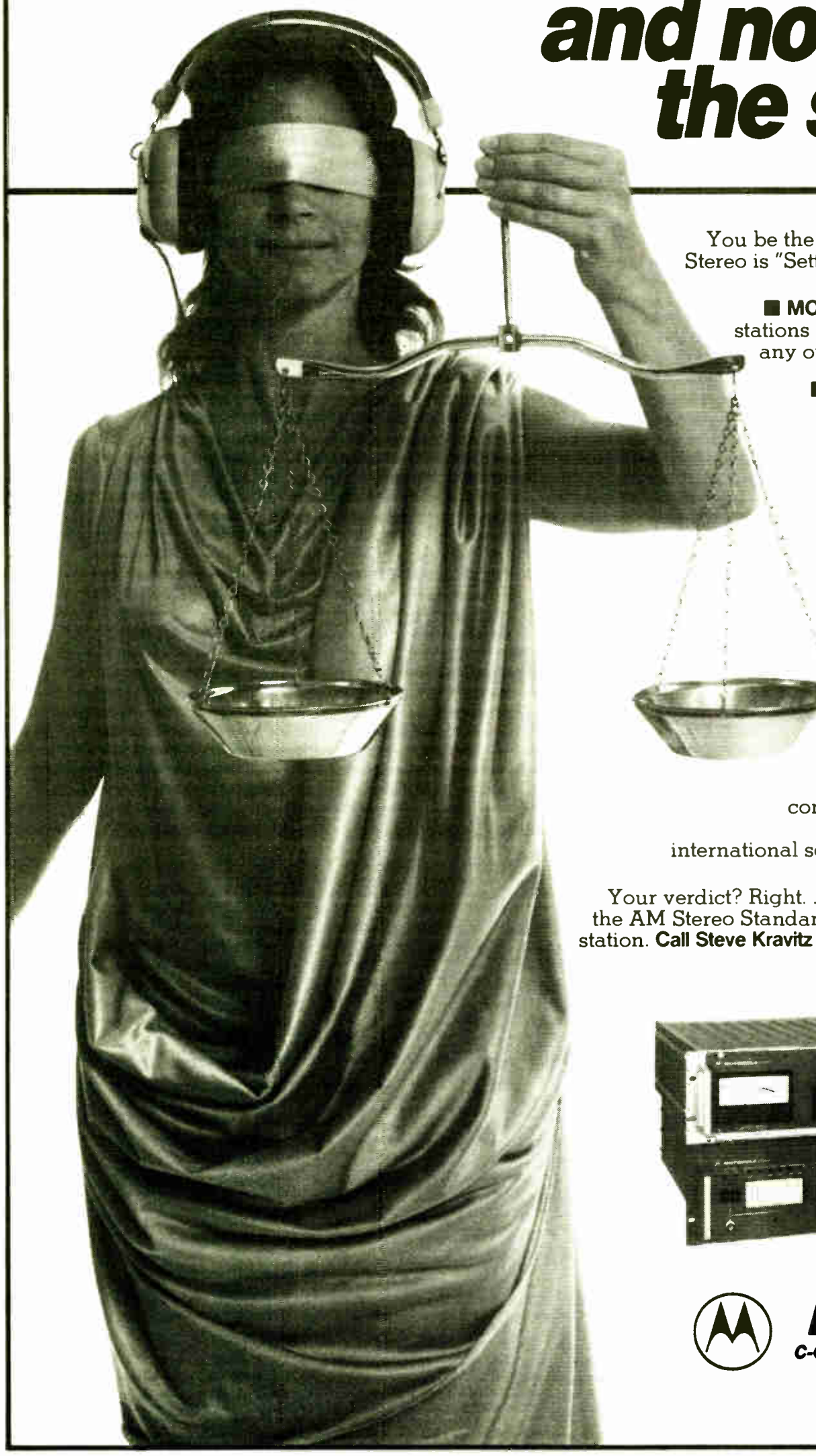

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Radio No-Shows Mar Meeting

by Judith Gross

Washington DC ... An open invitation from the NAB to learn about AM technical improvements and discuss the possibilities for better AM radios was largely ignored by receiver manufacturers.

A meeting scheduled just prior to the Radio '88 convention here drew only a handful of receiver manufacturers of the 180 invited and the reactions of those who did attend were not as enthusiastic as the NAB had hoped.

NAB Science and Technology VP Michael Rau explained that the meeting was scheduled to expose the manufacturers to efforts on behalf of AM improvement and spark interest in the new Sequerra receiver and in a certification mark for improved AM radios incorporating the NRSC standard.

Rau said that representatives of those companies who did attend were mainly engineers, not marketing managers, and that decisions about new radio designs are often, these days, made in Japan where the firms are headquartered.

One other obstacle, he said, seems to be the lack of interest in resurrecting an older technology such as AM radio, instead of supporting newer technologies such as CD and DAT.

One manufacturer's representative told the group his company would not design NRSC receivers "just to sell more radios." He added that "AM is just a thorn in our side; it's a market-driven thing."

NAB's Stan Salek (left) and Michael Rau address radio manufacturers.

Those who attended heard some cuts from the recently conducted B. Angell listening tests which showed that listeners demand better protection ratios—especially from adjacent channel interference—than those which have been used by the FCC all along.

They also heard the latest reports on coverage figures for station complying with the NRSC standard. Recent surveys done show that the 190 top Arbitron markets have at least one NRSC station including all top 50 markets, and that NRSC signals are available to more than 196,386,000 radio listeners in the US.

Charles Morgan, of Susquehanna broadcasting told the same representatives at the NRSC meeting held just prior to the receiver manufacturers' meeting that the standard had clearly reached the point where "it's time to go to your drawing boards"—to design new radios.

But Carl Pittman from Arvin, a company that manufactures radios on contract for other companies, said "we don't have any plans to make AM radios."

David Meyer, from Thomson Electronics pointed out that decisions about new radios "go beyond the technical into the area of marketing." He added that a certification mark to help market better AM receivers may not in itself be effective, without an accompanying improvement in AM quality.

Bart Locanthi, representing several receiver companies at the meeting added that consumer awareness of AM is low, "around 2-3%."

Rau expressed strong disappointment in the turnout of receiver manufacturers and said after the meeting that "because of the failure of the meeting NAB will have to look at other avenues to reach the decision-makers."

One possibility, according to Rau, is to hire a person familiar with the consumer electronics industry to lobby support for better AM radios.

He said the choosing of a certification mark for improved AM receivers was "the single most important thing" to work toward, and that if the receiver manufacturers don't support the concept there's "no hope for one."

Rau predicted that over time, NRSC radios will be manufactured and marketed, but that broadcasters probably would not be informed when those decisions are made.

"It would be nice to have receiver manufacturers promoting it enthusiastically," Rau said, "but with many standards, this is the best you can hope for."

NAB Test CD in Works

by Charles Taylor

Washington DC ... The NAB is in the final stages of mastering a compact disc containing test signals for radio station equipment, previously difficult to obtain all in one place and without a variety of signal generating equipment.

The 99-track CD, which should be available by late fall, will include NRSC noise and reference signals, as well as many of the more common test signals for frequency response measurement, harmonic and IM distortion measurement and some specialized broadcast test signals.

It will cost about $40, according to Stan Salek, an NAB staff engineer, and will require only an above-average quality CD player to conduct the tests.

The disc originally was planned as an easily obtainable way to provide signals for NRSC compliance testing, but "we did all those and still had 60 minutes left on the CD, so we came up with a lot of test signals that would be really hard to generate otherwise," Salek said.

Specific test signals include precise pilot frequencies; EBS/DTMF tones; and VU/PPM meter calibration signals for the new Institute of Electrical and Electronics Engineers (IEEE) impending standard.

Also included are Bessel calibration tones for FM deviation calibration, which Salek said must be measured within a 10th of a MHz in order to work properly, "so a CD with crystal reference definitely assures you of getting the right frequency"; and pre/deemphasis curve sweeps to check NRSC or 50 and 75 μsecond pre- and deemphasis networks.

NAB plans initially to press 1000 copies.

"We think it's going to be a useful product and therefore should sell well," Salek said. "Everyone who has seen the track list has been impressed."

For ordering information, contact the NAB Station Services department at 800-368-5644. For more information on the product, contact Stan Salek at 202-429-5391.

RAC to Evaluate AM Tech Filings

by Alan Carter

Washington DC ... The thoughts a group of engineers and communication attorneys expressed one September afternoon around a conference table—on the exhaustive review of AM technical requirements by the FCC—may be reflective of the industry.

A tremendous amount of useful information has been compiled, but it has yet to be carefully synthesized, according to the FCC's Radio Advisory Committee.

In addition, those present observed that there were few firm suggestions on technical changes needed to help AM.

The group, at a joint meeting of the RAC technical and allocation subgroups, decided to undertake what could be a painstaking task.

Several volunteered to compile a report for the FCC evaluating the comments made by broadcasters and engineering consultants on a number of technical criteria for allocations on the AM band.

The FCC initiated the review in a Notice of Inquiry in July 1987 seeking comments on assignment criteria, emission limits and the National Radio Systems Committee (NRSC) pre/deemphasis curve. Other areas examined were antenna issues and subjective audio listening studies.

Action already

So far, the Commission has taken one step as a result of the review. It issued a Notice of Proposed Rule Making in June that would make the voluntary NRSC audio standard mandatory and institute a complementary RF emission standard.

The FCC wants to move quickly on the technical review, according to Wilson LaFollette, an assistant chief in the FCC Policy and Rules Division.

But he told the subgroup meeting that although there is a "wealth of data" in the filings, "I don't find a lot of recommendations." He suggested the Commission was at the point it would have to draw its own conclusions. In writing a rule making, LaFollette noted tradeoffs will have to be made, and the FCC needs to know what broadcasters would like.

Wally Johnson, a consulting engineer who is chairman of the technical subgroup and president of the Association for Broadcast Engineering Standards (ABES), questioned if the RAC could "focus in" on some main points for the Commission. There are "common threads" that may need to be drawn together.

Points to note

A sampling of interviews with broadcasters industrywide who participated in the comment period gives some idea of what engineers think about issues addressed in the technical review.

"I think the big mystery is what the Commission will do with it," said Crawford Engineering Director Chris Alexander. "I think the Commissioners are between a rock and a hard place.

"They needed 'birth control' (for AM allocations) way back when. Now, it's impossible to clean the band up without hurting people."

Crawford supported making the NRSC audio standard mandatory, and Alexander said statistics in the filings showed the industry will have to reduce noise—which he called "impossible"—or increase the signal.

Atmospheric noise

Atmospheric noise is "getting worse," Alexander noted. "The whole noise issue was brought to light." He questioned whether the FCC realizes the importance of the situation.

Capital Cities/ABC Radio Engineering VP Al Resnick drew attention to the NAB's radio listener study conducted by B. Angell & Associates of Chicago that found current FCC interference protection contours sufficient for co-channel AM stations but inadequate for adjacent channels.

"It gives us a chance to see what listeners expect," Resnick said. But he added, "I didn't find any of it out of the ordinary. I didn't find any surprises."

Ken Brown, manager of allocations and licenses for Capital Cities/ABC, was more wary over the findings.

"We have had no idea of how bad off we have been," Brown said. "There's more to come. It's not over yet."

Interference woes

Brown said he believes interference is the problem with the AM band. "That's what I went looking to find out, and that's what I see."

Glynn Walden, AM stations engineer manager for Group W, also pointed to

(continued on page 17)

Car Audio Group Endorses FMX

Greenwich CT ... An association of aftermarket car audio equipment manufacturers, distributors, retailers, installers and sales reps has endorsed the FMX stereo extension system for FM radio.

Car Audio Specialists Association (CASA), based in Washington, DC, will work with Broadcast Technology Partners (BTP), the Greenwich-based organization that holds the license to the system, to increase awareness of FMX stereo to CASA's 300 members.

CASA President Hugh Whiteman of Quality Auto Sound, a car audio specialty chain headquartered in Lakewood, CA, called FMX "the new standard for quality in FM broadcasting."

FMX is designed to allow listeners in the fringes of an FM station's coverage area to receive a clean FM stereo signal without the hiss that normally accompanies distant stereo signals.

"We support advancements in technology that enhance the performance of autosound equipment and benefit the listening public," Whiteman said.

CASA, founded in 1978, was started to serve as a clearinghouse of information about trends and developments in car audio technology and automobile engineering that impact on the manufacture, sale and installation of aftermarket car audio equipment.

The cooperative venture between CASA and BTP will include developing and coordinating promotional events that will be presented through the association's 9000 storefront affiliated retail membership. The campaign will use retail point-of-purchase displays and promotion efforts among CASA retailers and FMX stereo stations.

CASA Executive Director Cheryl Hollins said the association also will "facilitate the flow of information" concerning FMX to its 25 manufacturer members. The information will focus on the decoder chips, the number of stations broadcasting with FMX and "what the technology does from A to Z," she said.

Approximately 50 stations nationwide are on-air with FMX or planning to implement the system.

BTP President and FMX co-developer Emil Torick said the CASA endorsement was significant in that a little more than half of FM receivers made are for automobiles, and FMX is very effective in car radios to improve signals in nulls and areas of multipath.

FMX will provide "full stereo separation at greater distances," Torick explained, as opposed to conventional receivers that are "fully blended to monophonic reproduction."

Torick said FMX creates new business opportunities for CASA members in replacement sales and would provide a boost to the radio aftermarket.

On chip development, Torick said that two chip manufacturers are proceeding with plans to market FMX decoder chips. Sanyo is distributing engineering samples and will be in production later this year. Sprague is about three to four months behind, with production expected in 1989.

For information from CASA, contact the association at 202-828-2270. Contact BTP at 203-622-2804.

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Chief Engineer, KLBJ AM-FM

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NRSC Debates FCC Plan


Charles Morgan (left), Stan Salek, and Eb Tingley speak before the NRSC.

by Judith Gross

Washington DC ... With about 16% of all AM stations converted to the NRSC audio standard, the talk at the committee's recent meeting turned to the FCC's proposal to make the standard mandatory.

The full NRSC met here just prior to the Radio '88 convention, and many members expressed concern that the wording of the Commission's proposed rule making places too much emphasis on the "RF mask" or transmission portion and not enough on the 75 μsec. and 10 kHz stopband audio portion of the standard.

Some members felt strongly that the FCC's rule making was not in keeping with the original goals set by the committee, namely to help obtain better AM receivers by "cleaning up" interference, especially second adjacent problems.

"The way it's written is not AM improvement, it's AM destruction," said Ken Brown of Capital Cities/ABC. Brown and others voiced concerns that the FCC will use the 10 kHz cutoff the standard mandates to allocate more stations in between those that already exist.

Charles Morgan, of Susquehanna Broadcasting noted that "the FCC is on a fast track with NRSC" and he pointed to the short comment period set on the rule making. Deadline for comments on the NRSC is 22 November, with reply comments due 22 December.

John Marino, of NewCity Communications asked John Reiser, an engineer with the FCC's Mass Media Bureau who attended the meeting, if the FCC might exercise any flexibility with respect to the RF mask portion of the standard.

In particular, Morgan and others voiced support for a two-tiered implementation of the NRSC, with the audio portion taking effect on the proposed date of 1 January, 1990 and the transmission portion perhaps taking effect in 1994.

While Reiser could not comment directly on the rule making, he pointed out that the normal FCC comment procedure provides for modifications of the proposal.

After lengthy discussion on the NRSC rule making, the group decided to ask the NAB and EIA to move forward to convince the FCC that "we had the right idea in the first place."

They also decided to have the technical subgroup meet once before the comment deadline to provide technical data about the effectiveness of the audio standard and the RF mask in a "real-world" situation and perhaps supply data in support of implementing the standard in a two-tiered fashion.

More NRSC monitoring

Also at the NRSC meeting, Delta Electronics, which has developed a splatter monitor to help implement the RF mask portion of the standard, introduced two other test devices to help stations comply with the standard.

Since the NRSC standard includes a definition for a test signal using pulsed USASI noise to duplicate typical program material, Delta has developed a stereo noise generator.

Delta's stereo noise generator is designed with outputs conforming to the NRSC specs which call for two separate USASI noise sources, cross coupled for a correlation of 1.4:1 (L–R 3 dB lower than L+R).

Delta has also developed a preemphasis monitor to measure the level of preemphasis used by AM radio stations.

Delta Broadcast Sales Manager John Bisset explained that the monitor is designed to help stations become more consistent in their use of preemphasis from 5-10 kHz.

FM issues next

A final subject put before the NRSC was the possibility of instituting an FM technical subgroup to work on FM issues.

A questionnaire circulated by the NAB and the EIA received 20 positive responses from those willing to participate in such a group.

Some of the FM technical issues raised by those answering the questionnaire were multipath; receiver performance including second and third order IM, adjacent channel rejection and standardizing stereo "blending" and high frequency rolloff; subcarrier protection' processing; noise reduction and radio data systems.

The first meeting of the FM technical subgroup was tentatively set for 15 November, here, with a second tentative meeting at the winter Consumer Electronics Show in Las Vegas in January.

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

FCC Group Tackles Radio Issues

by Alan Carter

Washington DC ... FCC officials gave radio broadcasters at a pre Radio '88 Radio Advisory Committee meeting some insight to Commission thinking on several major issues the industry is tackling.

The NRSC rule making is only the first of what may be several proposals to result from the AM technical review, according to Audio Services Division Chief Larry Eads. He did not elaborate on what may be forthcoming.

On the issue of the NRSC, the Commission is considering a 1 January 1990 implementation date as suggested by the NAB in its proposal for the NRSC, said Wilson LaFollette, an assistant chief for international affairs in Policy and Rules.

Broadcasters questioned the Commission staff as to how they can stress broadcasters' concern that the audio portion of the NRSC not get lost in what appears to be an effort at the agency to implement an RF emission standard. There was no response. The RAC, however, is preparing a report for the FCC on the technical review.

Eads assured broadcasters that the current Commission isn't interested in instituting shortspacing as part of the allocation process.

A second issue the Commission staff addressed is the expanded AM band.

LaFollette said a rule making on the expanded band would include technical standards and he indicated the document would be out relatively soon. The Commission wants to coordinate its introduction with the NRSC standard so receiver manufacturers can "kill two birds with one stone" in producing new radios, LaFollette said.

The Commission doesn't appear to be interested in moving very rapidly on another proposal to allow broadcasters to use FM directional antennas in short-spaced situations, Eads said.

He said there has been an increase in the number of broadcasters seeking short spacing wavers.

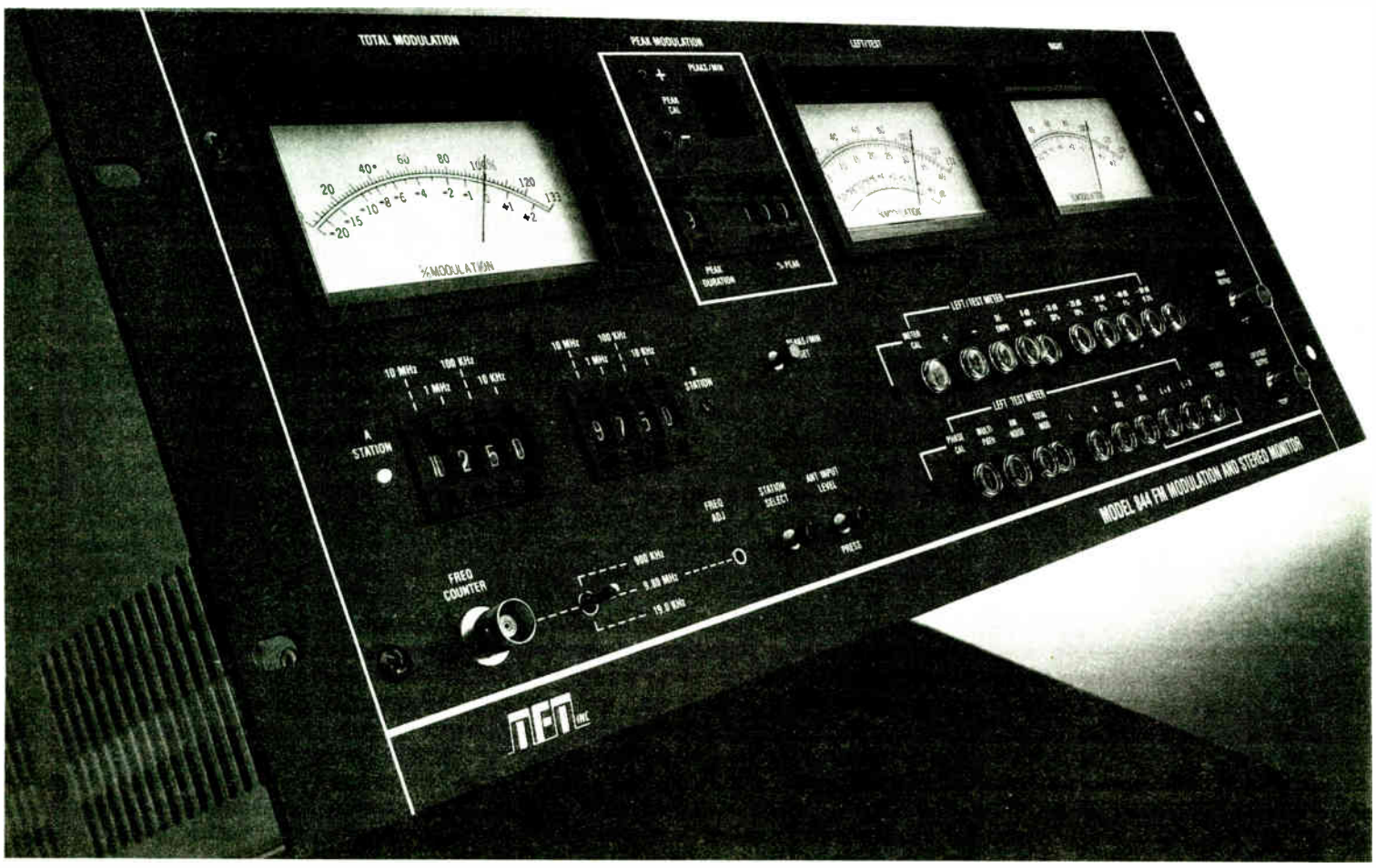
Eads assured broadcasters that the current Commission isn't interested in instituting shortspacing as part of the allocation process. However, he said there are no safeguards in the proposal to prevent a future Commission from taking such a step.

Action on a rule making to allow Class A FMs to increase their power from 3000 to 6000 W may be coming next summer, according to Jay Jackson of Mass Media. Comments are due 22 November and reply comment 22 December on the proposal.

On another issue, Eads said the FCC has not received "enough feedback and real world information" to make a move on allowing AM synchronous transmitters.

Of nine experimental authorizations, he said only two are on the air.

For information on the Radio Advisory Committee, contact FCC coordinator Larry Eads at 202-632-6485.



Texar Sold

(continued from page 7)

The purchase of Texar is the latest in a round of acquisitions for Gentner. The company first bought Advanced Design Technology, then entered the world of digital audio by acquiring MEI, which marketed the Digi-Sound digital audio storage and playback unit.

Gentner displayed Texar products at the Radio '88 and the SBE conventions. Gentner says the Texar name will remain on the products as the company becomes a "product division."

Clark called the Texar-Gentner arrangement "a good match." He said that Gentner is "one of the few companies that has the technical expertise to be able to continue the production and advancement" of such a high-tech product line.

Clark said he decided to sell the company because of "other things I wanted to do," mentioning specifically consulting on RF design and FCC matters.

Ultimate Radio Falls Short

(continued from page 1)

working, neither was the continuous tuning feature. And instead of three models—one with C-QUAM stereo, one with Kahn ISB stereo only and one multisystem stereo—only one was completed in time for the show.

In addition, the prototype model was a tabletop design with separate speakers. Reporters questioned why the NAB had commissioned a radio designed for in-home listening when most AM listening is done in cars.

The cost of the receiver has yet to be determined and the NAB was not able to explain how it planned to get receiver manufacturers interested in making similar receivers.

In addition, the NAB announced at the unveiling that the AM portion was "9-10 hours away from being completed," yet more than a day later, at the convention's close, the AM portion was not working.

Completion uncertain

NAB executive VP John Abel, Science and Technology VP Michael Rau and Sequerra himself all stressed that the model receiver was "not a production prototype."

Later Rau said that the NAB had done its part to show that a receiver with all the latest technology was possible, but that Sequerra had not completed his part of the agreement.

The NAB initially paid $25,000 for the design of the radio, which was completed on time. An additional $25,000 was to have been paid for three, working prototype receivers. The NAB has paid Sequerra half that amount and has not decided about the rest of the amount owed, Rau said.

Richard Sequerra fields questions as NAB's Michael Rau (l) and John Abel look on.

Sequerra said that in order to get consumer acceptance of new designs incorporating advances in technology "it will take strong leadership."

He added that he has faith in the receiver's ability to help AM. "I don't think I would have undertaken it if I did not believe AM to be as good as FM."

But reaction from general consumer reporters after the news conference ranged from puzzled to skeptical. One reporter questioned if the radio was "just a promotional gimmick," while others maintained that a tabletop model was not the right step to help AM.

FM DAs Opposed

by Alan Carter

Washington DC ... Greater Media took one last opportunity to reiterate its opposition to an FCC proposal that would allow increased use of FM directional antennas in short-spaced situations.

Warning the Commission to move cautiously in approving widespread use of FM directional antennas, Greater Media said in reply comments filed for a 5 September deadline that their use is "inherently susceptible" to external factors associated with the physical environment in which they are located.

The Notice of Proposed Rule Making, Docket MM 87-121, resulted from an inquiry under which 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/v contour protection is proposed for all stations, including Class Bs.

Under current rules, existing commercial FM stations 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.

In other points that Greater Media made, the group owner said the Commission should institute appropriate safeguards to assure adequate monitoring of directional operations.

The licensee of WEZY-FM, Lakeland, FL, Chapman S. Root Revocable Trust, also filed a reply comment opposing the position of Edens Broadcasting, licensee of WRBQ-FM, Tampa, FL.

Edens has asked for flexibility to short-space its station toward WEZY, according to Root. Such a move should not come at the expense of interference to all stations in the affected area, Root argued.

Edens has an application pending in a non-comparative hearing over whether the company has justified a proposed short-spacing of 3.74 miles out of a required 30 toward WEZY. The stations are separated by 10.6 MHz.

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

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Reaction Varied on Allied Acquisition

(continued from page 1)

Harris Senior VP and sector executive Guy Numann said in an inteview with RW shortly after the buyout that the deal would allow the company to "further demonstrate our commitment to the industry."

Allied founder and CEO Roy Ridge, who will remain leader of what will now become a Harris subsidiary, in the same interview with Numann, echoed that the change in status should have little effect on Allied's relationship with manufacturers.

"There will be a few suppliers, of course, who have some questions but I think we can deal with those," Ridge said. "We will probably renegotiate with some of the suppliers, but I think by and large 90% of them will be very happy with the arrangement here.

"We are still going to be the department store of the broadcast industry," he said.

Numann added that Harris will not restrict the sale of other companies' products through Allied even if they are in competition with Harris products.

Competition wary

But Broadcast Electronics Inc. (BE), a broadcast equipment manufacturer, and one of Harris' primary competitors, isn't convinced there won't be problems.

Allied handles the company's FM exciters, but Harris markets an FM exciter of its own. However, the question that is most pressing, according to BE president Larry Cervon, is one of fair trade.

"We're consulting our attorneys to see if there are any anti-competitive characteristics (in the buyout). There could be some legal questions to it," said Cervon.

"It's a very unusual situation for a company to try to dominate the business so overtly. The end result might not be healthy for the consumer or for the manufacturing industry."

Cervon called the acquisition a "premeditated attempt to dominate radio broadcasting."

The company's attorneys have not identified specific anti-competitive elements in the Harris/Allied transaction, according to Cervon. 'It came as kind of a surprise. We're studying the matter."

Neither has the company given thought yet to renegotiating a current contract with Allied.

Other companies did not openly appear as concerned about the purchase.

HARRIS

Mike Palmer, president of Arrakis, a broadcast manufacturer, said that the buyout presented a positive message to the international broadcast economy, despite potential conflicts surrounding the marriage of a manufacturer and distributor.

Improves international perspective

"The big players in this industry have been withdrawing: RCA sold, GE more or less got out," Palmer said.

ALLIED

"There's been a lot of speculation in the last three or four years that because sales at Harris have been dropping, they were either going to get out or lose international and domestic position and all in all, the industry and the country would lose.

"By Harris Corp. (investing money in the purchase of Allied), obviously the company has made a decision to reinvest in the radio industry and that's a very positive thing out of this," he said.

Arrakis markets consoles, another piece of equipment that is competitive with Harris products. But Palmer believes the initial uproar over the agreement will give way to calmer feelings.

"For individual managers over the next five years, there's going to be some good and bad, but Harris has always had the ability to produce a product that could destroy many small companies. It's just that someone plunked a stone in the middle of the pond and we've got waves and ripples everywhere for a while."

Welton Jetton, president of Auditronics, another console manufacturer whose product is distributed by Allied, said he felt comfortable with the buyout, despite the fact that Harris and Auditronics build competing products.

"That's business," Jetton said. "Each of them has a right to do what they want to do. We don't really see any problem with it. We've had a good relationship with Harris through the years as well as Allied, so I don't see anything negative."

A blissful marriage

Bill Hoelzel, senior VP at QEI Corp., another transmitter manufacturer, also saw no potential conflicts for the industry as a result of the marriage of manufacturer and distributor.

"Allied is a good company and we're not going to damage its effectiveness. We're not going to change any of the good things or the basic way in which (Allied) operates."

The company occasionally sells products through Allied, particularly its Model 691 FM modulation monitor/test set, but maintains no official agreement.

On the distributor side, most interviewed said that it is too early to speculate on the impact this will have in the broadcast industry.

"We're all going to have to take a deep breath and step back," said Tim Schwiegger, VP of marketing for Broadcast Supply West.

Neil Glassman, sales manager of Bradley Broadcast Sales, said a Harris-Allied joint sales agreement in effect since April 1987 didn't cause a market shakeout because the two operations continued to operate fairly independently.

But, he continued, "It's probably premature to guess what the now-combined companies are going to be doing that's different."

Stories behind buyout

Various theories regarding the buyout are winding through the industry, but sources admit that more theorizing than analyzing is fueling the discussion.

One theory of prominence is that Harris was interested in the company for its strength in marketing, hoping to increase its own promotions muscle.

"From what I understand, the biggest problem Harris had, with regard to vendor products, was how the paperwork was done and what the costs were as far as stocking and that type of situation," said Hoelzel at QEI.

"It seemed to me that the reason Harris went with Allied (in April 1987) was the fact that Allied (could effectively handle) the items that were not cost effective for Harris' paperwork system," he said. "From the standpoint of Allied, obviously it's cost effective for them to do that type of business. They certainly are a force in the industry.

"I think the interesting point to follow will be whose overhead schedule and pricing format ends up being the format for the whole operation."

Plans no restructuring

Harris' Numann said he is not planning to restructure pricing as a result of the arrangement.

"Harris tends to let its units be pretty autonomous," he said. "This is a particular situation where we want to retain the autonomous strengths of these operations . . . My view is that Allied is a good company and we're not going to damage its effectiveness. We're not going to change any of the good things or the basic way in which (Allied) operates."

Still, the effects of the buyout on the two entities and on industry counterparts will best be determined by time.

Said Bradley's Glassman: "Both Harris and Allied have well-deserved reputations in the business. To speculate on what their position in the industry is going to be, until we see the buyout affecting the way they do business day to day, is just a bit premature."

AM Review

(continued from page 10)

interference findings.

"AM isn't noise-limited as much as interference-limited," he said.

The comments should encourage the FCC to move toward greater protection of signal from co-channel and adjacent channel interference, Walden said, and abandon the "more is better" policy when granting new station licenses.

NAB Science and Technology VP Michael Rau said comments support the premise that more stations would be detrimental to AM. The NAB has called for a freeze on granting new AM stations and major change applications while technical changes are under consideration.

"If it's possible for them to do so, the Commissioners will add more stations," Rau said. "The jar of water is filled, and they've got to realize that. The spectrum can hold only so much. The point was made over and over, not just by NAB."

For information on Docket 87-267, contact Wilson LaFollette at 202-632-5414.

Ridding a Board of Demon Noise

by John "Q" Shepler

Rockford IL ... Marti Armstrong balanced the telephone precariously between her cheek and shoulder so she could still use both hands to solder. "So, what's the problem again, Susan?"

"I'm not sure. It's just that I've got a ... well, a lot of noise in this board."

Susan bit her lip and hoped Marti might have some insight that she didn't. She could see the news director peering through the window of the studio door about every 30 seconds. His production studio had been down all day and he was starting to get nervous about tonight's interview schedule.

Q-Tips

"I sure wish he'd take a walk around the tower," she said, half under her breath.

Marti was struggling with a flaky cue amp and didn't really need the interruption. Still, a friend in need ...

"Is it on all the channels?"

"No, just the mics and one tape channel. It seems to buzz a lot and the noise level varies as I tinker with it."

"Sounds like RF. See if you can disconnect anything to isolate it further. I'll be over when I get this amp back in the board."

Susan breathed a sigh of relief. The studio was still down, but at least some help was on the way. Marti was one of the best engineers in town, as well as a personal friend.

She could have called one of the guys at the other stations, but they wouldn't help without a lot of snide remarks. It was tough getting started in the business.

Strange encounter

Marti tilted back the control panel of the board and plugged the cue amp board into its socket. She pushed on the circuit card a couple of times to make sure it was seated.

"OK Tom, give it a try."

The production engineer clicked a cart machine pot into cue and pushed the start button. The audio was perfectly clean: no hum, no hiss and no crackles.

"What did you do to it?"

"Replaced an op-amp and a couple of capacitors. I put in higher rated parts but I'm concerned that this board is having too many problems. I'll come in Sunday night when you guys don't need it and check the power supply and the heat build-up, OK?"

"Thanks Marti. You're the best engineer we've ever had."

Marti flashed a quick smile and then headed back to the shop. Hurrying through the transmitter room door, she nearly knocked a six foot lion into the AM transmitter.

"Excuse me ... oh. Are you alright there, uh ... Mr. Lion, is it?"

"Stop snickering and get off my tail, Marti. If this costume gets ripped I'll have to pay for it."

"Sorry, Steve. Is that for the Halloween Party at the hospital?"

"Yeah, you coming?"

"Maybe later. I have go exorcise some evil spirits out of a control board right now."

"Well it's the right night for it, I guess. Good luck!"

Marti and Steve, the production director, took off in opposite directions. Marti quickly rounded up the attache tool kit that she kept for emergency consulting trips, grabbed her jacket, and headed out the back door.

Getting the demons out

The trip to Susan's station took longer than expected because of many costumed creatures darting across the road. Marti usually tried to avoid being out on Halloween night, but Susan's problems sounded like they needed immediate attention.

It was nearly dark when she pulled into the other station's parking lot. There were only three cars left. Marti could see Susan coming to the front door before she even rang the doorbell.

The broken mic shield would have made the mic cable act like an antenna ...

"Oh Marti, am I glad you're here." She almost dragged her friend back to the news studio.

"Well let's hear those gremlins sing, Susan."

"Hey, you'll be proud of me. I already found part of the problem. The shield to one of the mics was broken in the connector. This tape machine also had a loose amp. Hit the front of it and the noise goes away."

That made sense. The broken mic shield would have made the mic cable act like an antenna which would overload the mic preamp with RF. The loose tape amp would have made the tape channel noisy.

"So, what's left?"

Susan put the main mic into program and handed Marti a set of headphones. The AM was still bleeding in, even with the mic cord unplugged.

"It wasn't like this yesterday."

Marti opened the board and swapped mic preamp cards. No difference. She turned off the mic and the board became quiet.

The auxiliary mic channel didn't behave like that and none of the cart channels were picking up RF.

Marti was as stumped as Susan. This could take a while. "Got a schematic?"

Sneaky culprit

While Susan rounded up board manuals and a scope, Marti opened the top of the control board again and peeked around inside. The board was clean, no hack jobs on the wiring or extra holes drilled in the panels. Susan had done a good job keeping the equipment in order.

Marti was about to close the lid of the console when she noticed something in the wiring bundle that was unfamiliar.

There was a transformer and a couple of resistors neatly fastened with plastic ties among the shielded cables. She traced the wiring to a lever switch labeled "Talkback" on the front panel.

"What's this, Susan?"

Susan set down the scope and books she was carrying and came over to the console.

"Oh, that's the transmit switch for our two-way. You can talk to the remote truck through the studio mic by pushing that switch down. It doesn't work right now because I had to take the base unit in for repairs this morning."

Marti went back to the transmitter room and sure enough, there were the audio and control wires for the two-way laying on the floor of the rack. Marti found the shield for the PTT audio and fastened it to a ground screw on another piece of equipment.

Back in the studio, Susan put the mic into program and listened in the headphones. The RF noise was gone. She turned and looked at Marti in disbelief.

"Another missing shield, Susan. The two-way audio was grounded by the two-way transmitter. When you removed the transmitter, it left a 50-foot antenna running into your mic channel. Might be a better idea to ground that cable at the console."

"You're a genius, Marti. Now figure out one more and we're done."

Phantom stations

With that, she turned up the cue volume with none of the channels in the cue position. Nevertheless, the AM audio came through clearly.

The station was signing off. When the transmitter plates clicked off, the station's air signal disappeared from the cue

(continued on page 22)

Debugging the MCI JH-110 Deck

by Jim Somich

Part I of II

New York NY ... This month and next, we'll tackle the well-known MCI (Sony) JH-110 tape machine. Most maintenance types who are responsible for the 110 seem to develop a schizoid love-hate relationship with the beast.

When the 110 is in working order, it is one of the finest decks going. But when it is acting up sometimes no amount of troubleshooting logic seems to help.

The MCI JH-110 is a first generation machine of considerable complexity and sophistication. As is the case with many trail-blazers, the JH-110 is plagued with design shortcomings.

Machines I have worked on over the years seem troubled primarily by intermittents and chip failures. Some of the circuitry has been updated to improve performance and reliability.

Maintenance Notebook

Considering the age of its technology and its design sophistication and complexity, the JH-110 is a decent performer despite being a maintenance hog.

Early history

When the MCI was introduced, it was ahead of its time and marketed by a relatively small and unknown company, Jeep Harned's Music City Inc. (MCI). It quickly became the deck of choice for broadcasters who could afford its rather steep (at the time) price.

For many broadcast maintenance engineers, the 110 was their first contact with servo-controlled mechanics and microprocessor-based controllers.

The 110 may seem a bit "Rube Goldberg" by today's standards, but a thorough understanding of its design will help you keep 'em running and performing right along with today's state-of-the-art machines.

Several years ago Sony bought out MCI and relegated the JH-110 to the back-burner (it's available now only in 4- and 8-tracks).

Sony has been quite good in maintaining a stock of spare parts and boards for the 110 as well as providing good telephone tech help.

The new Sony APR-5000 series is the logical successor to the JH-110, but only time will tell if it will do better in the reliability department. On the surface, the 5000 seems to have solved many of its predecessor's problems.

Helpful insight

If you have been blessed with a fleet of JH-110s, you have probably developed your own list of weaknesses and symptoms. What I plan to share with you is part of *my* list.

I cannot take credit for all of these tips since they have come from many forgotten sources and this short column is not meant to be an in-depth discussion of the theory behind the 110 (the manual is an excellent source of this information).

My purpose here is to outline some of the more glaring deficiencies in the machine's design for those of you who are new to the MCI.

Hopefully, it might also add a few new tricks to the bags of those now maintaining JH-110's.

While the JH-110 appears to be a real bear to service, most of its problems are common to the breed. The design has major weak points, and they keep showing up time and again in New York or Podunck.

So, if you can't afford to scrap your 110's and replace them with 1988 models, read on.

Contact problems

Any discussion of the 110's weak points has to start off with the contact problems caused by the Molex connectors that hold this machine together. The Molexes are unquestionably the weakest link in the whole machine.

It seems that the simple Molex just cannot handle the microvolt and millivolt signals necessary for an advanced deck like the 110 to operate flawlessly.

A lot of microsecond-microvolt pulses just seem to get lost in the machine's innards somewhere!

Because of the nature of the signals being handled by the tape deck versus the electronics, there are fewer contact problems with the latter.

But everyone who has used a 110 for any length of time knows that even the electronics are not immune to contact-induced intermittents.

Two headaches

Contact problems with the JH-110 can be broken down into two distinct categories ... electrical contact discontinuities and actual circuit breaks due to the constant flexing of the circuit boards during installation and removal.

In most cases there is simply no elegant way to extract a circuit board from the mother without excessive flexing of both.

This can result in broken solder connections where the Molex pins are sol-

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Performance Proofs Still Needed

by Harold Hallikainen

San Luis Obispo CA ... Last month, we reviewed the station operator requirements, including the Chief Operator requirements of 73.1870. This time, we'll review the equipment performance measurement requirements of 73.1870(c)(2) and 73.1590.

We used to call this the annual "proof" although the Commission used the term "proof of performance" with respect to measurements on a directional antenna system.

Insight on Rules

The annual audio and spurious radiation measurements were "equipment performance measurements."

Several years ago, the Commission removed the audio measurement portion of the equipment performance measurements requirement along with the required audio performance.

The requirement was moved to demonstrate compliance with audio specifications along with removal of the audio specifications altogether.

FCC or marketplace standards

With the removal of audio performance requirements, audio performance was to be determined by "market pressure"—listeners would evaluate audio quality along with programming in making their listening decisions.

Unfortunately, the removal of the audio frequency response requirements also removed a standard aimed at insuring "interoperability" between transmitters and receivers.

It appears, however, that many stations had already abandoned the interoperability frequency response standard specified in the old 73.40 (for AM stations), by operating with various degrees of preemphasis to compensate for the high frequency rolloff of receivers.

This resulted in stations adjusting their audio response in response to variations in receivers, while receiver manufacturers adjusted the receivers trying to follow the stations.

What appears to have happened is that receiver manufacturers mostly kept tightening up the IF in an effort to get rid of adjacent channel interference.

The tighter IF made the receivers roll off the audio highs more, so the stations boosted the highs, causing more adjacent channel interference, causing the receiver manufacturers to cut back further.

This interoperability problem is now being dealt with by the NRSC standards, which the FCC is considering for adoption.

The Commission appears to be most interested in the bandwidth limitation portions of the NRSC standard (the 10 kHz audio brick wall and the RF mask) and less interested in the standard preemphasis.

This gets back to the question of what the Commission's job is. Is it merely interference protection, or is it also to establish standards that require all transmitters to meet the same standards, so there is a possibility the receivers will work reasonably well?

We still have some interoperability standards in the rules. For example, 73.128 requires AM stereo compatibility with receivers using envelope detectors, although the specified tests only demonstrate interference protection (occupied bandwidth).

For FM stations, 73.317(e) specified a maximum audio preemphasis. This section used to include definite audio response limits, insuring interoperability.

Finally, 73.322 specifies the FM stereo standards, which appear to be entirely to insure system interoperability instead

(continued on page 35)

Radio's Early Days on the West Coast

by George Riggins

Long Beach CA ... Several months ago a friend was sent a copy of the April 10-16, 1927 *Radio Doings, The Monthly Authority of the Pacific Coast*. The cost was ten cents, the same as *Liberty* magazine or the *Saturday Evening Post*.

The front page featured a picture of William Wrigley Jr., and Major Lawrence Mott. The back page was a full page ad for the "Federal Ortho-Sonic" receiver, priced from $100 to $1000.

The ad was placed by Yale Radio Electric Co. Yale is still in business, having long since moved from an area now occupied by the floral industry in Los Angeles to Hollywood.

Among the products mentioned besides the receiver were Elkorn, Modern, Sterling and Balkite Eliminators and Speakers by Amplion, Enchanter, Herald and Fine Arts. Also Cunningham Radio Tubes, standard for all sets since 1915. Wonder where those old timers have gone?

Kolster Radios, distributed by H. Earle Wright Inc., took a two page spread, purchasing pages two and three.

In addition to other products featured by the distributor, there was a listing of all the places in the southern third of California where the receiver could be seen and purchased.

What a far cry from the way we see receivers sold and demonstrated today.

Hardly portable

One of the more interesting ads was for Walbert's Isofarad receiver which was advertised to "operate direct from light socket."

Nowadays if we can't take our boom box with us, why bother? The price? Electric models, $350 to $400, battery models, $75 to $270.

Ray-O-Vac, a well recognized trade name of today was being manufactured by French Battery Company of Madison, Wisconsin.

Cabinet makers were advertising console cabinets made from two-toned walnut or mahogany.

The cabinet was a piece of furniture for the lady of the house so the man could have his contraption and not clutter the living room with all of the paraphernalia.

Old Timer

Look at the assembled "entertainment centers" that are being sold today, and it appears as though marketing has come full circle.

Quiz the station

Does anyone remember the "Voice of Catalina?" KWFO transmitted on a frequency of 211.1 meters, 250 W of power, and was listed as being on the air from 5 PM 'til 10 PM, and possibly for a couple of hours in the morning. Silent on Mondays.

Major Lawrence Mott was the owner-operator and it was non-commercial. The person who represented the station (probably Major Mott) published a 36-item questionnaire suggesting what to ask when writing to a radio station.

Some of the questions are still germane. Others, however, were purely non-sensical for even the 1927 time period.

The last question read, "Is your station operated to please its owner or to please the public? Does it do either? When? For what specific reasons? (Two single-spaced, typed pages will be allowed for this reply)."

Perhaps many people would ask the same question today.

Risque calls?

There were 22 stations listed for southern California and nine for the northern part of the state. Another ten stations were listed for northern and western states.

Interesting to note the number of stations still on the air with the original call letters. One of the engineers from the Portland area is still living and is still active in radio as an owner and engineer.

Will try to get a couple of comments from David Rees regarding his first remote and how his chief went about getting a program line from one building to another in Portland without using the telco facilities. Better in David's own words than in mine.

One call sign that has passed into oblivion is KFVD. I was privileged to know two engineers who worked for the station in the early years.

The only mnemonic that either man ever used was "King Ferdinand's Venereal Disease."

When a long-time resident of the southern California area was asked if he remembered the station, he said yes, and explained that the call sign was used by the owners of the Venice Dance Hall, hence the call sign with the proverbial K for being west of the Mississippi River.

KFVD had power of 500 W and a frequency of 208 m. Even in 1927, Earle C. Anthony had the most power with 4000 W for KFI (now 50 K clear channel).

DX-ing

A full page of DX stations was printed, as reported by listeners on the West Coast. Of note is the only 50 K station listed: WJZ, New York, NY, with 454 meters.

The station seemed to be on the air most of the time, at least in the evening hours in the west. PWX Havana, Cuba; CYL and CYJ Mexico City and KGU Honolulu, with only 500 watts are just a few of the stations mentioned.

NEW AND IMPROVED McKINLEY JUNIOR "B" ELIMINATOR. *No tubes to Blow Out, No Harmful Acids, Uses Non-Acid Electrolyte. Variable Voltage. Will Operate Any Radio Up to 6 Tubes, Including Power Tube.*

(An environmentalists dream! No PCB's.)

Doing nothing more than taking each page of *Radio Doings* and discussing the data would provide enough fodder for several more articles.

Next time a more complete listing of the call signs, especially those that are still in use. Wonder what some of those old time engineers are saying in that great DX land about what is happening today as pertains to technical standards?

George Riggins has experience in radio and electronics dating back to the 1930s. He is also a licensed ham operator and has had his own broadcast sales and service company, Riggins Electronic Sales, for over 20 years. He can be reached at 213-598-7007.

57 Years Ago in RW

Editor's note: The **RW** *of today and the* **RW** *of old fortuitously share the same name. The* **RW** *of old was printed for a period of time in the 1920s and 1930's, when radio was first becoming popular. The current version of* **RW** *that you hold in your hands has been around (in various forms and names) for over ten years.*

Reprinted from Radio World, September 30, 1930

"SECONDS"

TUBES that fall a trifle below the most exacting laboratory specifications may be obtained at prices that seem incredible. They are called "seconds" and they are "seconds," but they are not "thirds." Note the prices. Remit with order.

201A	50c	224	70c
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Picking the Best Mic for the Job

by Bruce Bartlett

Elkhardt IN ... Last issue, we sorted out the basic microphone types and suggested where each could best be used.

The transducer types are condenser, moving coil and ribbon; the polar patterns are omnidirectional, unidirectional and bidirectional.

In this issue we'll continue our coverage of microphone specifications to help you choose the best microphone for the job.

One of the most important specs is *frequency response*: the range of frequencies that a microphone will reproduce at an equal level (within a tolerance, such as ±3 dB).

A frequency response from 50 to 15,000 Hz is good; 40 to 18,000 Hz is very good and 20 to 20,000 Hz is excellent.

But if the sound source produces frequencies from, say, 100 Hz to 12 kHz, then a response covering that range is adequate. A frequency response that is beyond the spectral range of the source won't offer any increase in fidelity.

For example, a trombone radiates frequencies from about 80 Hz to 8000 Hz, so a microphone with a frequency response covering at least this range will pick up all the sounds a trombone can make.

Similarly, an orchestra produces a very wide frequency span from about 40 Hz (bass drum and bass viol) to 15 kHz or higher (cymbals and other percussion).

So, microphones used to record an orchestra (or other large ensemble) should have a wide, flat frequency response covering most of the audible spectrum.

A frequency response that is beyond the spectral range of the source won't offer any increase in fidelity.

A frequency response from 80 Hz to 15 kHz is adequate for most instruments. A response from 40 Hz to 9 kHz covers the range of bass instruments; a high-end response up to 12 kHz is sufficient for brass, voice and piano; and a response out to 15 or 20 kHz is necessary for cymbals, violin and some percussion instruments.

The low end

The low-frequency response of the mic should be limited to the lowest fundamental frequency of the instrument to be recorded, if possible.

For example, the frequency of the low-E string on an acoustic guitar is 82.41 Hz. A mic used on the acoustic guitar should roll off below that frequency to avoid picking up low-frequency noise and room rumble.

Some microphones provide a low-frequency cutoff switch for this purpose. Or you can filter out the unneeded lows at the mixer.

A frequency-response curve (such as shown in Figure 1) is a graph of output level in dB at various frequencies.

For a mic the output level at 1 kHz is placed at the 0 dB line on the graph and the levels produced at other frequencies are so many dB above or below that reference level.

The shape of the response curve usually indicates how the microphone sounds at about two to three feet.

For example, a mic with a flat, extended response reproduces the fundamental frequencies and harmonics in the same proportion as the sound source.

Thus, a flat-response mic tends to provide accurate, natural reproduction at that distance.

A microphone with a rising high end or a "presence peak" around 5 to 10 kHz emphasizes the higher harmonics. The subjective effect is a crisp, articulate sound.

This type of response is sometimes called a "tailored" or "contoured" response. It's popular for guitar amps and drums because it adds punch and emphasizes attack.

Note that microphone placement can greatly affect the recorded tone quality. A flat-response microphone does not always guarantee high-fidelity sound because mic placement has such a strong influence. That's a subject for another article.

Sensitivity

Sensitivity is a measure of the efficiency of a microphone. A very sensitive microphone produces a relatively high output voltage for a sound source of a given loudness.

The sensitivity of a mic doesn't affect its sound quality. Rather, sensitivity affects the audibility of mixing-console noise (hiss).

To achieve the same VU meter reading a low-sensitivity mic requires more mixer gain than a high-sensitivity mic. More gain usually results in more noise.

If you record quiet, distant instruments such as a classical guitar or chamber music you'll hear more mixer noise with a low-sensitivity mic than with a high sensitivity mic, all else being equal.

With close-miked pop music, sensitivity matters little because the microphone

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How to Select the Proper Mic

(continued from page 21)
signal level is well above the mixer noise floor. That is, the SNR is high.

Microphone sensitivity is often stated in "dB re 1 volt per microbar." The figure tells what voltage the microphone produces (in dB relative to 1 volt) when picking up a 1000 Hz tone at 74 dB sound pressure level.

Listed below are typical sensitivity specs for the three transducer types: condenser: –65 dB (high sensitivity); moving coil: –75 dB (medium sensitivity) ribbon or small moving coil: –85 dB (low sensitivity)

Differences of a few dB among microphones are not critical. Nearly all microphones have adequate sensitivity for broadcast applications.

The louder the sound source, the higher the signal voltage the microphone produces. Very loud sources, such as kick drums or guitar amps, can cause a microphone to generate a signal strong enough to overload the mic preamp in your mixer—say, up to 1 V!

That's why input attenuators or pads are often included in mixers to reduce the mic signal level from a loud source.

Impedance and SPL

A microphone's impedance is its effective output resistance at 1 kHz. A microphone impedance between 150 and 600 ohms is considered low; 1000 to 4000 ohms is medium and above 25 kilohms is high.

Low-impedance microphones are used exclusively in broadcasting and recording because they allow long cable runs without hum pickup or high-frequency loss. Nearly all solid-state mixers are designed to accept low-impedance mics.

Another microphone specification is maximum sound pressure level or SPL. To clarify this specification, first we need to review the term "SPL."

SPL is a measure of the intensity of a sound. The quietest sound we can hear, the threshold of hearing, measures 0 dB SPL. Normal conversation at 1 foot measures about 70 dB SPL; painfully loud sound is above 120 dB SPL.

Maximum SPL is the point at which a microphone's output signal starts to distort; usually the SPL at which the microphone produces 3% total harmonic distortion.

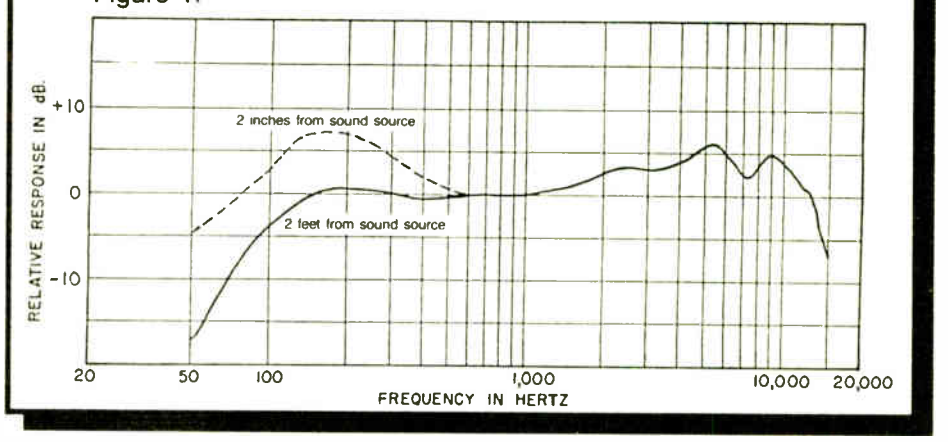
In the case of a microphone with a maximum SPL spec of 125 dB SPL, that means the microphone starts to distort audibly when the sound pressure level produced by the source reaches 125 dB SPL.

A maximum SPL spec of 120 dB is good, 135 dB is very good and 150 dB is excellent. Any well-designed dynamic microphone can handle SPLs in excess of 150 dB SPL and many condenser mics can work well up to 150 dB SPL.

Self-noise and polarity

Self-noise or equivalent noise level is the electrical noise a microphone produces, equivalent to what a sound source would produce in dB SPL.

Figure 1.



This figure is usually A-weighted, meaning that the noise was measured through a filter that rolls off low and high frequencies to simulate the frequency response of the ear.

A self-noise spec of 20 dB SPL or less is excellent (quiet); a spec around 30 dB SPL is good and a spec around 40 dB SPL is fair.

Most microphones produce a positive voltage at pin 2 with respect to pin 3 when the sound pressure pushes the diaphragm in (positive pressure).

If a microphone is wired in the opposite polarity and combined to the same channel, low frequencies in the sound pickup are attenuated or completely cancelled out.

You can prevent this from happening by checking that all your microphones are wired identically (check the microphone data sheets under the heading "polarity").

For mics that don't follow the standard, reverse the connections to pins 2 and 3. Also, to prevent polarity reversals in your mic cables, solder the same color lead to pin 2 on both ends of the cable.

Next time in the conclusion of this series, we'll feature special-purpose microphones, accessories, and a microphone applications chart.

Bruce Bartlett is a microphone project engineer and technical writer wth Crown International. He can be reached at 219-294-8000.

Marti Armstrong Clears a Board of Phantom Noise

(continued from page 18)
audio, only to be replaced by a fainter signal. It sounded like all of the stations on the band, with one AM station about a hundred miles away prevalent.

Marti shook her head and laughed. "OK, that's a strange one."

They tried replacing cue amp cards to no avail. Marti grabbed a soldering iron and lifted the input coupling capacitor on the circuit board. The console was still acting like an untuned AM receiver.

Next, she restored the input coupling cap. It was easier to disconnect the output leads at the amp socket than try to lift the output cap. The cue speaker was dead as expected and Hi-Z headphones clipped to the socket of the amp sounded quiet.

Marti clicked a cart machine into cue and started one of the news carts. It was completely clean. No RF noise. No mystery stations.

The schematic showed only the cue speaker hooked to the output of the cue amp. Marti traced the wires to a three-inch speaker mounted in a rack with the reel recorders. She soldered the board leads back to the cue amp but clip-leaded in a small substitute speaker. It sounded clean as could be.

Ghosts from the past

How could just a speaker cause this problem? Marti pulled the rack panel with the cue speaker from the rack and noticed that one of the speaker leads was connected to the frame of the speaker instead of to an insulated terminal.

This speaker must have come out of an old radio. Carefully, she clipped the grounded lead and soldered it to the amp lead so that no wires were touching the rack panel. With the cue speaker reconnected, the cue audio sounded great with no background sounds.

"All right Marti, I give up. What was that all about?"

Marti looked over at Susan's wide eyes.

"In this case, you had too many grounds instead of not enough. The cue amp has an unbalanced output. One side of the amp is common with the console ground and the other is the signal. Both leads go to the speaker.

"The low side of the audio was grounded both at the console and the speaker via the rack. The ground loop was acting like an antenna and the cue amp was detecting the signals. How could this ever have worked before?"

Susan looked at her sheepishly. "It hasn't worked since I got here. I hoped that if we could get all the problems out of this board, the news director might cool off. I guess I should have told you that was an old problem."

"Well, since you're my protege of sorts, I won't get too mad. But next time . . . ."

"Thanks Marti. Hey, its still Halloween and for all the tricks you've pulled from your cap tonight, my treat is to buy you dinner. OK?"

"It's a deal!"

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

AM Radio: SOS From the Titanic

by Ron Frizzell

Auburn ME ... In case no one has noticed, at the current rate of decline, sometime during the 2000 AD fall Arbitron, no one will be listening to AM radio. That's just 12½ years away, when 70% of the new cars sold this year will still be on the road.

AM radio, now, is like the RMS Titanic in 1912, 45 minutes after it struck the iceberg. At that time lifeboats were leaving this huge, safe, warm, 13-story structure.

After the mighty ship sank 1500 people drowned while 600 empty seats on the lifeboats were being rowed away. People stayed on board because they couldn't believe the mighty ship would sink.

We, like the people on the Titanic, statistically know it is going down but are finding it too hard to believe.

Even when the ship was down and awash at the bow it still seemed safe at the warm secure stern towering 100 feet above the water; people believed the ship was just too warm, too big and secure to sink—"something" would surely save it.

If AM flickers out the FCC will most likely be ordered by Congress to find out what went wrong. The spectrum will be cut in half.

Congress and the FCC, broadcasters and radio makers, who are fighting individually to keep the spectrum afloat, together are acting with a lack of intelligence, just as foolishly as the people who stayed on board the Titanic.

Weighted down by restrictions

A majority of AM broadcasters have stopped trying. The government is rigid with nearly inflexible rules.

A station in the midwest with an arbitrary FCC limit of 5000 W might cover a 20 mile radius with a competitive signal. That's sufficient to survive.

In New England, due to ground conductivity, it will cover about six miles. That's insufficient.

It has never mattered that 80% of the realistic population was missed as long as the sacred "city of license" was served. Power has always been more important than coverage.

The government has never taken into account that financially weak stations never really serve the public even though they may comply with license requirements.

The post mortem Congress orders will most likely look like this: In 1957, AM radios, especially in cars, sounded great. The cymbals, bells and whistles could all be heard. There was no apparent distortion.

Long way down

As more and more stations went on the air, receiver manufacturers cut down the frequency response of the radios to prevent interference from adjacent stations.

AM stations which had always had a technical deficiency now had a giant deficiency as the higher, more pleasant frequency responses began to vanish and distortion, created by those terrible ceramic filters, came in to take their place.

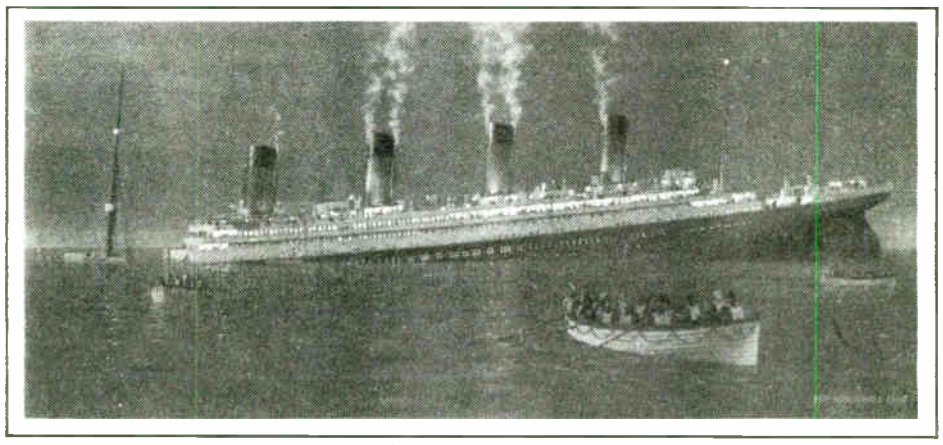
All this was occurring when the public was demanding better and better quality.

This was the beginning of the potential end. It was all in motion by 1968. AM radios began to sound worse and worse; FM better and better.

By 1978 General Motors and some foreign radio makers had perfected an AM radio that sounded as if the entire station had been shoved through a telephone before it got to the transmitter.

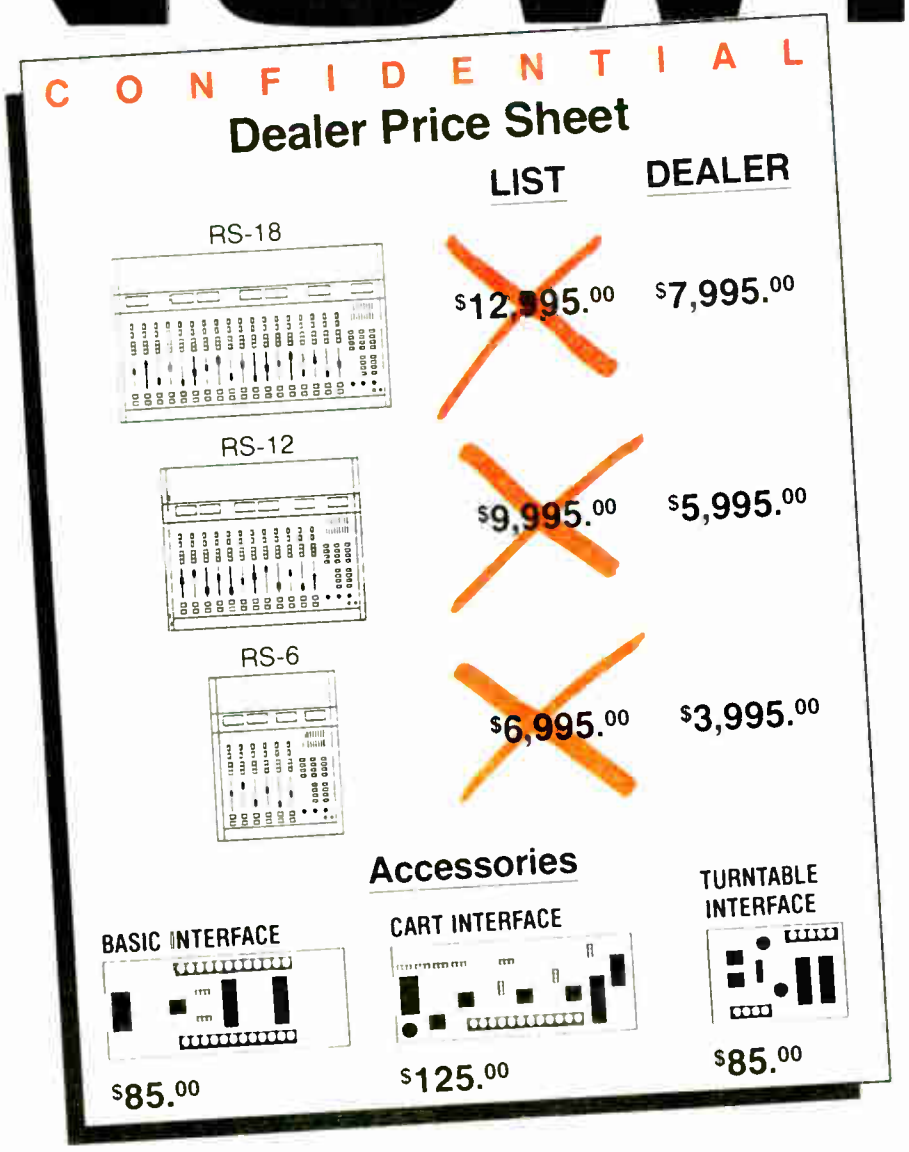
Indeed, the frequency and distortion rate of those car radios is about the same as a telephone line. Tragically, GM was the biggest producer of car radios. The first error of the broadcasting industry was letting radio makers do this to us.

(continued on page 38)



Artwork by Ken Marschall, reprinted from the book The Discovery of the Titanic by Dr. Robert D. Ballard

FEEL BETTER NOW?



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Circle Reader Service 1 on Page 38

A Guide to Running FM Stations

Starting and Operating Your Own FM Radio Station—From License Application to Program Management

Peter Hunn

Tab Books, Inc., Blue Ridge Summit PA, 1988

Reviewed by Bruce Elving

Book Review

Adolph MN ... More than a "how to" guide, this book is a history of one of America's fascinating little radio stations, WHRC 92.1, Port Henry, NY. The story about how Port Henry was picked out, how the frequency 92.1 was chosen, and the unique philosophy of this small town radio station comes through very well.

It truly is a book that covers everything mentioned in the volume's subtitle, and more, including stereo, subcarriers, translators, heights above average terrain—none of those qualities possessed by WHRC!

How then does WHRC serve as a model for other would-be broadcasters? Well, read on and learn, as I did.

You'll find out how the dream of radio station ownership could happen to almost anyone of low to moderate means and how a commercial radio station operated with no paid staff from a metal building the size of a one-car garage, which also served as apartment for the owner and his wife.

It's shades of Simon Geller of WVCA, Gloucester, MA mixed in with a bit of Roy Torian (former one-man owner-operator of KNOB 97.9, Long Beach, CA) and the Brownyard family of WHYP-AM-FM, North East, PA.

. . . Hunn's book (is) an interesting, recent and relevant station history.

It even alludes to some very contemporary issues—the proliferation of FM translators and the threat they may have to small-town radio. The book mentions WELY-AM, which went off the air for a while, partly in response to translator inundation of the small city of Ely, MN. Liberalization of FM boosters is mentioned at the end of the book along with how an on-channel booster of a Class A station could beam out 600 W to better serve the station's primary area.

The book is not alone in the field of broadcast management. There is the outdated, business oriented *Broadcast Station Management* by Quaal and Martin. Just reprinted is Lorenzo Milam's *Sex and Broadcasting, A Handbook on Starting A Radio Station for the Community*, a disrespectful book that helped launch the NFCB and alternative FM stations like KRAB, 107.7 Seattle (the 1988 edition not at all rewritten from ten years ago).

And I can think of Ernie Wilson's *Radio Station Development*, which covers such things as pirate radio to 50,000 W AM, but leans toward low-power FM school stations and cable FM.

Too often books like these cite pet local projects almost to the exclusion of the rest of the country or the rest of the industry.

While that may be true to some extent with Hunn's book, it's an interesting, recent and relevant station history. With virtually every example drawn from his own experience, he also quotes from some other authorities, ranging from Sydney Head and Christopher Sterling, textbook writers, to Bob Doll, publisher of the *Small Market Radio Newsletter*.

Included are the basics like how a station gets call letters and how to interpret coverage maps. And there's more broadcast history than you would expect in such a management and engineering guide. For example, Hunn points out how in 1949 Todd Storz took KOWH-FM, Omaha off the air.

"The voluntary 1949 silencing of the Omaha FM outlet was not an isolated incident. That year, another 211 permittees and operators of ailing FM stations did the same thing."

Well illustrated, the book even has a picture of Armstrong and cronies demonstrating FM in a store in Bridgeport, CT in 1939 and another showing C.B. Persons at the controls of W9XYH Superior, WI, along with WEBC (AM) in 1940.

I do question the book's taking up many pages to reproduce FCC forms that can be ordered directly and seen more clearly. The pages of forms are all reduced in size and hard to read. You will find 19 pages devoted to Form 301, "Applications for Construction Permit for Commercial Broadcast Station." It is a blank form. It would have been more in-

(continued on page 32)

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Routing Switchers in Today's Radio Studio

by Fred Baumgartner

Denver Co . . . Classic station architecture—the systems approach that most all of us deal with—takes sources and distributes them to each studio as needed using distribution amps or bridging audio.

Conversely most TV stations use a routing switcher architecture. Every input enters a central routing switcher and each load addresses a port of the switcher to obtain any of the inputs. This allows any source to feed any load.

Historically, the difference between radio and TV has been one of economics. Routing switchers represent a smaller portion of the overall expense to a TV station.

TV stations tend to have a larger number of outside sources, need to "time" equipment to a central point and often need to use expensive playback or recording gear to service more than one studio or edit suite.

But several recent trends have made the routing switcher architecture more suited to radio station use.

Cost and flexibility

Routers, specifically stereo routers, are becoming less expensive as a result of the TV stereo market. The number of station inputs is also increasing in some formats.

Routers offer a good alternative when rebuilding stations and reduce engineering time when making changes or maintaining old wiring.

In many radio facilities, engineering cutbacks or changes, multiple ownership changes, new needs or just a history of sloppy engineering has resulted in the stations' basic structure existing in a state of disrepair.

Grounding plans have been violated, levels and phases are out of balance and often there is no reasonable or current documentation. In other stations equipment is at the end of its maintenance-free lifetime.

In some stations format changes require increases in plant ability.

In any case, it's time to consider what a routing switcher can do for your station. Let's look at some of the advantages of this architecture.

Many benefits

First and foremost is versatility. Because any output port can connect to any input it is impossible to have a "you can't get that in this studio" situation.

This is important from a programming point of view and may be critical on those days when something out of the ordinary (big news events, etc.) are being carried.

For engineering, being able to put another studio on line, routing around a dead pot or tape machine makes a lot of equipment emergencies less disastrous and urgent.

Then there's ease of use. Most stations have push buttons, patch bays, rotary switchers and more to get a signal to where you need it. Since each port of a router is identical, once an operator understands any one port controller, they understand them all.

Because each port is all-powerful the operator can now do everything everywhere. And since the switcher can take care of stereo-mono compatibility, levels and the like, the operator can't goof up.

A router also has the ability to simplify paths. Work that once needed to be done in a studio—setting levels, checking it through, phase—all done under talent's elbow in audition can now be done in the shop.

And with sufficient output ports in a studio, recording a network feed need not tie up the board. A net feed can be routed directly to the machine without accidental noise from open pots and the board remains available for other use, on-air or production.

Anyone that runs any amount of continuous satellite programming can route the bird directly to the transmitter to buy an hour of studio maintenance time here and there.

Audio switcher installation costs are lower than the DA architecture. There are no DAs or combs, the quantity of wire is much lower, the install time is greatly reduced and the number of inputs on a board are reduced.

Since a given studio needs only two to four ports for the entire outside world, the cost of a studio is dramatically reduced.

Some optional advantages

In TV stations where equipment is shared, the concept of delegation makes sense. Here the control of a machine being used by a studio or edit suite or to dub is "delegated" to the user and others are barred from starting, stopping, recording, etc. A machine's output and its controls are routed to the load.

Machine control seems to make less sense to the radio station as machines tend to be permanently assigned to one function. In reality it is a nice option.

In many cases stations record for delay. A router with machine control can take a newsroom machine, tape the hourly network news, a news service feed, the air check, the weather bureau, futures and stock market quotations.

It routes the correct audio, starting and stopping machines at the right time, resetting timers and source selections. This is done without human intervention.

In many cases substantial programming is delayed hour to hour. A machine control can allow machines to tape, recue and playback the programs to a given studio at the right time.

Allowing the machine control to talk to transmitters, telephones and other equipment really expands the potential.

Additions to routers can include distributing master clock via control cable as well as some status indications (annunciator). Some can carry intercom and internal communications.

(continued on page 32)

Weatherproofing Mountain Sites

by Tim McCartney

Boise ID ... Mile-high transmission plants must be designed with their mountain top environments in mind. Extreme power surges, wind gusts, ice, lightning and soil with poor conductivity are a few of the areas which deserve special attention.

While each of these considerations is part of any well-planned installation, the stakes increase at 7000 feet when site access cannot be guaranteed. Thus a proper design is key to power maintenance costs and less down time.

Engineers from the US ice belt have unsuccessfully tried to dominate discussion about ice-related problems at transmission sites. Add to the "ice-impacted" list the mountain regions, and even Florida when the orange crop falls to untypical snowfall. Actually ice plagues most stations.

Perhaps the most important design consideration in response to ice concerns is the use of *radomes*. These fiberglass covers, effective in protecting antenna bays, are mandatory on mountains whenever feasible.

The exceptions

However, on Deer Point Mountain near Boise the five VHF TV batwing antennas must rely solely on de-icers. The result is heating systems which are inadequate much of the time.

TV stations must too often live with reduced forward power and excessive VSWR. And the electrical costs of heating up to 12 batwings on an antenna system are both steep and reoccurring.

All of the FMs, however, use fiberglass protectors. Their total physical and RF protection is demonstrated under conditions in which up to two feet of hard snow tops the radomes—and no VSWR! But, the tower must have sufficient wind-load capacity to tolerate the extra stress introduced by radomes.

On the aesthetic side, radomes offer an eerie, space-age ambience to the mountaintop tower with a variety of designer shapes and colors.

Many stations on the mountain have a spare bay or two installed on a tower, ready for use in the event of damage to their main system.

KBSU's is particularly attractive, featuring the latest in trendy radome design: red pin stripes over snowy-white fiberglass highlighting an avant-garde pretzel-shaped configuration. The chic style is supplied from ERI via three American distributors.

So, when asked by the FCC or the US Forest Service about environmental impact, one can boast of site beautification. Exhibit #75 should be a color glossy 8"×10" of one radome balanced on the ground with a curious mule deer exploring its design. See, a properly fashioned radome blends in and adds to the environment!

The primary threat, of course, is heavy ice falling from the tower onto a radome-protected antenna system, demolishing the fiberglass and leaving copper radiators exposed for further direct damage.

Backup systems

Since tower crews are hesitant, for good reasons, to climb ice-covered structures, design considerations require consideration of some kind of backup system.

Many stations on the mountain have a spare bay or two installed on a tower, ready for use in the event of damage to their main system.

Another approach to ice protection is the use of *ice guards* over vulnerable sections of the transmission line run, usually the area from the tower to the transmitter building.

Horizontal metal railings are mounted about six feet above the ground, with vertical ground posts anchored in the mountain. The three-inch heliax is protected from falling ice by the horizontal members of the ice guard.

True, they are yet another expensive item at installation time, but ice guards will be added after the first in-line repairs are made. So it makes sense to avoid that unnecessary expense up front.

Also on the topic of falling ice, a football helmet would be an appropriate addition to the mountain engineering maintenance equipment, right next to the snowshoes.

I remember carrying an aluminum trash can lid over my head on a number of occasions while ice plummeted off the tower.

Since craters in the ground are rou-

(continued on page 36)

Keeping the MCI JH-110 Operational

(continued from page 19)

dered to the motherboard, or even the actual breakage of small traces.

Only a bright light and magnifier will help you track down these little breaks.

Also, you have to be very careful when reinstalling a board to be sure that *all* pins are mating with the motherboard. On some of the boards, it is easy to miss a row of pins on installation.

Most of the time, intermittents can be traced to the connector itself. Corrosion builds up on the pins and the mating sockets and causes intermittent operation or a total failure.

Spray solution

The classic cure for corrosion has been a liberal application of Cramolin spray R-5. This superconductive cleaner is your best shot at cleaning up an intermittent contact.

In the most difficult cases, you might have to use an abrasive like steel wool to remove corrosion.

A coating of Cramolin should retard future corrosion. The R-5 5% solution seems to work better on the MCI than the weaker 2% solution.

If all of this fails to restore a board to proper operation, you can replace the entire connector. They are inexpensive and readily available. And don't overlook the fact that you might have a component failure on the board and need one quickly.

The best indication of a contact-induced failure is when you can restore the machine to normal, or near-normal operation by pushing down on various sections of the board when it is mounted on the mother.

Very often this flexing will restore an intermittent connection, but usually only for a day or two.

The MCI JH-110 audio electronics are well designed and relatively trouble-free.

Each module is connected to a motherboard using the Molex, however, and they are often the cause of intermittent audio problems.

The second greatest source of trouble in the electronics is the multitude of small electrolytic caps that are used extensively for coupling, bypassing and filtering.

They dry out and cause low-frequency problems or total circuit failures. Otherwise, the machines have reasonably great electronics. Something less can be said of the deck itself.

The tape transport

I seem to remember from solid-state theory somewhere that chips should last indefinitely. This is a myth when it comes to the MCI tape transport.

There are more spikes, overloads and narrow design tolerances in this deck than in any other piece of solid-state equipment you will ever be required to work on.

Perhaps it is because the 110 was a first generation machine or maybe because it was spawned from a small company. Whatever the reasons, the deck electronics will constantly challenge you with device failures!

As if this were not enough, the multitude of photocells (in the tape shutoff, motor tachs and counter circuits) seem to have a very finite life.

Also, the reel servomotors are prone to developing an AC component on their DC output which causes the tension arm to bounce wildly from one stop to the other, increasing wow and flutter tremendously.

Despite this wealth of problems that can occur with the JH-110, you will love it when it is operating properly.

When this machine hums it is unbeatable!

Next time, we'll take a look at some specific problems and their cures.

Jim Somich has been in broadcasting for over 20 years and has served as CE for a number of stations. Currently he is CE at New York's Z-100 (WHTZ-FM) and president of Major Market Engineering. He can be reached at 201-867-5000.

CONTRACT ENGINEERING

When Inspection Time Comes

Preparing for a Visit from the FCC's Field Operations Bureau

by Lee Freshwater

Part I of II

Flat Rock NC ... The only sentence in the English language worse than "We're off the air" may very well be, "There's a gentleman from the FCC here to see you."

Immediately you panic and wonder if he will notice the many things the boss hasn't had repaired yet. Or you may say to yourself, "No, it's a joke. The FCC doesn't come around anymore."

FCC inspections are alive and well, although not as prolific as they once were. One engineer we know is about to retire and has never seen an inspector, while in the last ten years I've been through seven inspections and know of at least five more in one market.

With deregulation, the Commission is not digging nearly as deep into station operations as it used to. This makes it easier to prepare for the inevitable visit. But more importantly, it means the FCC has placed more responsibility on the licensee to maintain proper technical operations.

There are three primary reasons for a visit from the FCC: complaints, EBS or FAA requests and random inspections.

Not all severe

Complaint inspections are usually of a more serious nature than a letter from a disgruntled listener. The Commission looks into interference complaints from other services, contest rigging, double or fraudulent billing, etc.

The last inspection I was involved with was precipitated by a request from the FAA for a tower survey and to check on old EBS equipment that was given to stations back in the 1950s.

Random inspections occur primarily during renewal time. Stations are chosen at random by call signs and area. If you are operating a combo AM/FM it's highly possible that only one of your stations will be inspected.

When investigating complaints the inspector will make a "swing" through an area, and may at his discretion inspect any station. So a complaint about one station may cause the inspection of others in the area.

In addition, the inspector may "check" on other stations' modulation, frequency tolerance, etc. If he sees something wrong he may either inspect the station or send it a violation notice.

One inspector gave us the grand tour of the "field truck." It contained about $250,000 worth of monitoring gear for AM/FM/TV and other services. Our first thought was of George Orwell, as Big Brother could watch us at any time.

Preparing for the inevitable

There are several things you can do to prepare yourself for the inevitable visit. The best is to "inspect" yourself.

As a contract engineer, the first thing you should do is fully inspect each station.

Using a "check-list" we look at the entire operation. A report is then prepared for the licensee with each item listed and what should be done. We then file a copy in our files.

After you have pre-inspected, sit down with your manager and outline what should be done and what it should cost. If you do your research properly, you can also give the manager an idea of what the fine would be if these items are not taken care of.

Another thing that has worked well for us is to "know your fellow engineer." Get to know the engineers at other stations in your area. You can do this through the local SBE Chapter.

Perhaps one of your operators knows someone at the other stations who could introduce you. Offer your assistance with parts, ideas, time, etc. It could pay back a thousand fold.

The last inspection we had, another engineer gave us a two-day warning—plenty of time to make sure the "i's" are dotted and the "t's" are crossed.

This can also help you out at 3 AM when you need a part. In one market, if the engineers took back all the parts they had "loaned" or borrowed, every station in town would be off the air.

Train your operators

To further prepare your station, have a meeting with all the operators. Make sure they fully understand that the FCC is still inspecting stations. Explain to them that operators have an obligation to fully understand the technical operation of the station.

If you have a directional array and change patterns or have different power levels, operators must know how these things are done and must do them on time.

The FCC does have the authority to levy a fine against the operator and/or the station for flagrant operating violations.

I do not know of the Commission actually fining operators, but we did have an inspector suggest to me that they could.

The operator on duty at the time of the inspection will be asked to explain and demonstrate to the inspector how to raise/lower power on the transmitter.

Make sure the operators know to be completely honest with the inspector. If the operator changed patterns or power level late, he or she should be honest about it if asked. Chances are the inspector has already monitored the station, and knows exactly when things were done.

Also talk to the receptionist. An inspector will first ask to see the engineer and/or the manager. It doesn't look too good for the receptionist to say, "I wonder who our engineer is." Remember, first impressions are very important.

FCC inspections are alive and well, although not as prolific as they once were.

Third Class, alive and well

While the Commission has done away with the old "Third Class" operator license and replaced it with the post card "mail-in" permit, the spirit of the license has *not* changed.

Instead of the operator verifying technical knowledge to the Commission by test, the Commission ruled that it was up to the licensee to provide proper training.

Unfortunately many stations have let this slip by and are doing little if any training at all. Many operators don't know how to turn the transmitter on or off and in some remote situations have never even seen the transmitter.

We advise stations to implement a strong program of operator training in the area of engineering. The operator need not know how to repair the transmitter, but has to be able to recognize problems and know what to do about them. This can't be done with no training.

Use the old Third Class Exam, as many of the old study guides are still available. Hold training sessions in all areas of the technical aspect and reward those who do well. It does pay off when the inspector walks in the door.

Judgement day

The dreaded day has arrived. The secretary buzzes you and announces that a man from the FCC is out front. First of all, *don't panic.*

You've pre-inspected yourself and properly trained the operators; all is in order. The inspector is there to do a job just as you are. An inspector is a member of your society, an engineer, someone who understands your language.

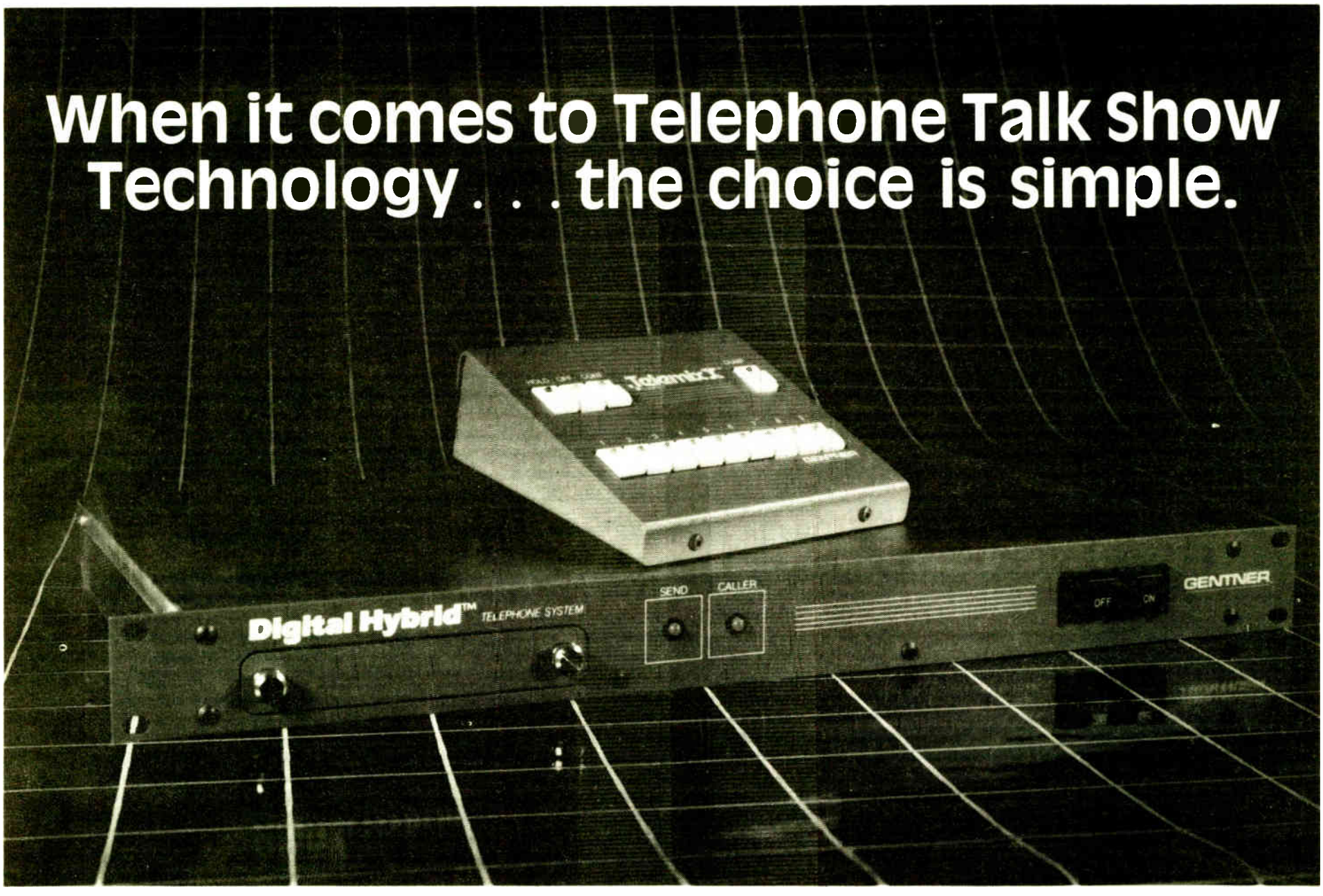
With that in mind say your silent prayer, put a smile on your face and go introduce yourself.

The inspector will usually tell you why your station is being inspected. If it's a routine inspection, relax, remember that you've done your homework and everything is in order.

The first thing the inspector will want to see is your licenses and control room. The second necessity is a place to work, preferably as quiet as possible.

Make sure you have a notepad with you and ask the inspector if you could take notes as the inspection progresses. (This probably won't be a problem.) Also ask for a review of everything when the inspection is finished.

(continued on page 31)



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People and Maintenance Parallel

by Miriam Bandfield

Marion IA ... Truthfully now, have you ever wondered whether you are weird? I mean weird in the sense of socially awkward and out of step.

Perhaps my parents thought that of me. They were always too polite to ever say such a thing out loud but I remember one time when they might have suspected it.

I was a 17-year old girl just finishing high school. In fact it was graduation night and I had been invited to the senior class party. I didn't have a date but I knew some of my friends would be there.

Nevertheless, I did not want to go. I had something else I wanted to do, something more exciting, but my parents forbade me to do it. "Either stay home or go to the party. Tonight those are your only two choices."

I was angry but I went to the party. Oh, it was OK, but it did not compare with what had been my Plan A—to go over to the church all alone and practice on the sanctuary organ. I loved music.

I also loved learning the way in which that electro-mechanical thing worked and then developing the skill needed to play it to its full potential.

At the party with all my most-likely-to-succeed classmates I felt awkward, self-conscious. But when it was just myself and a "machine" I felt challenged yet confident.

Me and the control board

It wasn't until college that I was introduced to radio broadcasting in general and, later, electronics specifically.

Again, I found that same satisfaction in pitting myself against a "machine," first as a DJ playing the control board like some space-age instrument and later as a chief engineer tuning an entire FM station, persuing harmony.

Hours working alone with inanimate objects, however, means a corresponding number of hours lost interacting with people. In one area of life my confidence grew but in another it was stunted. Now we are back to weird!

In the past three years my life has changed quite a bit. I am now a wife, homemaker and mom. My life is centered upon people now.

What a relief to discover that things I learned as an engineer, in fact some of the character traits essential to good engineers, are the same as those needed to be a good friend, mate, and parent.

... some of the character traits essential to good engineers are the same as those needed to be a good friend, mate, and parent.

I am not going so far as to say that people are like transmitters, but I will say that good relationships with people can be developed using the concept of maintenance.

Time and patience

It seems to me that good maintenance involves understanding (or knowledge), patience and commitment.

To keep a piece of equipment running smoothly you need to know how it works *plus* you need the patience or stick-to-it-iveness to do what needs to be done until the task is accomplished. It is, for the moment, focusing more on the piece of equipment than on yourself.

If a cart machine acts up you could get angry and put your fist through the wall. That might make you feel better for a couple minutes. (At least it could divert your attention from the problem at hand to the hand itself!)

But ultimately you are going to have to settle down, focus on the cart machine, call up the necessary knowledge and apply it patiently until the problem is solved. (Some things take time.) The same approach works with people.

Maintaining the social machine

Say you are a single guy but you know that you could change that if you could only get a date. So you plan your strategy in advance when you see that new, pretty salesperson.

You decide to stop her in the hallway, do all the talking so there won't be a lull in the conversation and talk about yourself the whole time so she hears all about your good points (and not about your weaknesses).

Then you plan to ask her out in front of other people so she will be too embarrassed to turn you down.

But when you follow through with this plan it falls flat. She just keeps glancing at her watch. Finally she says she is sorry but she doesn't think she is free. Then she walks out.

What if you tried it again with some understanding and patience? Forget about yourself for the moment, both your strong points and your fears. Show an interest in her, an honest desire to get acquainted. And remember, some things take time.

The "C" word

One of the most important aspects of maintenance is commitment. If that is too frightening a word for you, call it having an eye towards long range goals. Although commitment sounds lofty it always comes down to some very nitty-gritty choices.

Let's say it's time for you to roll off the sofa and go out to the transmitter. The station is scheduled to be off the air only a couple hours per week so the cleaning and dusting can be done and that time is *now*.

That weekly argument bubbles in your mind: "I am going to skip cleaning this week. No one will know whether I do it or not. It isn't like we'll sound any better tomorrow because I cleaned tonight. Anyway, it's too cold out there ... or too hot, or too far up the mountain or too overrun with scorpions."

But then you think of what you want in the long run: an efficient operation and the reputation as a competent and respected chief. So, you dress for the weather (or scorpions) and go.

People-maintenance

So many people today are crying out for this same kind of commitment as you relate to them. Of course the arguments will bubble in your brain when it comes to these choices too.

"I don't want to help my friend move to a new apartment. There are other people who will do it."

"Why should I try to comfort my wife? She is always crying over some silly thing."

"Go to the kids' concert? No. I hate classical music."

As you can imagine, some of the alternatives you will be faced with are not thrilling. In fact they may be rather tedious at the moment, just like cleaning that transmitter. It may often seem that this one little thing is not going to make much difference.

But as with that transmitter, it is the accumulation of all those "little things," either done or not done, that moves you closer to your goal of firm friend, caring parent, supportive spouse.

So, weird people, relax. You *do* have what it takes ... good maintenance capability.

Miriam Bandfield is a former radio CE living in Iowa currently at home raising her baby daughter.

Preparing for an FCC Visit

(continued from page 29)

The inspector will want to write down all the permit names, etc. Remember, all operators **must** have the FCC permit. There should also be a letter designating the chief operator.

Worst offenses

According to the FCC Field Operation Bureau, the ten most violated rules are:

1. Failure to maintain or have a complete public inspection file.
2. Failure to have a licensed operator on duty.
3. Failure to conduct EBS tests.
4. EBS monitor-receiver and/or tone generator not operational or installed.
5. Failure to operate station within the limits of frequency tolerance, modulation limits, spurious and harmonic emissions.
6. Equipment performance measurements not maintained.
7. Failure to designate a person holding a commercial radio operator permit to serve as the station chief engineer.
8. Failure to post station and/or operator licenses or permits.
9. Failure to post EBS check list at normal duty station.
10. Failure to meet specified transmission emission limitations.

Although these are perhaps the most violated rules, the FCC Mass Media Bureau has an enforcement program of their own. Among other things it enforces lottery laws, main studio rules and political broadcasting rules.

Now that the inspector is here and the ordeal has begun, there are specific areas that will come under scrutiny. We'll take a look at these areas and how they can be brought into compliance next time around.

Lee Freshwater is a partner in Blue Ridge Consultants, a contract engineering firm in Flat Rock, NC. He can be reached at 704-693-1642.

Circle Reader Service 11 on Page 38

Resonating a Load in Impedance Matching

by Tom Osenkowsky

Brookfield CT ... In some cases impedance matching may be simplified by the addition of a single component in order to achieve resonance. Resonance occurs when a conjugate load impedance is transformed into a pure resistance.

We can resonate a load by the addition of a series or parallel component. In series resonance a component having equal reactance but opposite sign is placed in series with the load, thus leaving a pure resistive value.

In parallel resonance a component is placed in shunt with the load and a value of pure resistance, always greater in value than the original, is produced.

Figure 1 shows a QuickBasic code for a computer program which will automatically determine both series and parallel resonant values.

In some instances one can take advantage of this practice in order to reduce component count thus saving money and increasing reliability.

Another approach to simplicity can be the connection of a tower base directly to a transmission line.

Since the line will act as a transformation network (and can be modelled as such) it is indeed possible to eliminate the ATU entirely or locate the ATU in a more accessible location.

A working example of the latter can be found at station WLAD in Danbury, CT.

In order to get to the tower base, a long series of stairs must be climbed up the side of a mountain. During winter months access is not always safe. Routine base ammeter readings were not always possible.

After careful study I solved the problem by using a Delta remote ammeter which now places the actual base ammeter inside the transmitter house some 600 feet away.

Additionally, the tower base is connected directly to the transmission line where it feeds a tuning unit inside the house.

In this case, readings can be taken at will since the DC sample is fed directly to the base ammeter as well as a second DC sample for the R/C and the tuning unit can be serviced indoors.

In this particular case, the transmitters would end up seeing 59 +j7 ohms without a tuning unit. Not bad, but a −72 degree Tee network provides optimum rotation, thus excellent bandwidth at the Harris SX-1 combining point.

In some cases networks can be simplified, but as always, be careful to observe component and transmission line ratings.

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

Figure 1.

```
CLS : CLEAR
PRINT "              LRESON 1.01] BY THOMAS G. OSENKOWSKY
(203)775-3060"
pi = 3.14159265358979#

DO
LOCATE 3, 1: PRINT SPACE$(80); : LOCATE 3, 1: INPUT "Carrier
Frequency (khz) ", carfreq
IF carfreq <= 0 THEN BEEP
LOOP UNTIL carfreq > 0
carfreq = carfreq * 1000

100 DO
LOCATE 4, 1: PRINT SPACE$(80); : LOCATE 4, 1: INPUT "Load
Resistance ", loadr
IF loadr <= 0 THEN BEEP
LOOP UNTIL loadr > 0

DO
LOCATE 5, 1: PRINT SPACE$(80); : LOCATE 5, 1: INPUT "Load Reactance
", loadi
IF loadi = loadr OR loadi = 0 THEN BEEP
LOOP UNTIL loadi <> 0 AND loadi <> loadr

IF SGN(loadi) = -1 THEN seriescomp = ABS(loadi / (2 * pi *
carfreq))
IF SGN(loadi) = 1 THEN seriescomp = ABS(1 / (2 * pi * carfreq *
loadi))
LOCI: PRINT USING "Series   Reactance = ######.## "; loadi
* -1; : PRINT "       Series   Component = ";
IF SGN(loadi) = 1 THEN PRINT USING ".###### uf"; seriescomp ELSE
IF SGN(loadi) = -1 THEN PRINT USING "###.## uh"; seriescomp
paras = loadr * (loadr ^ 2 / loadi ^ 2 + 1)
IF SGN(loadi) = -1 THEN paracomp = ABS(paras / (2 * pi * carfreq))

IF SGN(loadi) = 1 THEN paracomp = ABS(1 / (2 * pi * carfreq *
paras))
LOCATE 9, 1: PRINT USING "Parallel Reactance = ######.## "; paras
: PRINT "       Parallel Component = ";
IF SGN(loadi) = 1 THEN PRINT USING ".###### uf"; paracomp ELSE IF
SGN(loadi) = -1 THEN PRINT USING "###.## uh"; paracomp
LOCATE 11, 1: PRINT USING "                                  Parallel Resonant
Resistance =  ####.##"; loadr * (loadr ^ 2 / loadi ^ 2 + 1)
LOCATE 24, 1: PRINT SPACE$(80); : LOCATE 24, 1: INPUT ; "Another
Run (Y/N) ", an$
an$ = UCASE$(an$)
IF an$ = "Y" THEN 100
END
```

Launching Your Own FM Radio Station

(continued from page 25)

structive if the author had taken us step by step through the process of filling it out.

The book is good, however, in showing the mechanics of "Petition for Rulemaking," including a sample one that worked. That is usually the first step in getting an FM channel in a town, after which an application is filed, with comparative hearings often the result when more than one party wants the same FM channel.

I would like to have seen more sales helps or rules of thumb to apply as to sizes of communities where successful FM sations could be expected.

Hunn shows cognizance of competition, and explains the format and station operating hours and his news philosophy. WHRC apparently proves you can run a commercial FM station with no news wire, no network, no satellite dish, no computers and not employ hard sell in soliciting advertising—especially if you run the business with a little humor. Even the *New York Times* saw fit to run a story on WHRC.

Also interesting was the decision to sell WHRC to a Vermont company, enabling Hunn to take $200,000 and run to a daytime AM sation in Oswego, NY, hoping to turn around its fortunes. The Port Henry station is now WHWB-FM, and has embraced stereo.

Rich in historical anecdotes, the book includes a mention of the $7,500 paid to WMCA by WHOM for 92.3 in New York City back in 1949.

It says "whether a station is profitable or not, it is often difficult for a broadcaster with radio in his blood to come to terms with selling his radio outlet. When the station owner was the one who actually built the facility, the thought of selling can seem unthinkable."

Hunn seems to be the ideal broadcaster. Interested in radio and in serving the community, he takes the opposite approach of so many in the industry, such as Jerrel Shepherd of KWIX, Moberly, MO, which billed over $325,000 way back in 1968, who was quoted in the book,"We are more a sales organization than we are a programming operation. It could be said the KWIX is a sales organization with the programming to support it."

Finally, the Hunn book has some caveats for would-be station owners. Does he recommend that others run radio stations from their homes as he did? Read the book and find out. I'm sure you'll find it fascinating.

Bruce F. Elving has a Ph.D. in communications from Syracuse University and publishes the FM Atlas and Station Directory *and* FMedial *newsletter. He is an occasional writer for* **Radio World**.

Radio Routing Switchers

(continued from page 27)

Most manufacturers can give you a router with good SNR and low crosstalk. But there are key questions which need to be answered.

Practical router considerations

First of all, what happens if I overdrive an input? Do I lose all those nice cross talk figures?

Also, do the ports' remote controls make sense? Can a DJ use them? Will it handle a range of input levels or do I need homebrew pads or amps on each input?

How does it grow, in large or small chunks, expensive or cheap chunks and how much will its power supplies and controls handle?

Most importantly, will it work forever with no maintenance and what happens if it doesn't? Are there dual power supplies? Is the software backed up?

Can this switcher help me do more than just route signals? How are the controls connected, a common coax or twisted bus, RS232 or individual multiple conductor line?

Once your questions have been answered, it's time to look at design and a few other considerations before making a choice. We'll look at some of those next time.

Fred Baumgartner is engineering manager at Legacy Broadcasting's Denver stations KHOW/KSYY. He was formerly CE at WIBA, Madison, WI, and ACE at KWGN-TV, Denver. He can be reached at 303-694-6300.

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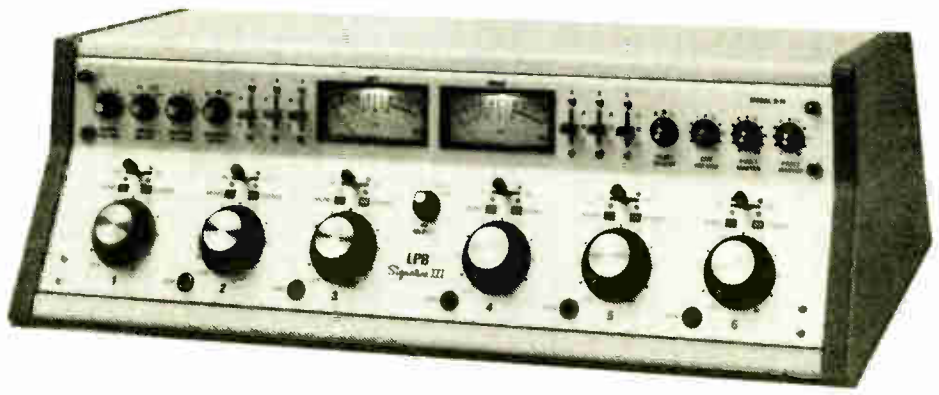
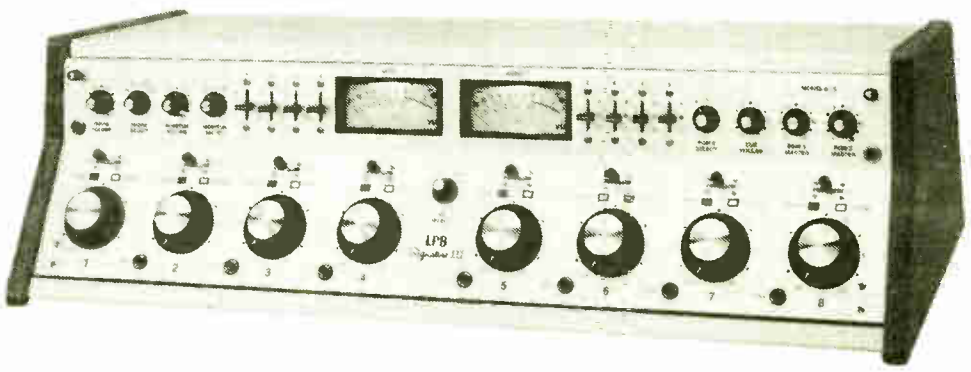
6 Mixer



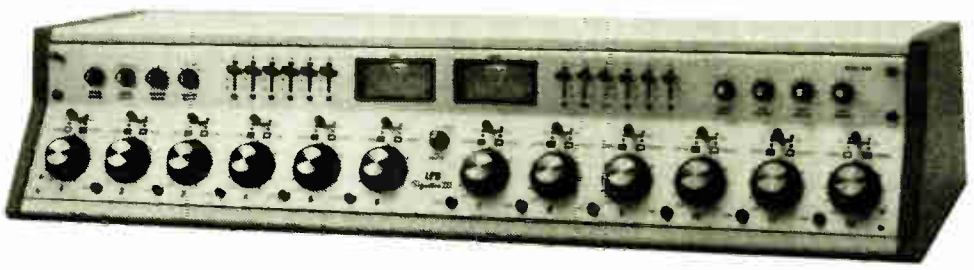


S-13 Dual Stereo
8 Mixer

S-15 Dual Mono
8 Mixer

S-20 Dual Stereo
10 Mixer

S-21 Dual Mono
10 Mixer



S-24 Dual Stereo
12 Mixer

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Problem Areas in Programming

Breathing New Life into Small Station Formats

by Peter Hunn

Westport NY ... Last year an engineer friend of mine decided to enter the ranks of broadcast ownership and he acquired a small, southern daytimer.

"For only 250 watts, it's got a pretty good signal," said the new station owner. "There is one thing," my compatriot continued, "I could really use your help with the program format. It just doesn't sound right."

Heading down south to investigate, I recalled that this fellow was a stickler for perfection, and that as a result, he was probably underestimating the positive points of his station's air product.

I wondered if the format would be off-key enough to warrant even a few suggestions. When I got within the little station's signal range, however, it became clear to me that my friend's concerns were not unfounded.

In fact, while taking copious notes I practically lost control of my car and headed into a guardrail!

After going over those notes, I discovered that the shortcomings of my associate's radio programming fall into a few problem areas that tend to water-down the format at many a small broadcast station.

The following paragraphs seek to identify some of these sensitive program areas, and offer guidelines for their correction.

Without a call sign (or some dial position identification), audience members may not know what they are listening to. Unfortunately, it is not uncommon to listen to some small market stations for 20 to 30 minutes without hearing a single set of call letters, or generic ID.

For years even folks who really wanted a Pepsi would ask for a Coke simply because the name Coke was so often promoted. The same may be true of radio stations.

Obviously, when listeners in your marketing area are surveyed (whether formally or informally) you want them to come up with your station's call sign.

A station should mention the station's call letters directly after each record. For example, "WZZZ with James Taylor's latest song ... " or "WZZZ and a tune for you by James Taylor ... " Noting the call letters twice in each break will not hurt either.

Time checks

There are lots of people who turn on a radio for the sole purpose of getting the correct time. Again, it is all too possible to listen to a station for upwards of half an hour without hearing mention of this important element.

Give a time check after each record (and/or long spot break). I've never heard a single listener complain about stations that give too much time information.

It is also important to say the time in a natural way. If someone were to stop a person on the street in order to ask for the correct time few individuals would respond by saying, "It's 20 minutes, now, after the hour of 2 o'clock."

And yet, many announcers needlessly draw out a time check in such a fashion. Just say, "It's 20 after 2."

Station policy needs to dictate whether digital or analog time checks should be rendered during the second half of an hour.

There are those who, arguably, feel that the recent digital watch proliferation makes it difficult for the younger crowd to relate to, "It's 18 before 3;" as opposed to, "It's 2:42," etc.

Then there's the "I can't wait to get out of here" syndrome.

Although one might not get a station ID, or a time check, he'll probably be sure to hear the radio announcer say, "I'm Joe Bloe, and I'll be with you until 7, and then John Smith will be in."

If someone kept telling you when he was going to leave, and exactly when his replacement was expected, wouldn't you get the impression that he was rather anxious to do something a bit more enjoyable?

Air talent should de-emphasize direct mention of when the next DJ is taking over the controls.

Record rotation/placement

No station owner would suggest that his DJs speak in a monotonous voice. Similarly, broadcast management should seek an interesting variety with regard to its format and related record rotation.

Ideally, the records played (within a station's format) should vary from each other just enough to make the programming interesting, while not shifting dramatically enough to make the listener wonder what type of music format the station typically offers.

A good record rotation within a radio format might be compared to a good menu plan. Many foods are used to make an interesting meal.

The foods must, however, be presented in acceptable or familiar combinations.

A radio outlet that features a poor record rotation could be likened to a hostess who serves her Thanksgiving dinner guests a small slice of turkey and a plateful of cranberry sauce.

Commercial spot breaks

Have you ever noticed that, like records on the Top-40, commercials vary in tempo and intensity?

A polished radio format should include commercial spots that are aired in an order which is related to their energy levels. Extreme up-down-up-down segues should be avoided in commercial spot rotation.

Live spots are generally the most sedate and should have the first position in a spot break. These announcements might be followed by more up-tempo spots containing a music bed or jingle.

Without creating an over cluttered sound, all spot breaks should end with some mention of the station's call sign/ID slogan. Frequently this is contained in a station promo (to be run last in a spot break) or jingle.

In lieu of such material, it is acceptable to briefly mention the call sign over the introduction of the first song played after the spot break.

All commercials that contain music beds should have the music out by the final syllable of the commercial's last word so that no music trail interfered with (or serve to protract) a subsequent

(continued on page 37)

Are Hams in Danger of Cancer from RF?

by Neil Lewbel

Stratford CT ... Since the beginning of this year a number of newspaper articles have appeared around the country describing links between amateur radio and RF exposure with deaths due to cancer.

The cause of these recent newspaper stories is an article which appeared in the January 1988 issue of the *American Journal of Epidemiology,* a medical journal.

The article was titled "Increased Mortality in Amateur Radio Operators due to Lymphatic and Hematopoietic Malignancies." It was written by Dr. Samuel Milham, Jr., who works in the Epidemiology Section of the Washington State Department of Social and Health Services, Olympia, WA.

This article describes an extensive study of the cause of death of licensed radio amateurs in the states of Washington and California. The study covered the period from 1 January 1979 to 31 December 1984 and was the latest of several in which Milham compares death rates and causes with exposure to electrical fields.

Milham's first study appeared in the *New England Journal of Medicine* in 1982. This study was based on a comparison of the cause of death for men in Washington State with their listed occupation.

The statistics were determined for eleven occupations which involve exposure to electrical and magnetic fields. Occupations such as electronic technician, radio and telegraph operators, power station operators and television and radio repairmen were included.

In 10 of these 11 groups there were more deaths due to leukemia than would normally be expected. Milham's conclusion was that electrical and magnetic fields may cause leukemia.

Following this first study an amateur radio operator contacted Milham and suggested that he study mortality in hams, who are exposed to electrical and magnetic fields.

This resulted in Milham's second study, which appeared as a letter in the 1985 Volume 1 issue of *Lancet*, a British medical journal. The basis for this second study was the "Silent Keys" column in QST which lists some of the members of the ARRL who have died.

The study took the names of male hams in Washington and California listed in "Silent Keys" from 1971 to 1983. The cause of death or death certificates were checked for most of these amateurs. The results showed a higher than expected mortality rate due to certain types of leukemia.

The latest study which triggered the recent newspaper articles is a more ex-

(continued on page 37)

Performance Proof Guidelines

(continued from page 19)
of interference protection. Of course, this section was written before the Commission got out of the standards business.

Note, however, tbat this section does not require that FM stereo systems use this standard, but merely that any station that uses 19 kHz shall use it to transmit stereo meeting this standard.

Note also that 73.322(a)(3) does not preclude the use of other stereo subcarriers, hence the design of the FMX system, which uses another AMDSBSC subcarrier at 38 kHz (in quadrature with the subcarrier required by this section).

This "protection" of the 19 kHz subcarrier is similar to the protection offered the television BTSC subcarrier by 73.682(c).

When the FCC dropped the audio measurement requirements, much of the trade press wrote that the FCC had dropped the annual "proof" requirement.

As mentioned above, only the audio portion of the equipment performance measurement requirement was dropped. We'll look at 73.1590 to see what is still required for radio stations.

When to do it

All AM, FM and TV stations (except class D NCE FMs operating with 10 watts or less TPO) must make equipment performance measurements of each main (not auxiliary) transmitter when one of the following occurs.

- Installation of a new or replacement main transmitter.
- Modification of a transmitter as permitted under 73.1690(e).
- Installation of AM stereo transmission equipment under 73.128.
- Installation of FM subcarrier or stereo equipment under 73.295, 73.287, 73.583 or 73.597. Note that these measurements must be made even if you're just changing a remote control that uses a subcarrier to return metering.
- Annually for AM stations with not more than 14 months between measurements!
- When required by other provisions of the rules or the station license.

Note that annual requirement for AM stations. Note also the requirement that measurements be made when changing subcarrier equipment.

What to measure

Rule 73.1590(b) requires the measurements to demonstrate compliance with the transmission system requirements appropriate for the station (73.44 for AM, 73.317 for FM).

These are all RF bandwidth requirements, except that 73.317(e) requires that the audio preemphasis in an FM station may not exceed a 75 μsecond network.

The measurements for an operating AM station are to be made at ground level about 1 km from the antenna center, with the station operating into the antenna [73.44(d)].

Further, if the station is directional, the carrier frequency reference field strength is to be based on a non-directional antenna (as determined by one of three methods).

Assuming the measurement is made in the major lobe of the array, where the actual carrier field strength is higher than that of a non-directional antenna, the sideband and spurious radiation must be attenuated the specified amount below the ND field, which puts a more strict requirement on DAs than NDs.

Since the measurements are to be made with modulation [73.1590(b)], and the measurement area begins at 15 kHz from carrier [73.44(a)(l)], it appears that the measurements would have to be made with a spectrum analyzer.

This contrasts with the previous requirements where "evidence" that spurious radiation was not causing objectionable interference could be provided with a communications receiver.

The required measurement data along with a description of the equipment and procedures used to generate the data must be signed and dated and kept on file at the transmitter or remote control point for two years, and be made available to the FCC on request.

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

Guarding Against the Elements

(continued from page 28)
tinely formed around towers by these falling meteorites, caution is the word.

Lightning

When it comes to lightning "the tall one takes the fall" most of the time. On the mountain, the station with the highest antenna location absorbs the brunt of lightning storms. As a result, it is forced to regularly stock a spare plate transformer.

So ironically this station serves as insurance for the rest of us from the worst of Mother Nature's electrical discharges. We should all contribute to its maintenance budget for such services rendered. But, in the end, nearly all of the stations get a piece of the action.

Some of the techniques for dealing with erratic power surges after an outage also help with lightning protection: surge protectors, uninterruptable power supplies, etc.

Ultimately, however, it comes down to straightforward bottom-line reckoning. Higher maintenance costs are required on a mountaintop at 7000′ than at 2000′ on a tower.

That means you need a certain number of spare parts such as a full set of high voltage diode stacks for the transmitter power supply. It also means storing heavy items at the site rather than expecting to transport them there.

Poor ground conductivity

All of your nightmarish experiences with poor grounding exist at mountaintops. The "soil" (a loose definition at best) is made up of rock and clay, which partially explains why no trees grow at the site.

Add in the low moisture content during most of the lightning season, and the earth fails to meet lightning protection expectations.

A central ground system ties together many sites on the mountain. But it's not adequate for the environment. The stations with the least trouble have pursued elaborate grounding strategies, which have paid off in the long run.

One station invested $45,000 in copper about 12 years ago. It bonded copper to the tower, buried it under extensive sections of ground, used eight-inch wide copper ground strap and shielded the building inside for RF screening.

You might imagine the suggestions which have been discussed for years about a community ground system for all stations on the mountain. But, there's the matter of cost to consider.

And the stations which are now surviving lightning storms with no damage clearly have no room for improvement. Besides, they are the stations which invested heavily in elaborate ground systems.

As another strategy for such locations we've looked into chemical ground rods, which improve grounding as they produce their own moisture on a daily basis. While such a theory seems ideal for mountain sites, we have yet to actually try them.

At Deer Point

Back to how it's handled at Deer Point, each station does its best to tie into whatever ground is available. That means a minimum of four-inch copper strap—the thick stuff and silver soldering.

Higher maintenance costs are required on a mountaintop at 7000′ than at 2000′ on a tower.

Before soldering KBSU installed several brass nuts and bolts to provide additional physical support and some electrical connection in the event that a lightning strike were to melt the silver solder. This has actually occurred on the mountain.

It's not possible to get underneath one's transmitter in the trough to check the condition of the bonding. So, the best possible connection of grounds straps *prior to* the transmitter installation is logical.

If these suggestions strike you as being no different than design considerations for *any* transmission site, you're right.

While such techniques are frequently used, the difference at a mile high is that *all* of these approaches become mandatory, not optional. And even then, it's best to maintain a backup transmitter and an RF switcher hooked onto the transmission line input.

Thus the terrific gains in elevation are traded off by additional design expenses. On the other hand, tower construction expenses are lower. The tallest structure on our mountain is just 220′, a far cry from the 1000′ structures on flatter lands.

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.

Can RF Cause Cancer in Hams?

(continued from page 34)

tensive study of mortality in hams. This study was based on a list of all licensed amateur radio operators, purchased from the National Technical Information Service.

The list showed those who were licensed between 1 January 1979 and 16 June 1984. Hams with Washington or California state addresses were taken from the file.

A search for deaths was then done by name. Because there are much fewer female hams, records showing female names were removed from the study.

More than 67,000 names were compared with death records in the two states. In this group there were 2,485 deaths during the study period.

Analysis of the data obtained from this study indicates that there were more deaths due to two specific types of leukemia than would have been expected.

Acute myeloid and acute unspecified cell were the two types of leukemia mentioned. It was this point which has been emphasized in the newspapers. There are, however, several other points which Milham made in his article describing the study which are more encouraging.

One important point was that "the overall mortality of amateur radio operators is quite favorable when compared to that of all US males."

Milham's article also indicates that in addition to electric and magnetic fields amateurs are exposed to electric shocks, soldering fumes and degreasing agents in pursuing their hobby. He also mentions that about "one third of the group also works in jobs with electric and magnetic field exposure."

However, the article also states, "The low standardized mortality ratios for malignant and non-malignant respiratory diseases suggests that members of the ARRL have a lower ratio of cigarette smoking than does the general population."

The ARRL responded to the newspaper articles and Milham's study in the March 1988 issue of QST. The ARRL mentioned that the study also showed that amateurs had fewer deaths from certain kinds of leukemia than the general population.

The QST article also raised questions about the methodology used in Milham's earlier study of hams. But the ARRL Committee on Biological Effects of RF Energy is still studying Milham's most recent article.

Milham had several comments which put the issues in proper perspective. He said in a phone interview that "all we know about it is FCC registrants have increased mortality in some areas and decreased (mortality) in others."

He also pointed out the fact that only some types of leukemia are elevated indicates that there is something real which requires more study.

When asked if he felt there were any special implications for broadcast engineers, Milham suggested that he would not jump ship and change jobs at this point.

He does however, believe there is sufficient justification to do more studies on the effects of electrical and magnetic fields.

Neil Lewbel, in addition to writing about radio and electronics, is licensed as amateur station KA1PJQ. He can be reached at 203-377-8517.

Formatting

(continued from page 34)

event.

Back in the early 1970s when KCBQ-AM was a high energy, San Diego rocker, it featured a terrific promotion called *The Last Contest*.

During this promotion, KCBQ offered prizes like: dinner for you—and 1,000 of your closest friends—as well as yacht cruises to exotic locales. And after your happy return, you could keep the boat!

Today large stations continue the KCBQ tradition and give away big prizes such as cars, homes, $50,000, etc. Is it possible for a small station, with few available promotional dollars to come up with a worthwhile contest? Fortunately, if you responded "yes," you win.

People seem to enjoy simple contests (like trivia questions) where they are able to play along even if they are not able (or likely) to call in for a prize.

One tried and true promotion is: "Guess the first date, this winter, on which it will snow an inch or more (as measured outside our studios)." An appropriate prize would be a gallon of antifreeze, a snow shovel, ice scraper, etc.

In any event, if your station can afford a music or general trivia book, and is able to get the local fast food restaurant to give you a couple of hamburger gift certificates your broadcast facility is well on its way to getting into the contest business.

Finally, it is true that, in addition to the areas covered in this article, there are other radio format guidelines that might require consideration.

However, when the basics mentioned here begin to get straightened out, a consistently listenable radio format is well within reach.

Peter Hunn is a former station owner, Billboard magazine air personality of the year, and holds a Masters degree in Mass Communication from Central Missouri State University. His book "Starting and Operating Your Own FM Radio Station" was just published by TAB Books, Inc.

The Wreck of the Good Ship AM

(continued from page 23)

We are averaging a loss of two shares a year. We lost four shares in 1987, one share in the spring of 1988. We have twnty-five shares to go; there are only 12½ years left.

Nero in Congress?

Ed Markey, the chairman of the House Telecommunications Subcommittee, the FCC's boss, may go down in history as the man who fought for the Fairness Doctrine but he will also go down as the politician who fiddled while Rome burned.

He is a champion of tight controls on radio and TV and is a champion of "more is better" in the "public interest."

Ironically, he is fiddling with those broader issues while 50% of the spectrum he was entrusted with goes dark. More bureaucracy and this slow-moving process will kill the band before he ever leaves office.

If I could do a cartoon, I'd make a Mr. Magoo-type character standing on the deck of the ship. Near him would be a life preserver and an anchor. He would represent the government and Congress.

In the water would be tired swimmers representing AM radio stations. Magoo would be saying, "Here's help, grab this, hold on tight." Then, as only Magoo can do, he would accidentally throw the anchor.

Sadly, Magoo would never know the error until it was too late. That's where we all are right now. The anchor is in the air—we're beginning to reach for it in desperation. Unless momentum ceases we're all going down, believe it or not.

Costly errors

The next error was not getting receiver makers, the FCC and broadcasters together long ago. AM is going down because people can't hear technical quality.

AM stereo presented some hope. There's no magic in stereo, but with stereo came AM radios with much higher technical quality. This error goes to the FCC for not choosing a single system of broadcasting AM stereo.

We've lost 12 shares while the "marketplace decision" took place. Here some receiver makers, including GM, came to the rescue.

There are now millions of those great sounding radios out there. But many AM radio station owners are standing on their Titanic decks and saying "I'll wait and see."

The marketplace decision has been clearly made in favor of Motorola and thousands of AM station owners haven't even noticed—or don't care.

They have the very power to turn the band around, but they don't try. They have inadvertently shut off the emergency pumps.

We are sinking faster.

The next error was allowing simulcasting. That anchor cost us four shares the first year it went into effect. In 1960, the FCC ordered us to stop simulcasting so as to make more people listen to the FM band—what logic reversal!

Based on that experience the return of simulcasting was only going to weaken AM. It solved the financial problems of many FM stations who didn't care about their AM but it has driven AM listening down more.

AM radio, now, has hundreds of radio stations whose name is "FM 103." Some markets have no AM radio stations at all, just big regional FM stations broadcasting on local AM stations.

Public interest pitfalls

The FCC offered some help—the breakup of the clear channel stations. Now poor signal stations might be allowed to move down to less crowded frequencies. The biggest problem is the "public interest standard."

If I want to move my weak signal station, I go on "public notice." Because I'm already a broadcaster, I'd be the last to be chosen for the new frequency. And so present, poor signal broadcasters don't apply for their only hope.

The very public interest standard that should foster radio's development is causing it to sink faster.

The government that could help it is caught up in a huge web of bureaucracy. A giant battle between the FCC and Congress assures any help this year will have to wait. Many AM stations are going off the air forever while the two sides bicker.

Often, their transmitter site is worth more than the declining value of the station. The public interest ultimately is served when the station goes dark and the shopping center is built.

. . . (By 1968) AM radios began to sound worse and worse; FM better and better.

The bureaucracy isn't moving fast enough. In a few years it will be too late. The most common question by younger people when buying a radio is, "Can I get it without AM?" FM-only radios are now in production.

Lifeboats await

The first thing that is needed is an immediate adoption of the NRSC standard—the standard that stops AM radio stations from transmitting frequencies over 10 kHz; no radio can hear them anyway.

When this happens, radio manufacturers have already agreed to produce compatible radios that contain a sound that approaches that of FM.

Yet with this immediate hope, 70% of all AM broadcasters have ignored the conversion. Their ship is sinking. They deserve it.

Next some very immediate attention is needed by the FCC and Congress. Unfortunately, bureaucracy moves slowly. If it moves slowly this time, it will eliminate the AM spectrum.

AM radio, at least temporarily, needs the latitude to upgrade, increase power where applicable and change frequencies without potential harassment applications.

Hundreds of construction permits have been issued to non-broadcasters for AM facilities. A vast majority have not been built. The public interest standard favors non-broadcasters.

What AM doesn't need right now is a bunch of first-time broadcasters without the vast financial resources and skill that it takes to get people to listen to AM.

Fighting for AM

Many AMs need more power. In the eastern part of the country, a 3000 W FM puts out a far better signal than a 10 kW AM above 1200 on the dial.

A city with a noisy AM band from this kind of upgrading, but with 10 AM signals cutting cleanly through the noise, is better than no band at all.

Simulcasting should be stopped. If an AM/FM combo doesn't want to fight for AM, it should sell it or give it up. Simulcasting has hurt AM badly.

Some brokers will not even list an AM-only radio station because the market is too weak. FM stations are now the biggest buyers of AM radio stations, and it's just for the purpose of adding a fraction of a share point to increase an FM rate at the negotiating table.

Without simulcasting, AM owners will be forced to fight—just like FM owners did in the late sixties.

If half the AM band does go dark—and at least that much may happen—the FCC should consider spacing the remaining stations 20 kHz apart. Then AM, with increased power, would produce better quality than FM.

AM could come out fighting with technical dominance. Help is needed immediately by everyone. Anything less will eliminate 50% of the broadcast spectrum by the year 2000.

Finally, there needs to be a Congressionally mandated continuous tune dial. It worked for UHF years ago. AM now needs this help until the crunch is over.

It is imperative that these radios are high quality 9 kHz radios, so the AM will sound similar to the FM portion when they automatically change from one band to the other.

All this need to happen at the speed of light. The old demographics of AM listeners could make the downward spiral in listening irreversible in a few years.

Ron Frizzell is president of WLAM-WKZS-WJBQ in Auburn-Portland. He can be reached at 207-784-5401.

Any of these problems sound familiar? Get to know Modulation Sciences' composite baseband solutions.

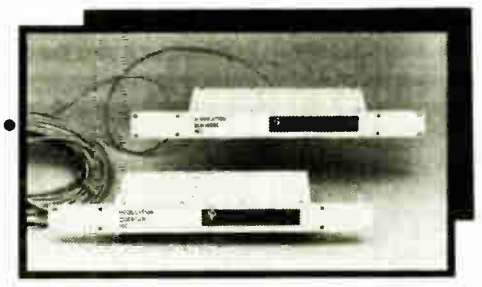
Problems

- Transmitter noise, heat, RF field interference and physical location make the transmitter room a poor place to locate the stereo generator and audio processing. Necessary and critical adjustments are inconvenient at best; nearly impossible at worst!
- Lossy, expensive, hard-to-install 950 mHz semi-rigid coax is often impractical to run from the studio to the STL antenna on the roof.
- Fire codes won't let you run PVC jacketed coax through the ceiling, except in very expensive metal conduits.
- Long composite runs at the transmitter or studio pick up ground loop hum.

- You need to drive multiple exciters without composite level changes and switching or relay hassles.
- The station has two stereo generators and two transmitters. You want a simple way to matrix-switch them without requiring complex backloading.
- It's a pain to use your spectrum analyzer and other test gear to make composite measurements because of the hassles of interrupting the air feed to connect them.

- The PD, the CE and the GM all want to monitor and measure the station's quality. But buying three modulation monitors is out of the question.
- Keeping tabs on the competition's signal quality is important, but it's inconvenient and expensive to do.
- Lots of boxes use composite baseband—the STL, stereo and SCA generators and more. You need an easy, economical way to test their performance, and directly measure composite baseband signals.
- The station has an old modulation monitor gathering dust. You don't trust the readings, but can't it still be useful?

Solutions



Modulation Sciences' CLD-2501/2 Composite Driver/Receiver

- Lets you put your stereo generators and audio processing where they belong—at the studio.
- Supports up to 3000 ft. (or two milese, on special order) of flexible, inexpensive, twinax cable – standard or PTFE-jacketed for plenum runs.
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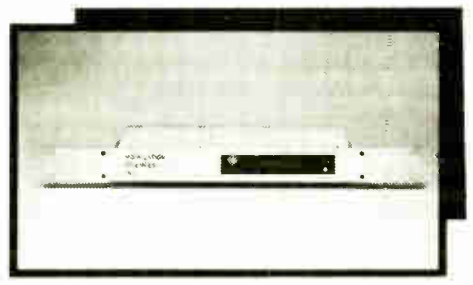

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AMPLIFIERS

Want to Sell

Shure M64 phono preamp, BO. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

Ramko DA's, 6R/E (2), $100 ea; (2) Excalibur DA1-5, $50 ea. M Legner, 703-971-7069.

Vital AA-1A (11) audio dist amps w/rack mount main frame 1 in 6 out. G Mundkowsky, 12918 Smalley, Grandview MO 64030. 816-966-0731.

Bogen TA-100, MX30 & Challenger, audio PA amps, $100 or $40 ea; Newcomb custom audio amp, built EQ, $75; Dynakit preamp, stereo, vgc, $40. J Dexter, 1604 Missoun Ave, Artesia NM 88210. 505-746-6590.

Belar RFA-1FM RF amp, 92.7 MHz, never used, BO. M Strong, KKBS, POB 1756, Guymon OK 73942. 405-338-5493.

McIntosh MA-5100 stereo amp/preamp, fair cond, $300. W Dudley, Location Sound, 6919 19th St, Tampa FL 33610. 813-237-6516.

Peavey CS800 800 W amp, 4 hrs use, in original carton, $550. B Novosad, KSMB, POB 31023, Lafayette LA 70502. 318-232-1311.

Bogen 100 W amp, solid-state, $200; Bogen 50 W amp, tube-type, $50. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Shure FP11 mic to line amp, excel cond, $125. C Butler, Butler Bdctg Srvs, 1775 Bartlett, Orange Pk FL 32073. 904-264-8169.

Ampex 620 speaker amp, $100; Gates Stay Level limiter amp M5167, $175. L Oliver, 304 W 89th St #2A, NY NY 10024. 212-874-0274.

ANTENNAS & TOWERS

Want to Sell

Andrew Heliax, 140' of 5/8" cable, new, $100. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

FM tower, 600'; 450' of 3" rigid transmission line; 40,000' #10 copper wire. J Stevens, WLAU, Rt 10 Box 420, Long MS 39440. 601-425-5145.

Utility tower, 340', on ground, ready to move, gd cond, $12,000/BO. DF Dixon, 142 David, Lugoff SC 29078. 803-438-5788.

ERI 10 bay CP FM at 95.7 MHz, excel cond, BO. B Howard, KOFO, Box 16, Ottawa KS 44067. 913-242-1220.

Jampro JLCP-7 FM antenna, 7 bay for 12" face or leg mount, 106.3 MHz, 195' 1-5/8" coax air dielectric w/EIA connector each end, $5000/all. B Dickerson, WEAG, POB 520, Starke FL 32091. 904-964-5001.

CCA (Shively) FM 6 bay low power CP FM, 97.7 MHz, rebuilt 8/87, 1 spare bay, avail now. D Walker, WOXY, 513-868-3842.

Andrew HJ7-50A xmsn line 130', 1-5/8' line w/GP 87R, GB 87G connectors w/fittings, gd cond. D Walker, WOXY, 513-868-3842.

Jampro JSCP-2 FM antenna system, will tune to your freq w/factory warranty, also 10 radomes, excel cond, BO. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Phelps-Dodge 4 bay HP antennas, $1200. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

Rohn 25G guyed, insulated, 180' AM tower, w/guys, on ground, ready to ship, $1300. D Kelly, KWPN, Box 84, West Point NE 68788. 402-372-5423.

Three tower 10 kW phaser; tuning unit 1 MHz 100 kHz, tower & beacon, 250', call for prices/info. P Buxton, WTAK, 6420 Stringfield Rd, Huntsville AL 35806. 205-859-6100.

Unflanged coupling w/bullets, (6) 3-1/8", (3) 1-5/8" unflanged couplings w/bullets, (2) 1-5/8" 90° unflanged couplings, no bullets. R Lane, KTYD, 5260 Hollister Ave, Santa Barbara CA 93116. 805-967-4511.

RCA TFU-24DM UHF TV ant on chnl 41, $500. C Haynes, WJMI, POB 31235. Jackson MS 39206. 601-948-1515.

ERI 10 bay CP FM, at 95.7 MHz, excel cond. B Howard, KOFO, Box 16, US 59 Hwy & Radio Rd, Ottawa KS 66067. 913-242-1220.

Andrew 1-5/8" motorized transfer switch, $400; 3-1/8" motorized transfer switch, $1200. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Various 3-1/8" coax hardline elbows, right angles, joints & flanges. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Jennings vaccuum coax switch, 3-1/8" 50 ohm SPDT, $1200 ea; 6-1/8" 50 ohm bullets, $30 ea. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Collins G5C PM-4E 4 bay FM, 102.3 MHz, 1-5/8" fittings, $3000; ERI 403 isocoupler, completely rebuilt, 102.3 MHz, $700. D Morrison, KWKK, POB 89, Dardanelle AR 72834. 501-229-4949.

Centronics 10 kW three tower phasor, many valuable components; (3) 10 kW ATUs. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Andrew 40525A dehydrator, basic unit, gd cond, 6 yrs old, w/manual, partial overhaul 6/88, BO. J Gober, WCOK, 236 Goodwin Crest Dr, Birmingham AL 35209. 205-945-4646.

Want to Buy

Guyed tower w/24" tapered top, at least 100', 700-800' overall height. D Furr, POB 707, Columbus MS 39701. 601-328-1420.

Towers 220'+, self-supporting to hold dish. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 614-846-9234.

Broadband high power FM CP antenna, 4 bay, from 102-106 MHz. D Agnew, 402-488-4275.

Self supporting tower, 200-300' zone B. D Van Zandt, Cornerstone Radio, POB 500, Petersburg IL 62675. 217-632-2266.

Guyed or self support tower, 250' min, for LPTV antenna & (4) STL dishes. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

LPTV antenna, Ch 64 UHF. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

AUDIO PRODUCTION (OTHER)

Want to Sell

API 550A stereo EQs. $550. F Chambers, 813 Putnam Ave, Brooklyn NY 11221. 718-453-6499.

Tascam PB-32H (2), $75 ea; Tascam PB-32-P, $75; Teac PB-64 (2), $75 ea. M Legner, 703-971-7069.

Orban 111B reverb unit, $300. M Legner, 703-971-7069.

dbx 900 series, rack mount card cages (3), $400 ea; 942 decoder modules (8), $125 ea; 941 encoder module, $125; de-esser module, $275; model 140A encode/decode unit, $325, will deal on whole package. M Bostic, WKLX, 259 Monroe Ave, Rochester NY 14607. 716-454-3040.

Audio Tech System, audio exciter (2), $125 ea; Ed Cor stereo HA400 headphone amp. M Legner, 703-971-7069.

dbx 905M & 902M parametric EQ & de-esser, like new, $500. B Weiss, KLSI, 3101 Broadway Ste 460, Kansas City MO 64111. 816-753-0933.

Orban 8100A Optimod w/8100AST studio chassis, mint cond, $3500. P Christensen, WIVY, 3101 Univ S, Jacksonville FL 32216. 904-721-9111.

Henry Eng Mix Minus Plus (2). $125 ea. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

Howe Phase Chaser, excel cond, $695; NPN patch bay, studio interconnect, new, $200. T Hodgens, KHSS, Whitman Towers Penthouse, Walla Walla WA 99362. 509-522-5412.

Eventide H-949 Harmonizer w/de-glitch, excel cond, $1600. F Scheidt, 15 Charlotte St, Rochester NY 14607. 716-232-5210.

UREI LA-3A compressor & limiter w/rack ears, $300. A Baker, Bdct Prod of America, 804 E 38th, Indianapolis IN 46205. 317-925-7371.

Stereo prod/air studio system w/Auditronics 218 console, $8000; (2) Technics SP-15 TTs w/carts, arms, preamps, $1000; UREI 536 EQ, $250; Aphex dual Compellor, $750; patching, $300; (2) MCI/Sony JH-110B R-Rs, $7000; custom wood & formica cabinetry, $16,000 package. J McNally, KZBS, 9400 N Broadway, Oklahoma City OK 73114. 405-478-4499.

Eventide BD995 digital delay. BO. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Audio/Digital TC-4 digital 6.8 sec 15 kHz time delay, 9 mos old. H Kneller Jr, WKII, 813-639-1112.

Tapco full octave stereo EQ, $75. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Valley People Dynamite 2 chnl comp/limiter/de-esser, vgc, $250. S Syarto, MJI Bdctg, 666 5th, NY NY 10103. 212-245-5010.

Howe Phase Chasers (2), stereo, $800/both. C Keith, ALI Bdctg, 9 Roxbury St, Keene NH 03431. 603-352-8460.

Want to Buy

Manual or copy needed for Kahn Symmetrapeak SP-58-1A. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Production room & control equip, need gd used gear. R Hughes, Team Bdctg, 561 Golden Ave, Mobile AL 36617. 205-456-1362.

AUTOMATION EQUIP.

Want to Sell

Schafer 903 system (2), w/R-R deck & Audiofile, BO. M Golchert, WBVR, POB 298, Russelville KY 42276. 502-726-3555.

SMC 250, w/2 Carousels, recond, still in box, $300 ea. C Washington, WFRK, 1725 Mt Vernon Rd, Leesburg FL 32748. 904-365-0659.

Systemation on-air & prod controllers for automation system, gd cond, $3000/BO. B Efron, KJLA, 3435 Broadway, Kansas City MO 64111. 816-753-7707.

MEI Microprobe 3 control brain for satellite operation, $1200. T Bigby, KXLA, POB 900, Rayville LA 71269. 318-728-6990.

SMC automation unit, great cond, includes DP-2 Brain, 5 ITC 750 PB units, 2 48-cart Insta-Carts, DS-20 switcher, PDC-4 clock, 2 CRT's Sanyo & Motorola, automatic logger, dule tone sensors, program backup cassette, used 1 yr, $10,000. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Broadcast Product CL24 AS10 automation controller, does not random select; Sonomag 250, unknown cond, 24 slot Carousel, BO. G Vogel, KHIH, 7900 E Berry Pl, Englewood CO 80111. 303-779-8797.

IGM 504 3 chan x 20 wide, $700/BO. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

Harris 9003 automation controller, equip w/2 terminals, 32 sources, monitor panel, all cables, extra disc drives & spare parts, $5000. E Steinberg, KDFC, 2822 Van Ness Ave, San Francisco CA 94109. 415-441-5772.

SMC Automation, DP-2 brain, DS-20 switcher, (2) Instacarts, (5) 750 R-R machines, excel cond, $10,000/BO. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

Shafer Audiofile 1 units (6), are individual columns, 4 complete & functional, 1 complete but not working & 1 is mostly complete and non functional, $600 ea or all for $3000. R Schacht, WBAX, 1 Broadcast Plaza, Wilkes Barre PA 18703. 717-288-7575.

Cetec 7000GLS, (4) ITC 770 R-R's, (2) Schafer 24 tray Carousels, (1) 48 tray Instacart, vgc, now in service, $16,500/BO, delivery negotiable. T Hite, WAUC, POB 908, Wauchula FL 33873. 813-773-5008.

IGM Instacart 48 tray, mono, late mdl w/black panel & LED's, vgc, $6000 or trade for cart machines. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Schafer 903 System complete or w/o R-R, BO; UREI 31 band graphic EQ, BO; road case for equip 22" front rack space, top removes for additional rack space or mixer, w/handles, BO. J Jarjoura, WCIB, POB C, Falmouth MA 02541. 508-548-3102.

SMC TS-25 dual tone decoder, brand new, $400/BO. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Want to Buy

Carousels for Harris 9002, also need non-working units for parts. B Williams, WDOC, POB 309, University Dr, Prestonsburg KY 41653. 606-886-2338.

Real-time announce clock, any make, any model, for automation system, must be capable of 24 hr operation & in at least repairable cond. D Salter, WSTX, POB 428, Christiansted, St Croix USVI 00821. 809-773-0390.

Spare parts for Harris System 90, IGM Go-Cart system would consider buying system that is out of commission for parts. P Tinkle, WCMT, POB 318, Martin TN 38237, 901-587-9526.

SMC Minipro w/350 Carousels & Otari R-R's. J Torsitano, KNIS, 6363 Hwy 50E, Carson City NV 89701. 702-883-5647.

SMC 352RS Carousel, need one or more. G Stinnard, WEJL, 149 Peru Ave, Scranton PA 18503. 717-346-6555.

Keyboard for Harris System 90. T Low, KBEE, POB 3131, Modesto CA 95353. 209-523-7756.

Schafer 800 T or S tube or transistor, any cond; SMC 250, need (3) Carousels. B Van Prooyen, WYGR, 1055 28th SW, Wyoming MI 49509. 616-532-1168.

SMC ESP1 or ESP2 automation system, (4) reels, (4) single play carts, time announce & remote control, $10-15K. F White, WLOR, POB 45, Thomasville GA 31799. 912-226-7911.

CAMERAS (VIDEO)

Want to Sell

QuickSet 6245 head; QXD-1 5602 full size dolly, 4" wheels; QXT-7 6312 tripod, 3/4 size w/elevator, $1100. Larry, 412-763-8359.

CEI 310 (2) cameras complete & gd cond, $3000 ea/trade. H Henson, Henson Prod, 3796 Bethania Sta Rd, Winston-Salem NC 27106. 919-924-8717.

Canon Z9 pistol grip zoom/VTR control w/mounting bracket for pan handle, $175; Fujinon MCA-1A panhandle mount bracket for Fuji pistol grip, $50; power cable, coiled, from belt to camera XLR-4F(L) to XLR-4M, $30; Peter Lisand quick release, $60. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

RCA TK-76 portable/studio bdct camera, excel cond, $3000/BO; RCA TK-44 studio cameras (5), full CCU's, $5000 ea. G Urban, 314 W 52nd, NY NY 10019. 212-677-2200.

Sony DXC1800 w/3/4" recorder, VO4800 complete, in excel cond w/tripod, field carrying case, cables, rechargeable batteries & charger/power supply, BO. B Cook, POB 4390, Woodland Park CO 80866. 719-687-6357.

Long focal length lenses for IO camera: 16" IE lens & 406" IO lens, both w/cases. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

RCA TK-14 image orthicon cameras (3), complete w/power supplies, focus current regulators. Angenieux hyperuniversal zoom lens & standard complement, 600-800' of cable, manuals & spare parts. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Telemation TM-2100 mono, w/10:1 Angenieux zoom lens, w/manual; RCA PK-330 (2) studio vidicon camera chains w/10:1 Angenieux zoom lens, control units & cable, w/manuals. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Norelco PCP-90 plumbicon color camera, $300; Houston Fearless studio pedestals, $100; RCA PK-701 color studio camera, $395. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Sony DXC 1640 like new, in case w/all access, $700. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Sony DXC-3000 (3) CCD cameras, lens, viewfinder, case, cable, etc, LN, $4500; AC supply, rack mount, CCU & 100' cable also avail. B Dombrowski, Whirlwind Prod, 10356 W Warren, Dearborn MI 48126. 313-584-4038.

Miller fluid head, $400; NCE fluid head, $400; O'Conner 30 fluid head, $700; Akley gyro head, $7700; Arriflex gyro head, $300; ITC hydro head, $500. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

Want to Buy

Philips LHD-1/20 service manual for telecine equipped cameras inc any updates or mods for same; service manual/descriptive lit/catalog of Telemation telecine equip. G Odell, The Film Group, Box 9, Wethersfield CT 06109. 203-527-2972.

Dumont or RCA TV camera, want old TV equip. A Wiener, Briton Rd, Monticello ME 04760. 207-538-9538.

Dumont cameras, monitors & associated equip; also RCA TK-11, TK-31, TK-41 camera chains, camera tripods also. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

CART MACHINES

Want to Sell

BE 3200 72/76 mono triple tone, $1300. B Weiner, KNYO, 210 Allen, Glendale CA 91201. 818-409-0185.

Tapecaster 700 R/P, $200; (2) Tapecaster 700P, $100 ea; Spotmaster 70-Ten stereo, $300; Spotmaster 505 BRS stereo PB, rackmount, $50; Sparta 800 R/P, $75. M Legner, 703-971-7069.

Nortronics, 1 record, 2 play heads, 3 chan fits stereo cart machines ITC, never used, $20 ea. T Duffy, POB 521, W Haven CT 06516. 203-934-6992.

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RW Broadcast Equipment Exchange

CART . . . WTB

Harris mono PB older, w/desk top & rack mount bracket, missing power cord, pinch roller & manual, although similar manual avail, worked fine when removed w/exception of noisy motor, $100/BO. D Slentz, Gemini/Dover, Box 1678, APO NY 09283.

Collins mono cart, great cond, plus lots more, $150. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

ITC RP mono (3), not new but very little use, excel cond, $900 ea. F Lauerman, WMAM, Roosevelt Rd, Marinette WI 54143. 715-735-5631, aft 2PM CT.

QRK & Tapecaster mono PB, need some work, $50 both. B Cain, WFPG, 2707 Atlantic Ave, Atlantic City NJ 08401. 609-348-4646.

Ampro CT2500B PB machine, $100; Spotmaster 500B (1) R/P, $150 & (2) 505B PBs, $100 ea. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Ampro 2514 PB, stereo, three-tone, new head, $600; ATC CR stereo record amp w/interconnect cable. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Gates Criterion 80 w/record module, BO. C Springer, KLMR, POB 890, LaMar CO 81052. 719-336-2206.

BE 5304. B Raines, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

ITC SP case & rack mt kit, new, $150. W Axell, KSAY, POB 2269, Ft Bragg CA 95437. 707-964-KSAY.

IGM Instacart late model, 48 tray mono, excel cond, comp factory refurb, never unpacked. J Holmes, WRGM, 2900 Park Ave W, Mansfield OH 44906. 419-529-5900.

Tapecaster 600RP, excel cond, record amp, needs some work, $200. P Kriegler, KRCK, 423 N 47th St, Omaha NE 68132. 402-553-0960.

Tapecasters & Spotmasters (7), $200-$500. J Phillips, All Star Bdctg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Criterion 80 stereo record amp, desk mount, very clean. H Kneller Jr, WKII, 2500 Edwards Dr Ft Myers FL 33901. 813-639-1112.

Cue cards, 150 Hz (2) for Harris Criterion 3-deck 992-3800, $50 ea. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

BE 3100 play stereo, ultra mint cond, original heads, w/manuals, $1700 firm; BE 3200 R/P stereo, mint cond, original heads, w/manuals, $2750 firm. R Kaufman, PAMS Prods, POB 462247, Garland TX 75046. 214-271-7625.

Tapecaster 700P stereo, $200; also 700RP stereo, $300. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

BE5304 stereo triple deck, new heads, new motor, all tones, gd cond, $1500; ITC RP mono, excel cond, $900. B Mountjoy, Custom A/V Srvs, POB 1240, Elizabethton TN 37644. 615-543-5849.

Fidelipac Dynamax CTR 124 R/P stereo cart machines (5), $2400 ea/BO; (6) Dynamax CTR 112 play only stereo, $1300 ea/BO. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Want to Buy

Any non-working cart machines in decent shape, must be stereo. R Hines, Hines Eng Srvs, 265 Emming St, Cincinnati OH 45219. 513-721-7625.

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.

Criterion 80 or BE R/P machine. R Ramirez, WSOF, POB 1246, Madisonville KY 42431. 502-667-5440.

Recent ITC stereo R/P & stereo 3D PB in gd cond. D Agnew, 402-488-4275.

ITC 3D motor. M Morning, WRTA, POB 272, Altoona PA 16603. 814-943-6112.

Stereo recorders & players in gd cond, perfer ITC Premium line or Audicord, reasonably priced. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Gates CPD2 record elect or entire machine. T Driggers, Driggers Bdctg, 818 Quail Ct, Heladsburg CA 95448. 707-437-9370.

Tapecaster mono R/P, $200 or less. H Iko, WBZBQW, 16 Lillian Pl, New Windsor NY 12550. 914-446-7747.

ITC 30 stereo cart machine. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Cart rewinder. D Wiitala, WLOR, 118 S Union, Traverse City MI 49684. 616-947-3220.

CASSETTE & REEL-TO-REEL EQUIPMENT

Want to Sell

Ampex 354 2 trk, gd cond, $100. C Washington, WFRK, 1725 Mt Vernon Rd, Leesburg FL 32748. 904-365-0659.

Scully 250-2 Recorder/Reproducer, 2 trk 3-3/4 - 7-1/2 ips. Never Used. $750; CRL FM stereo processing system. SPP-800 preparation & SEP-800 spectral energy processors, never used, both $1500. H.M. Dyer Electronics, 2982 Wixom Rd., Milford MI 48042. 313-685-2560.

Scully 270-2 stereo PB decks (2), 7.5-15 ips, in rack, $1000 or $475 separately; also Magnecord mod 748, $100/BO. J Burt, POB 1572, Durango CO 81302. 303-247-8060.

Ampex 350-351 model remotes (2), $150 ea; Ampex 2 trk (2), in Russ Lang type cabinets, $365 ea.; Ampex FT in cases (350), $325. Mr. Oliver, 212-874-7660.

Ampex 4 trk, 350 elect, 300 dk, w/sel sync, very cheap, working fine; Ampex 3 trk in console, same as above. Mr. Oliver, 212-874-7660.

Ampex 4 trk, 350 elects, 300 deck w/Sel-Sync, $525; Ampex 3 tk in console, $425; Ampex 2 tk (2), $375 ea; Ampex FT in cases, $325. Mr. Oliver, 212-874-2074.

Ampex 600, Ampex 601, Ampex 601-2, Ampex 970, may need some alignment & overhaul but basically in sound cond, BO. G Kristiansson, Villa Skansen Inc, 122 Fairmount St, S Burlington VT 05401. 802-864-9779.

Otari MX5050 2 chan R/P, vgc, $850; Magnecord 1022 2 chan R/P, gd cond, $200; Teac A-2340 4 chan simul-sync R/P, vgc, $450. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Teac A-3300 SX 2T w/remote control; Teac A-3440 4 trk w/dbx RX-9. bridge meter & remote control, $800. M Legner, 703-971-7069.

Ampex AG440 1" 8 trk, gd cond w/roll about stand, sel-sync, test tape & manuals, $2500. C White, 35 Osborne Ave, Kenner LA 70065. 504-443-5611.

Revox A77 2 trk 7.5-15, gd cond w/remote, $495. B Borrelli, Media Group, 462 Merrimac, Methuen MA 01844. 508-688-5573.

Tascam 34-B, as new cond, $1500/BO. B Leslie, Pro Recdg Svc, 13709 Maple Leaf Dr, Cleveland OH 44125. 216-662-1435.

Otari ARS1000 less than 6 mos use, excel cond, $1000. G Vogel, KHIH, 7900 E Berry Pl, Englewood CO 80111. 303-779-8797.

Ampex PR-10 gd cond, BO. W Borneman, WBYO, Box 172, Boyertown PA 19512. 215-369-1075.

Scully 280B stereo (2), needs work; MCI JH-110 stereo, w/remote, needs work, all three in roll around cabinets, $700 ea, cash & carry only. T Devine, WVLK, POB 1559, Lexington KY 40592. 606-253-5900.

Ampex 700 remote control, new; Editall 1/4" (S-3) splice block, like new; Nagra preamps (2) XCYO, unused; Jensen 206 synchronizer. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Otari MX-5050 capstan motor, rebuilt by Otari w/PC board, $135; Ampex 440 4 trk pwr supply, BO. R Rhodes, Rhodes Music, POB 1550, Radio City Sta, NY NY 10101. 212-245-5045.

Pentagon C-34 TMS stereo cassette copier, used less than 20 hrs, $1000/BO. G Kristiansson, Villa Skansen Inc, 122 Fairmount St, S Burlington VT 05401. 802-864-9779.

Magnecord PT-6, (4) plus one for parts, dubbing amp & regular amp, mounted in rack (also avail) & used for making 3 copies from master; also rack mounted fan & adapter for 10" reel, master, BO. G Kristiansson, Villa Skansen Inc 122 Fairmount St, S Burlington VT 05401. 802-864-9779.

Revox A77 1/2 trk, 3.75-7.5 w/varispeed, gd cond, $300. G Sive, The Video Connection, 31844 Rancho Amegos, Borsall CA 92003. 619-749-7662.

Tascam 34, 4 chnl, excel cond, extremely low hrs, w/manuals, $850. B Osborne, A/V Assoc, 4760 E 65th, Indianapolis IN 46220. 317-253-8562.

Electro Sound 505 R/P amp 2 roll cabinet, very nice, $1200/trade for low power working xmtr. RJ Smith, Gospel Spotlight of N GA, POB 406, Summerville GA 30747. 404-857-5815.

Ampex 351 mono w/Inovonics 380 elect, $300/BO plus shpg; Wollensak portable tube type mono, works, $25/BO. K Smith, POB 85, Gorham ME 04038. 207-929-6129.

Studer-Revox HS-77MKIV FT mono, 15 ips, special factory order, under 10 hrs use, mint cond, $995/BO/trade. Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-766-9101, 10 AM-noon PST.

Marantz/Superscope CD338 pro portable 3 head stereo cass deck w/limiter & mic pads, Dolby, service manual, $135. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Teac 3440 4-trk, new heads, $400. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Revox PR99 PB only, 2 trk, superb cond, $1000/BO. K Harnack, Harnack Eng, 1197 Gibbons Ave, Memphis TN 38127. 901-353-4837.

Marantz/Superscope CD330 pro portable stereo cass deck, limiter, mic pad, Dolby, monitor speaker, ops & service manuals, onginal carton, excel cond, $150 firm. R Cannata, Cantrax Recorders, 2119 Fidler Ave, Long Beach CA 90815. 213-498-6492.

Ampex AG440B-4 1/2" 4 trk, $2700. A Baker, Bdct Prod of America, 804 E 38th, Indianapolis IN 46205. 317-925-7371.

Berlant BR30 (2) 10" reel transports c/w heads, gd motors & elect, operating cond, w/spare motors & heads, $250/both plus shpg. J Smith, Mobile Bdct Srvs, 758 St Michael St, Mobile AL 36602. 205-432-7807.

Ampex 350 mono w/Inovonics elect, solid state, rack mount, $500. A Baker, Bdct Prod of America, 804 E 38th, Indianapolis IN 46205. 317-925-7371.

Ampex AG 600-1 half-track stereo, perf cond, $650. G Kanny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

Ampex 440-C FT, very clean, $1000 ea. N Erickson, Rainbow Rcd Stds, 2322 S 64th Ave, Omaha NE 68106. 402-554-0123.

Magnecord 1028 w/manuals (2), $175 ea. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

Scully 280-B (2), two track & mono, w/varispeed, gd to excel cond, $1200. D Schmitz, Irving Prod, 3202 E 21st, Tulsa OK 74114. 918-744-1221.

Ampex AG350 mono w/solid state elect, rack mount, $800. A Baker, Bdct Prod of America, 804 E 38th, Indianapolis IN 46205. 317-925-7371.

Scully 280 Series, 12 trk head assy w/spec sheet from JRF, $500; Ampex 354 stereo elect w/manual, $150; Ampex PR-10 (2) mono elect, $100/both. B Sgambati, SGAM Rec, 747 Saddle River Rd, Monsey NY 10952. 914-356-6553 aft 6 PM.

Alpha 21 & (3) 22, mono audio voice-quality duplicators, cassette-cassette, 1 master to 7 dubbing positions, $395 for all. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Sony ORM-10, CCP-13B & (2) CCP-04B, gd cond, new heads, 1/4" or cassette master to 11 dubbing positions, stereo duplicator, $12,000 for all. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Ampex 4 trk w/sel sync, $525; Ampex 3 trk, $425; Ampex 2 trk (2), $375 ea; Ampex FT in cases, $325 &console cabinet w/wheels, $100. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

Metrotech 500 logging recorder, FT mono, one pass, 15/16 ips & some other higher speed, missing power cord & book, otherwise vgc. J Seaman, WSVA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Scully 270 play only decks (2), stereo w/new heads, vgc; (2) more avail soon, excel automation decks, all w/books. J Seaman, WSVA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

ITC 850 Series stereo deck in roll around cabinet, vgc w/book. J Seaman, WSVA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Ampex AG350 solid state R/P rack mount, vgc, $850/BO or trade. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336.

AKAI GX-650D 3 motor/dual capstan semi-pro deck. very nice unbalanced in/out, stereo. J Seaman, WSVA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Nagra III, (9) as is cond, $789 ea. B Cook, Cook Assoc, POB 4390, Wood Land Park CO 80866. 719-594-9464.

Telex 300 high speed duplicator w/(2) R-R & (3) slaves in rack, excel cond, w/manuals, low use, $800; Scully 280B 2-trk R-R w/varispeed in Ruslang cabinets, mint cond, $1200. B Carr, Carr Comm, POB 167815, Toledo OH 43616. 419-874-1118.

3M background music player w/(2) 24-hour tapes, like new, $400/BO. R Zimmer, Arizona Audio, 3055 N Tyndall Ste 22, Tucson AZ 85719. 602-623-2933.

Ampex 351 refurbished deck, constant tension, 2 trk w/Inovonics 375 elect, gd heads, $1150 or trade. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336.

Otari ARS1000, 6 mos old, $1000. J Kennedy, Chnl 9 TV, RD 1 Box 460, Cogan Station PA 17728. 717-998-9999.

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

Ampex 354 2 trk stereo, tube type, $800; Ampex AG-600 FT solid-state, $500. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Ampex AG440B R/P, excel cond in custom or portable console, $1350/BO or trade for U47 mic. R York, Jewel Records, 1594 Kinney, Cincinnati OH 45231. 513-522-9336.

Tascam 80-8 w/dbx & new RP head, $1900. C Lawson, L&N Eng, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Otari MX5050 Mark III-8 1/2" 8 trk, full function remote control; also 8 chnls of rackmount dbx NR, $3950/pkg. J Block, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Scully 280B-2 stereo deck in Ruslang cabinet, vgc. J Seaman, WSVA, POB 752, Rawley Pk, Harrisonburg VA 22801. 703-434-0331.

Revox A77 hi-speed, 7.5-15 ips, 1/2 trk, no head wear, spares & manual, $500. M Heleniak, Milwaukee Snd Stds, 610 N Water # 100, Milwaukee WI 53201. 414-272-7085.

Ampex AG-440-C-1 FT mono, stored for past 5 yrs, motion sensing, new cond, $1500. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

Otari MX5050 2 trk, fairly old but very reliable, gd cond, 7.5-15 ips, 2 trk record 1/2 trk & 1/4 trk PB, $550. J Block, Prod Block Stds, 906 E 5th, Austin TX 78702. 512-472-8975.

Otari 5050 BII R-R, $1800. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Want to Buy

Multitrack transport or recorder, any cond, wanted by non-profit org (IRS qualified), will pick up. B Goldes, Balalaika Orch of Detroit, 1937 Byrd, Dearborn MI 48124. 313-271-3261.

MCI/Sony capstan & reel motors, any cond., recdg heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-826-0601, in FL 305-659-4805.

Dictaphone 1000 or 4000 system or components. Larry, 412-763-8359.

Otari MX5050BQII, must be in very gd cond. B Hanson, KCMQ, POB 459, Columbia MO 65205. 314-449-2433.

Otari 5050B or equiv, need several stereo half track R-Rs, gd cond. D Agnew, 402-488-4275.

Revox A77's (2). R Ramirez, WSOF, POB 1246, Madisonville KY 42431. 502-667-5440.

Audio cassette loader, state make, model, cond & price, photo will help. C Juranis, CJ Recording Srvs, 1300 Robeson, Reading PA 19604. 215-374-6832.

Scully 280 transport, 1/4" 2 trk headstack & hardware. L Beigel, On-Cue Recdg, POB 85042, LA CA 90072. 213-466-3595.

Portable cassette copier, 1 copy, 1 pass, mono, prefer in carry case. C Cooper, Admix Bdct Srvs, 960 Woodward, Charleston WV 25312. 304-744-0022.

Inovonics 375 R/P Ampex retrofit elect. L Beigel, On-Cue Recdg, POB 85042, LA CA 90072. 213-466-3595.

RW Broadcast Equipment Exchange

CONSOLES

Want to Sell

Gates Stereo Statesman, excel, $600; Gates Yard, gd cond, $250. J Cramden, 315-487-2393.

Sphere 16 x 4 console for sale. table top, 3 know EQ, illuminated bus select & VU's, P&G faders. Factory refurbished, $2900. 818-709-1281.

Collins 212 G-1, gd cond, BO. W Borneman, WBYO, Box 177, Boyertown PA 19512. 215-369-1075.

Harris Mono 5 vgc, w/manua, $400. B Cain, WFPG, 2707 Atlantic Ave, Atlantic City NJ 08401. 609-348-4646.

Quantum QM12P 12 chan stereo, 22 inputs, in service, $3000. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

Ampex MX35 mixers (2), $250 ea; xformers, $25 ea; mic & line inputs, switchable; Sigma mixers mic inputs (3), $125 ea & echo bleeds, $15 ea; Altec mixers 1567, $250 ea w/VU meters, xformers, $25 ee, treble-bass att, Harmon-Kardon mixers, $80 ea, DPR7's. Mr. Oliver, 212-874-2074.

McCurdy SS-8600, 13 in, 2 out, 2 EQs, tone osc, excel cond, $2500. E Dausman, 55 Columbia Ave, Berkeley Hts NJ 07922. 201-665-2550.

Ampex-Sigma 3761 (2) 4 chan mike mixers, excel cond, $75 ea or $125/both. B Leslie, Pro Recdg Svc, 13709 Maple Leaf Dr, Cleveland OH 44125. 216-662-1435.

Tangent Series 4 20 input by 4 by 2, price inc road case & comm module, $2500 firm. T Evans, Reel Prods, POB 427 Allston MA 02134. 508-343-0673.

Wheatstone SP5, great prod console, $12000. S McCloskey, WBHH, 916 Bay St, Beaufort SC 29902. 803-524-9210.

Ampro AC-105 10 chan, $2500; Sparta Centurion II 12 chan slider, $3000. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Yamaha 916 prod board, $2000. M Legner, 703-971-7069.

Quantum QM-8 8 in 4 out, excel cond & Speck 16 in 8 out remote power supply, easily portable, $1195 ea/BO/trade. Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 818-766-9101. 10 AM-noon PST.

Sparta AS-40B 8 chnl stereo, excel cond, w/manual, $1200. J Stevens, 150 E Olive •108, Burbank CA 91502. 818-953-5099.

LPB Signature II stereo 10 chnl, brand new, $5000/BO. R Shannon, Randcraft Comm, 408 Jane Way, Lufkin TX 75901. 409-564-3723.

Biamp 1682 16 chnl stereo mixing console, $300. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Gates Yard input transformer bank, $75 plus shpg; GE BC1A power supply, gd cond, but needs minor work, $30 plus shpg. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

McMartin B-802 stereo w/mono mix-down, $550. B Kuiper Jr, WFUR, POB 1808, Grand Rapids MI 49501. 616-451-9387.

Sparta A-20-2 8 x 2 w/Daven pots (has cue), ch 7 & 8 w/rocker switch & Canon connectors on rear, $500. A Baker, Bdct Prod of America, 804 E 38th, Indianapolis IN 46205. 317-925-7371.

Gately 16 x 8 w/EQ, 4 effects buss, quad monitoring, Canon connectors for line & mic inputs & Canon connectors for outputs, $2800. A Baker, Bdct Prod of America, 804 E 38th. Indianapolis IN 46205. 317-925-7371.

RCA stereo console, excel cond, $1750. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

Tascam 30, 8 input, 4 buss output mixer. 8 trk monitor submix, 3 band EQ, RIAA phono inputs, excel cond, w/manual, $750. B Osborne, A/V Assoc, 4760 E 65th, Indianapolis IN 46220. 317-253-8562.

Micro-Trak 6618 6 chan stereo, excel cond. $1200. C Ratliffe, WADE, POB 1210, Wadesboro NC 28170. 704-694-2175.

Broadcast Audio Mark IV-8 8 chnl stereo, priced to move, 3 yrs old. R Lane, KTYD, 5260 Hollister Ave, Santa Barbara CA 97116. 805-967-4511.

Collins 212T 2/4 chan console w/18 linear faders, operating, w/manual, $900. J Smith, Mobile Bdct Srvs, 758 St Michael St, Mobile AL 36602. 205-432-7807.

ATI Vanguard Series 8 chnl stereo, slide pots, 12 inputs, 2 yrs old, new cond w/spares, $1950. C Murray, KMGE, 925 Country Club Rd, Eugene OR 97401. 503-484-9400.

Ramsa WR8112-8118. B Raines, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

BE 4 chan mono, like new, $500. D Handy, WTIF, 104 E 7th St, Tifton GA 31794. 912-382-1340.

Autogram AC8 8 chnl stereo, built-in clock/timer, mint, $3300; Cetec 2000 5 chnl mono prod board, almost new, $800. B Mountjoy, WIDD, POB 1240, Elizabethton TN 37644. 615-543-5849.

Harris Gatesway 80 8 chnl mono, 18 inputs, new cond, $1500. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

Gates Stereo Statesman 5 chnl, 9 input stereo, call for price. R Fox, KMKT, POB 1810, Dennison TX 75020. 214-463-5656.

Auditronics 110, 14 input by 4 or 2 out for prod or on-air, recent refurb, $7000. J Georgiads, WRRO, 124 N Park, Warren OH 44481. 216-373-1440.

Harris Gatesway 80 mono, $750. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Ramsa WRT820B, 20 inputs, 8 outputs, w/patch bay, 2 yrs old, $5500. P Dickson, KLSY, 15322 SE 49th, Bellevue WA 98006. 206-454-1540.

Collins 212S-1 6 chnl mxr, gd cond, $500/BO or trade RCA 77DS. G Palamara, Morningstar Snd, RD 3 Box 753, Howell NJ 07731. 201-938-4217.

McMartin 8 pot stereo; Ampro 8 pot stereo. B VanProoyen, WYGR, 1055 28th SW, Wyoming MI 49509. 616-532-1168.

LPB Signature II stereo 8 chnl, mint cond, $3200; ORK 5 pot stereo, $1000. J Kennedy, Chnl 9 TV, RD 1 Box 460, Cogan Station PA 17728. 717-998-9999.

RCA 10-chnl mono console, rebuilt, $1050. J Fugler, KLRD, 38989 Oak Glen Rd, Yucaipa CA 92399. 714-790-1848.

Visual Elect 8 pot console, newly refurbished w/in excess of 20-30 inputs, works great, $850. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Ampex MX35 mixers (2), $250 ea & transformers $35 ea; Sigma mixers (3), $125 ea, & echo bleeds, 4 pots, $15 ea; Altec 1567A mixers (2), $250 ea; Harmon-Kardon DPR7 mixers (2), $80 ea, & Altec xformers, $35 ea. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

UREI 1681 8 chnl stereo, 4 yrs old, $1900/BO; Tascam M208 8 x 4 x 2, 1 yr old, no book, $600. A McCarthy, KUIC, 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

Ramsa WR500 8 x 2 field mixer, excel cond, $650. C Butler, Butler Bdctg Srvs, 1775 Bartlett, Orange Pk FL 32073. 904-264-8169.

Shure M-67 mixers (4), $150 ea; Bogen RTP-1 mixer, $50. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Gates Gatesway 2 modular solid state console, mono, $950 plus shpg. T Crockett, Hot Tracks Recdg, POB 10501, Blacksburg VA 24060. 703-953-0222.

Cetec remote console system w/(2) TTs & 5 chnl stereo console, gd cond, $800. B Carr, Carr Comm, POB 167815, Toledo OH 43616. 419-874-1118.

Want to Buy

Tascam MX-80 8 x 2 mixer w/rack ears. G Steadman, WBUR, 630 Commonwealth Ave, Boston MA 02215. 617-353-2790.

Any stereo 6-8 input consoles, non-working but in decent shape. R Hines, Hines Eng Srvs, 265 Emming St, Cincinnati OH 45219. 513-721-7625.

Harris Executive wanted in gd cond. R Ramirez, WSOF, POB 1246, Madisonville KY 42431. 502-667-5440.

Parts for **Gates** Diplomat console cheap; parts for RCA BC-8A console, cheap. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Top dollar for non-working consoles. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Altec 250T3 parts & manual needed. R Smith, Gospel Spotlight, POB 406, Summersville GA 30747. 404-857-5815.

DISCO & SOUND EQUIP.

Want to Sell

Jensen C3781ST 600 ohm 15" duplex, 4 pos HF atten switch from radio station client room, closest to $150. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Scott Tuner FM 311-C, $100; lead screws for disc cutting, Presto 6N, 224/104/160/120 lines per inch, $50 ea; C apps disc cutting needles w/hot stylus, needles new, $7 ea, boxes $25 ea. Mr. Oliver, 212-874-2074.

Ampex 620 speaker-amp in portable tan case, $100; Altec speaker & small cab 604B, $225; EV 12TRX (2) in cabs EV, $225 ea. Mr. Oliver, 212-874-2074.

dbx 157 Pro NR, 2:4 chan, total 8, simultaneous play/record units, $600 ea; McIntosh 2100 power amp, $300. H Fenster, Univ Rehearsal & Recdg, 17 W 20 St, NY NY 10011. 212-929-3277.

Pultec MEQ5 mid-range EQ's (2), $1000 ea. R Rhodes, Rhodes Music, POB 1550, Radio City Sta, NY NY 10101. 212-245-5045.

Allison-Kepex 500 w/single card enclosure (CM-001), RCA MI-11723 sound effect filter. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Altec 604B cabinet, $300. Mr. Oliver, 212-874-7660.

Yamaha MS10 powered speaker, $75. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016. 212-986-2219.

EMT 140 tube reverb, $1400. T Papa, Santa Monica Snd, 2114 Pico Blvd, Santa Monica CA 90404. 213-450-2119.

E-V S1202. B Raines, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

Yamaha E1010 analog delay, $200; Realistic SCT-74 dubbing stereo cassette deck, high speed, $100. B Roberts, 5504 87th St. Lubbock TX 79424. 806-794-6023.

Speakers (2) designed for 10,000 sq ft auditorium, array of top name speakers. 21/solid wood cabinet, $800/BO/both. M Murrell, WTCX, Rt 1 Box 592, Dayton TN 37321. 615-775-4363.

EMT 140 stereo reverb w/remote, $1200. T Papa, Santa Monica Sound, 2114 Pico Blvd. Santa Monica CA 90404. 213-450-2119.

Altec 604B in cabinet, $225; EV 12TRX (2) in EV enclosures, $225 ea. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

Pyle Driver, new, $200/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Audio Kinetics Pacer w/remote control, 2 deck synchronizer, $1900. M Heleniak, Milwaukee Snd Stds, 610 N Water #100, Milwaukee WI 53201. 414-272-7085.

Delta Lab Effectron II (ADM256) digital delay, new cond, $350. T Crockett, Hot Tracks Recdg, POB 10501, Blacksburg VA 24060. 703-953-0222.

Klipsch La Scala, 2 horns, road case, exterior horn speakers, excel cond, $1500 firm. R Kaufman, PAMS Prods, POB 46227, Garland TX 75046. 214-271-7625.

Auratone 5C, new in unopened factory box, $50/pr. M Heleniak, Milwaukee Snd Stds, 610 o Water #100, Milwaukee WI 53201. 414-272-7085.

Lexicon PCM70 digital FX box, $1300; Yamaha R1000 digital plate reverb, $250; Orban 245E stereo synth, $200; ADA 2FX digital multifx box, $175; Rocktron RX2H imager/exciter w/NR, $275. M Heleniak, Milwaukee Snd Stds, 610 N Water #100. Milwaukee WI 53201. 414-272-7085.

Want to Buy

dbx DX-40 processor or (2) dbx 150's. B Roberts, 5504 87th St, Lubbock TX 79424. 806-794-6023.

LIMITERS

Want to Sell

Orban 424A compressor, limiter, de-esser, stereo, like new w/manuals, $600. R Nimtz, Univ of Notre Dame, Box 1088, Notre Dame IN 46556. 219-239-6423.

Volumax FM limiter, great cond, plus many others & stereo gens, $150; Orban Optimod 800A, great cond, FM Optimod still in service, $2000. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Inovonics MAP II 8 band AM audio processor, $600. D Kelly, KWPN, Box 84, West Point NE 68788. 402-372-5423.

Limpanders-Broadcast Audio limiters (2), 35-B & 350-B, $50 ea or $75/both. B Leslie, Pro Recdg Svc, 13709 Maple Leaf Dr, Cleveland OH 44125. 216-662-1435.

CBS Labs 4110 FM Volumax, $200. D Loucks, KTKL, 2132 W 42nd, Casper WY 92604. 307-265-6700.

Gates M51567 Stay-level limiter; Conax (Fairchild) limiter for disc cutting, $165. Mr. Oliver, 212-874-7660.

DAP 310; CRL APP 300, UREI BL-40, all very gd cond; also CBS Audimax's Volumax 400 & other gear. S Williams, POB 10853, Springfield MO 65808. 417-886-7327.

Fairchild Conax 600 for disc-cutting, $175; Gates Stay Level limiter & amp, $200. Mr. Oliver, 212-874-2074.

Harris Solid Statesman limiter, gd cond, $300. B Effron, KJLA, 3435 Broadway, Kansas City MO 64111. 816-753-7707.

Orban XT2 all factory upgrades, excel cond, $1300. J Hartmeyer, WCLT, POB 880, Newark OH 43055. 614-345-4004.

Gates Stay Level w/gd tubes, $30/BO. K Smith, POB 85, Gorham ME 04038. 207-929-6129.

Dorrough DAP 310 recently factory aligned, $350. D Handy, WTIF, 104 E 7th St, Tifton GA 31794. 912-382-1340.

Marti CLA-40 compressor, gd cond, w/manual, $100. W Dudley, Location Sound, 6919 19th St, Tampa FL 33610. 813-237-6516.

Orban 418A stereo limiter, like new, $475. M Gollub, WMJS, POB 547, Prince Frederick MD 20678. 301-535-2201.

FM Optimod 8000A, gd cond, $1950. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53207. 414-482-2638.

Marti CLA-40A rack-mount, working units, 600 ohm bal output for FM stereo L&R chans, $250 ea. Dean J Judy, WTGP, Thiel College, College Ave, Greenville PA 16125. 412-588-7700 X213.

CBS Audimax 4440, $200. C Lawson, L&N Eng, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Harris Solid Statesman AGC, very little use, new cond, $450. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

Fairchild Conax 600 for disc cutting, $175. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

Modulation Sciences CP803 composite clipper, works fine, $650. A McCarthy, KUIC, 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

Orban 8000A FM Optimod, 115/230 V, 50/60 Hz, 13 W, $2200. KFXY, POB 1430, Morgan City LA 70381. 504-384-1430.

CBS Audimax IIIS stereo, gd working cond; CBS Audimax III mono, recently removed, fair cond; CBS Volumax 411 FM stereo, gd cond. H Kneller Jr, WKII, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

Want to Buy

Orban 8100 FM Optimod, don't need split chassis or AXTZ, will pay gd price. D Sparano, WVCR, US Rt 9, Loudonville NY 12211. 518-783-2990 after 2PM.

Optimod 8000A. D Van Zandt, Cornerstone Radio, POB 500, Petersburg IL 62675. 217-632-2266.

Collins 356E-1 limiter/amp, R Smith, KF6EA, 2245 Felspar St, San Diego CA 92109. 619-483-9331.

Orban Optimod 8000A. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Valley People stereo Dynamite. L Osborne, KBPI, 1200 17th St, Denver CO 80202. 303-572-6200.

UREI LA3A, need (2) in gd cond. R Kaufman, PAMS, POB 462247, Garland TX 75046. 214-271-7625.

MICROPHONES

Want to Sell

AKG C-60 mics w/power supplies & 60' cables in excel cond (2), $300 ea. B Castner, We Three Castners Ltd, 1618 Birmingham Blvd, Birmingham MI 48009. 313-433-3630.

AKG D224E, excel cond w/case & (2) windscreens, $175. P Combs, Only Son Prod, 2316 Forrest Home Ave, Dayton OH 45404. 513-236-2340.

RCA 44 mic & stand, vgc, $150. J Dexter, 1604 Missouuri Ave, Artesia NM 88210. 505-746-6590.

Neumann U47 w/power supply, $1750. Mr. Oliver, 212-874-2074.

Vega Pro 63 diversity rcvr, 154.600 MHz, no mic power cord or manual, vgc, $500/BO. B Hawkins, 403 Harrell Dr, Edinburgh IN 46124. 317-266-9700.

RCA BK-6B; EV lav; Auricon E-7; Sennheiser MZA6, MZA15UP, MZP, KAT 11, MZF 4, 5, cases; EV 600E, UA-3-11s, RCA 77 shock mount, EV CO-90 phantom modules, Cannon P-3 conns, agreeable prices. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Neumann U47 w/pwr supply, $1725. Mr. Oliver, 212-874-7660.

RCA 74B ribbon mike, just rebuilt, $215; 1935 Western Air Patrol AM radio w/2 short-wave bands, completely restored in & out, very nice, $125. R Button, R&R Recdg, 48 Shattuck Sq #6, Berkeley CA 94704. 415-843-6733.

Vega Pro 63 dual diversity FM wireless mic, excel cond, $1200. J Stitzinger, 23800 Via Irana, Valencia CA 91355. 805-259-2011.

RCA Junior Velocity similar to 44, perfect cond, chrome body (2), $275 ea; also rare static ribbon (2), $75/both. W Dudley, Location Sound, 6919 19th St, Tampa FL 33610. 813-237-6516.

E-V 668, older version of RE20. G Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

E-V RE50, mint cond, w/case & cable, $75; E-V 635A, $50. D Rowland, 7310 Corporate Dr #708, Houston TX 77036. 713-541-1596.

Vega 55/56 radio mics, carry case, portable receiver & body xmtr (25), $749 ea. B Cook, Cook Assoc, POB 4390, Wood Land Pk CO 80866. 719-594-9464.

Sony ECM50PS lav mic w/case, vgc, $90/BO. R Branski, 5347 S Spaulding, Chicago IL 60632. 312-737-3303.

EV RE-51 (4), miniature headset mic, $35 ea. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Realistic 200-300' range on 49.830 MHz, auto squelch standby control, tie clip mic has been changed to hand mic, sounds great. $50; Highball-2, new in box, $40/all or $15 ea; Realistic 33-320A, new, you ship, $30/both. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

E-V RE16 (4) mint cond, $125 ea or $225/pr. C Butler, Butler Bdctg Srvs, 1775 Bartlett, Orange Pk FL 32073. 904-264-8169.

Want to Buy

Shure SM5B. S Johnston, WGH, 281 Independence Blvd Ste 101, Virginia Bch VA 23462. 804-826-1310.

Altec yoke for Altec 639 mic. L Beigel, On-Cue Recdg, POB 85042, LA CA 90072. 213-466-3595.

MISCELLANEOUS

Want to Sell

Metro Data K-100 keyboard w/phone coupler & D-100 xmtr unit, use for programming on cable channels or for low power TV, excel cond, $800. K Crosthwait, Rt 5 Box 77, Kingston TN 37763. 615-376-5763.

Tape-Athon Mod 702 BGM players (10), $25 ea; (6) Customusic CPC-10 players, $25; (2) CPC-60 Customusic BGM players, $100 ea. J Burt, POB 1572, Durango CO 81302. 303-247-8060.

Standard equip racks 70" (4), $50 ea. C Washington, WFRK, 1725 Mt Vernon Rd, Leesburg FL 32748. 904-365-0659.

Heath Elect course, mint cond, AC, DC, semiconductor & microprocessor courses & two experimenter-trainer modules w/all parts, $475. M Dilley, Producers Studio, 86 E Broadway Ste 10, Eugene OR 97401. 503-683-1400.

Lambda LNS-P-24 24 V power supply, new; (3) Shallco mono 600 ohm step attenuators. R Simonson, KHAT, 4949 Yankey Hill Rd, Lincoln NE 68516. 402-423-1530.

NAB Eng book, like new, 6th ed, approx 30 volumes, misc elecs books, BO for whole lot, $35. J Dexter, 1604 Missouri Ave, Artesia NM 88210. 505-746-6590.

Half-cabinet, 19", gray, two locking doors, unused, ideal for repeater installations, (10), $200 ea. Larry, 412-763-8359.

IBM displaywriter office word-processor, w/printer, DD disk drive, $2500. Larry, 412-763-8359.

GE 30F1445, oil filled capacitor, 1.5 uF, 15 kV, non-PCB, 8W x 4L x 8H w/brackets, new. $400/BO. W Shulz, WFYR, 130 E Randolph St, Chicago IL 60601, 312-861-8100.

Scott tuner FM 311-C, $175; disc cutting lead screws 224/104/160/106/120, $45 ea; Capps disc cutting units w/meters w/pigtails for hot stylus, $6.50 ea; hot stylus units w/meters (2) heats needles for disc cutting, $25. Mr. Oliver, 212-874-7660.

Ampex MX35 mixers (2). mic-line in, $250; xformers for line input, $30 ea, uses two, 4 inputs; Altec mixers portable also 1567A's, $250 ea; xformers for Altecs, $30 ea, uses five, if needed, 5 inputs; Sigma mixers, mic in 250 (3) mixers & echo bleeds, $140 ea. Mr. Oliver, 212-874-7660.

Selenium rectifiers (2), new, HD current; RCA TK-45 color cam remote cont joystick; Varagon TV7 zoom lens complete innards; Canon 35mm 72 wide angle lens C mount for TK 11 B&W, BO. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Patch bays (4) single input, nearly new, $60 ea. Mr. Oliver, 212-874-7660.

Lang model 36" high, 19" standard wide, wheels, $55. Mr. Oliver, 212-874-7660.

Knobs from 1st generation RCA TV EQ; Jones plugs & sockets from old RCA TV; major sound effects discs; instruction manuals; 1st generation TV EQ from TK30s forward, BO. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Wegener FM cable modulator, mono at 103.9 for putting AM daytimer on FM cable, $800. D Kelly, KWPN, Box 84, West Point NE 68788. 402-372-5423.

New FM, Class A radio station seeks, tower, transmitter & studio equuipment, call N. Norris, 313-234-4335.

Capacitors, G2B 0.0001 at 10 kV, $20; type 1950 0.0005 at 6 kV, $20, Type E 0.0005 at 12.5 kV, $15; Type 1996 0.002 at 12.5 kV, $15; Type F3B 0.002 at 8 kV, Type F2L 0.001 at 5 kV, $7.50. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 aft 5 PM ET.

Resistors: (8) Ohmite 100 ohm 175 W, $7.50 ea; (4) Ohmite 10 ohm 100 W, $5 ea; (8) Ohmite 5 ohm 50 W, $3 ea. L Owens, 2824 Dan Patch Dr, lexington KY 40511. 606-252-5072 aft 5 PM ET.

Anderson Jacobson A242A acoustic modem, half or full duplex; Anadex DP8000 tractor feed printer; Radio Shack TRS-80, Mdl 1 printer; Radio Shack TRS-80 Mdl 1 monochrome video monitor, all items worked when removed from service, BO on ea. T.Driggers, Driggers Bdct, 818 Quail Ct, Healdsburg CA 95448. 707-433-9370.

Teletype ASR33, (3) one working, two for parts, BO. C Edwards, WWJM, 210 S Jackson St, New Lexington OH 43764. 614-342-1988.

Generator, 10 kW diesel, 208 V, 3 phase, electric start, on trailer, $2000. G Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

RW Broadcast Equipment Exchange

MISC . . . WTB

Extel AF-11R (3) teleprinters, 1 ea Lenkurt 25A line interface unit, 1 ea B&I Elect ST-104 alarm unit, 2 ea factory service manuals, assorted PC boards & spare parts, $600/lot. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Handbook of Radio Publicity & Promotion, new copy, $20/BO; (4) Accustaliner wood veneer speakers, used in mobile disco, weigh about 75 lbs ea, handle 900 W RMS, $1000/all. G Johnson, WAGN, 413 10th Ave, Menominee MI 49858. 906-866-5551.

Scott FM 311-C tuner, $180; Neumann U47 w/pwr supply, $1775; disc cutting lead screws, 224/104/160 lines/in, $150/all; also 106/224/120 at $50 ea; Capps disc cutting needles w/pigtails for hot stylus, $7 ea; hot stylus units (2) w/meters for heating needles for disc cutting, $25 ea. L Oliver, 304 W 89th #2A, NY NY 10024. 212-874-0274.

Plate transformer, 3 phase. primary 220 V, sec 4000 V/1 A, $450. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

RFI filter Sprague F-1135/G JN17-3300B1 250 VAC 100 A, single or 3 phase use on 208 or 240 V, $600 & $700; double throw safety switch, 3 pole 240 V 400 A, $800, 600 V 100 A fused, $350. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Harris rack cabinets (2), 78" tall w/AC outlet strips & interior equip supports, less side panels, $100 ea. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

Heath/Zenith 89 computer, 3 serial ports, 64K memory, KDOS & CP/M systems, Basic w/compiler, about 100 spare disks, some w/games & other programs, $250. L LeBlanc, WXKL, POB 875, Concord NH 03301. 603-225-5521.

Epson RX-80 printer, like new cond, $150. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Telex CS61 headset w/mic, BO. C Springer, KLMR, POB 890, Lamar CO 81052. 719-336-2206.

Want to Buy

Schematics, blue prints for consoles, studios, etc, books on bdct elect courses, cheap. K Meazes, POB 71098, LA CA 90071. 213-666-9570.

Wire recorder that works. H Russell, Admix Bdct Svc, 960 Woodward Dr, Charleston WV 25312. 304-744-0022.

Manual for Narda 443 power meter. J Gerike, KWIX, 300 W Reed, Moberly MO 65270. 816-263-1500.

Old 'On the Air' sign, 50's or earlier, also old mics. B Hawkins, 6255 52nd NE, Seattle WA 98115.

Info on DA antenna & phasor design to learn from, cheap. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Old radio & TV gear, pre 1950's TV & pre 1940's radio. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

MONITORS

Want to Sell

Belar RFA-1 RF amp; Belar SCM-1 SCA monitor; TFT EBSO EBS encoder/decoder/fixed freq rcvr; CBS Audimax 4450, all in gd working cond, BO. M Bostic, WKLX, 259 Monroe Ave, Rochester NY 14607. 716-454-3040.

Collins 900C-3 monauural or stereo mod monitor w/manual, $875. D Hill, KXAL, POB 1393, Mt Pleasant TX. 214-572-6536.

Collins SCA monitor, working, also many others; McMartin 1969 model, stereo monitor tuuned to 97.3, $600 & test equipment also, $100. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Belar TVM1, TVM2, RF amp, TV aural mod monitor, $2700. B Weiner, KNYO, 210 Allen, Glendale CA 91201. 818-409-0185.

Gates AM 80 AM mod monitor. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

McMartin mod monitor, stereo, tube type, $500. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

Belar AMM-2A AM mod mon, gd cond, 1340 kHz, w/manuals, 2 yrs old, BO. G Stonebraker, KMYO, POB 1330, Aztec NM 87410. 505-632-3402.

McMartin TBM400 FM mod mon, great cond w/main chnl & SCA functions, $150/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Want to Buy

Manual or copy for McMartin TBM 3500 FM mod monitor. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

Manual or copy for McMartin TBM 3000 FM freq monitor. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

MOVIE PROD. EQUIP.

Want to Sell

Arriflex ARRI-S, 5 prime lenses, 12-120 zoom, 2 mag, battery, case & access, 16mm camera, $2500. C Crawford, POB 722, Princeton Jct NJ 08550. 609-799-3377 (PM).

16mm splicers, synchronizers, moviscopes, full cote, rewinds, Bach-Auricon sound system, B&H to DR, Frezzi 100D invertor; Siemans interlock proj, all well cared for. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Want to Buy

Century 3.5mm lens, wide angle, Arrimount or C-mount. C Crawford, POB 722, Princeton Jct NJ 08550. 609-799-3377 (PM).

RECEIVERS & TRANSCEIVERS

Want to Sell

Hallicrafters SX-43, vg w/Sams Photofact schematic, $75; Scott receiver, floor model, nickel plated chassis, Wunderlich tubes, multiband, $100. J Dexter, 1604 Missouri Ave, Artesia NM 88210. 505-746-6590.

Bearcat BC-15 10 chan scanner, like new, $100. B Weiss, KLSI, 3101 Brooadway Ste 460, Kansas City MO 64111. 816-753-0933.

Contact 360 receiver & down converter for AC format, $2500. P McQuade, KATO, POB L, Safford AZ 85548. 602-428-1230.

Hughes video sat receiver. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Regency HX2200 handheld scanner, ranges: 118-174, 406-512, 800-950, NiCads, charger, case, like new in box, $220. H Goldman, PRO, 31 Mulberry St, Springdale CT 06907. 203-322-2537.

Military R-901 0.5-30 MHz shortwave receiver, $150/BO. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Johnson/McMartin SCA receivers (2), $20 ea. N Beaty, WSVL, N Morristown Rd, Shelbyville IN 46176. 317-897-6255 aft 6 PM.

Want to Buy

Motorola MOCAT CB radios. K Linden, 3605 Michael Ct, Annandale VA 22003. 301-953-0612.

REMOTE & MICROWAVE EQUIP.

Want to Sell

Rust RC-2400/Mod 45 xmtr/receiver system w/manual, mdl 45 remote control relay panel, $200. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

S-A 15 kHz dual digital decode card for ABC news feed, $800. T Brandenburg, KGTS, College Place WA 98324. 509-527-2991.

Wegener sat receiver, 1601 mainframe, all cards for Transtar stereo country, Panda boards & demods, BO. T Bigby, KXLA, POB 990, Rayville LA 71269. 318-728-6990.

Laux rcvr for SMN country format. G Gilpin, WAGR, POB 2265, Luumberton NC 28359. 919-729-3394.

Marti RMC20 remote control complete studio transmitter set w/3 slaves. hand delivered or telco, in working order, $1700/BO. R Ryley, KWIC, 1690 N Major Dr, Beaumont TX 77706. 409-866-8899.

S-A 6650 satellite receiver, excel cond, BO. W Borneman, WBYO, Box 177, Boyertown PA 19512. 215-369-1075.

Marti receiver on 161.73 MHz, great cond, $150. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Moseley TRC15A remote control w/Hallikainen TEL171 digital metering installed, $1500. D Kelly, KWPN, Box 84, West Point NE 68788. 402-372-5423.

Moseley WRC-10T studio unit, gd cond, out of service 5/88, $400. B Frank, KANO, 100 East Main, Anoka MN 55303. 612-427-7550.

Moseley PBR-30 RC system, $800. J Stromquist, WNCB, 2816 Hagberg St, Duluth MN 55811. 218-722-3017.

Moseley PCL 505-C microwave/STL; Moseley TRC-15 xmtr/rcvr w/subaudible & subcarrier. J Kramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

Marti RPT1 UHF & VHF, $350; Marti RMC-2AX xmtr end only remote control; Marti SCG-8 subcarrier gen; 950 MHz cavity resonators; VHF yagis, brand new in box. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

AdCom 7010 agile FM sat demodulator, $500. G Gerke, Armada Bdct, POB 444, Wisconsin Dells WI 53965. 414-254-2546.

Moseley PCL 303C 951.5 MHz composite STL system, great cond, $1750/BO. I Epstein, KJAZ, 1131 Harbor Bay Pkwy, Alemeda CA 94501. 415-769-4800.

Wegener satellite receiver for SMN Stardust format, convertible to nearly all SMN formats, 1 yr old, vgc, avail approx 9-1-88; PR subaudible metering cards for Moseley TRC-15. H Kneller Jr, WKII, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

Motorola, one base unit & two mobiles on 154.515 MHz, 100 W output, works great, base is partially transistorized, tubes for finals only, mobiles are solid state, $500/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

M/A-Com MA-4001 satellite receiver, 3.7-4.2 GHz input, freq agile, outputs: baseband, video & audio, $500. S Streitenberger, WFCB, 45 W Main, Chillicothe OH 45601. 614-773-3000.

Comtech/Fairchild RCV-360 Transtar A/C config, new cond, w/down converter, sell or trade for flanger or ?, BO. D Mussell, WIFX, Hwy 23, Jenkis KY 41537. 606-832-4655.

Want to Buy

Comrex single line freq ext system. L Houch, Rollin Recording, 210 Altgelt, San Antonio TX 78201. 512-736-5483.

Old remote control &/or microwave gear (or manuals) to learn from, cheap. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

S-A digital 7.5 kHz card. M Morning, WRTA, POB 272, Altoona PA 16603. 814-943-6112.

Used working video microwave relay. R Merrigan, Mighty Mac Bdctg, 1155 Old Portese Rd, St Ignas MI 49781. 906-643-8686.

Comrex TLX. J Vakelich, Bdct Srvs, 4551 Flag Ave N, Minneapolis MN 55428. 612-537-1431.

Wegener system to receive Transtar oldies or AM only format; Panda II audio demod for CNN news, #1630; Colorado Magnetics NS-85. H Kneller Jr, WKII, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112.

STATIONS

Want to Sell

Class C 100 kW FM, 170,000 ADI, new facilities, no AC/AOR or CW-FM in market. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Radio station, 1 kW daytime AM, FCC approval to increase to 2.5 kW, approx 4 acre tower site, recently renov ofc bldg on approx ¼ acre in bus dist, new bdct & prod equip, $420,000. J Brown, POB 958, Douglasville GA 30133. 404-920-2281 or 404-949-6385.

NW of San Antonio, TX, 500/250 W AM, assume & small down. 512-691-0716.

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Invitation to bid for Complete Class "A" FM Radio Station Package including RF and Studio. Obtain a bidding form and complete list of equipment along with a statement of terms and conditions by October 14, 1988, from the Omaha District Office of the U.S. Small Business Administration, 11145 Mill Valley Road, Omaha, Nebraska, 68154, or telephone (402) 221-3626 James C. Johnson.

Cable FM radio station, serving 300,000 homes in the LA & Valley areas of S Cal, Westwood 1 affiliate, 8 yrs old, state of the art equip & music library, full music service, must sell, $195,000 cash. B Russell, KCME, 1657 Hi Dr, Simi Valley CA 93063. 805-583-5263.

Want to Buy

AM, FM, TV or CP for right price/terms, principals only. G Haston, 1119 San Antonio St, El Passo TX 79970. 915-533-4700.

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

STEREO GENERATORS

Want to Sell

Moseley SCG9, works great, $1000/BO. A McCarthy, KUIC, 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

Harris 994-6533-001, new, excel cond, $150/BO. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

CRL stereo gen (4) separate units work together, excellent condition, $3500. A Munro, WKTZ, Jacksonville FL 32211. 904-743-2400.

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STEREO . . . WTS

Stereo gen for Gates TE-3 exciter; also 15 W RCA exciter & Gates M-6095 exciter. J Cramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

Want to Buy

Any make/model stereo gen, cheap. P Kriegler. KRCK, 423 N 47th St, Omaha NE 68132. 402-553-0980.

SWITCHERS (VIDEO)

Want to Sell

Vital 114-10X video switcher, RGB chromakeyer, flip flop mix, 1 ME & audio follow, $5400. T Judge, TAG Comm, 75 Weaver Rd, W Milford NJ 07408. 201-697-8454.

ISI 904 switcher, gd cond, 2M/Es, 10 inputs, chroma key, wipes, fades. $3995. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Archer 15-1274, w/diagonal or horizontal wipes, auto or manual, perfect cond, $50. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

Want to Buy

Large video prod switcher w/at least 20 inputs & 3 ME's. H Henson, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

Dynair VSX, 12x12A or similar routing switcher. D Sis, St Johns Univ, Collegeville MN 56321 612-363-3378.

TAPES, CARTS & REELS

Want to Sell

Pre-recorded music, 17 reels, some never used from Music Director Series, $20 ea. C McGirty, WEKC, 710 Croley Bend Rd, Williamsburg KY 40769. 606-864-7843.

Fidelipac carts (150) need rebuilding, $50. B Cain, WFPG, 2707 Atlantic Ave, Atlantic City NJ 08401. 609-348-4646.

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NAB reels, 10.5" metal 1/4", all in gd cond, 1-10, $1.50 ea, 11-100, $1.25 ea, 100+, $1 ea. Falk Recd Srvs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

Scotchcarts, approx 1500, lengths from 2.0 to 7.5 min, mostly 3.5 to 5.5 min, all in gd cond, mix of black and brown shells, $2 ea/BO on whole lot. M Bostic, WKLX, 259 Monroe Ave, Rochester NY 14607. 716-454-3040.

Ampex reels, (200) w/hub 1 mil 642 tape, erased music syndication tapes, little use. $5/reel plus shpg. T Moore, WBCO, 403 E Rensselaer, Bucyrus OH 44820. 419-468-2326.

Tape carts, all lengths, Mastercarts, Fidelipacs, $1.50 ea. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

Fidelipac '50s, '60s & '70s carted Gold library, mono, 800 plus titles, $1500 plus shpg. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

Fidelipac 300 audio carts (100), $2 ea. H Casteel, Technichrome, 701 Desert Ln, Ste 4, Las Vegas NV 89105. 702-386-2844.

Fidelipac Mastercart II, never used, 660 70 sec carts, 460 40 sec carts & used 2.5 min, pref sell as lot but entertain all offers, $1.75 ea. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78218. 512-828-3737.

Beautiful music tapes w/25 Hz tones, $15/reel; Public Domain movies & TV shows on VHS, $10, on U-matic, $25. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

World transcription library, 115 discs, mint cond, microgroove 33-1/3 LP, lateral 12" discs, complete w/orig jackets & orig metal & wood case, little if any use, top artists, approx 40 yrs old. J Oliveira, 4878 E Santa Ana, Fresno CA 93726. 209-291-4312.

Want to Buy

Langworth Library, SFX, public domain music, TV programs, record libraries, cheap. K Meazes, POB 71098, LA CA 90071. 213-666-9570.

London Music Library 78s, complete library or part. D Eressy, WFCC, 1457 Main St, W Chatham MA 02669. 508-945-4855.

Audiopak, Fidelipac, 3M, mono & stereo, used bdct carts. Herb, ATI Mark V Products, 1395 Manassero St, Anaheim CA 92807. 714-779-8833.

1/2" video tape, for Sony AV-3600 Series VTR's. A Ross, Univ of WA, Media Srvs, CDMTC, WJ-10, Univ of WA, Seattle WA 98195. 206-543-4011 X230.

Thesaurus, World, Lang-Worth & Associated transcription libraries, in top cond. C Fuller, VOICES, 119 S Constance Ln, Countryside IL 60525. 312-579-9578.

Audio tape, 1" R-R, used once, on reel or hub. T Houston, Custom Audio Rcd, 929 California Ave, Bakersfield CA 93304. 805-324-0736.

Capital & Standard transcriptions, complete library wanted 12" disc. H Morgan, WHJM, POB 2312, Knoxville TN 37901. 615-546-4653.

Production music library, unlimited use buyout on reel or disc. B Fogal, Hold Plus, 5319 SW Westgate Ste 20, Portland OR 97221. 503-292-4871.

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

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POSITIONS WANTED

Engineer, 20 yrs exper, seeks pos as radio CE, or as bdct equip sales rep, want Western NY, but will cons anywhere. P Shirley, POB 292, Mumford NY 14511. 716-538-2976.

Exp Sr Bdct Eng, can handle turnkey construction, facil design & FCC paperwork, major market exp, group oriented, will relocate anywhere, excel refs. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 10-1-88RW.

GM w/exper as CE, PD, SM is looking for small mkt sta to manage, 19 yrs exp in all types of formats, call anytime. P Plank, POB 1401, La Quinta CA 92253. 619-564-4065.

Eng mgr seeks pos as group tech director, 20+ yrs bdct industry w/prev TD exp, as well as tenure w/equip manufacturers (both mktg & eng). Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 9-1-88RW.

CE seeks posin Midwest, 18 yrs exp FM & AM high power directional, FCC gen license. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 9-3-88RW.

GM avail, prog & ops oriented, believe substance sells, music's important, but no jukeboxes, 35 yr radio/TV vet, 15 yr mgmt small-medium mkts. Call John, 912-564-2922.

CE wishes to relocate to Vermont, presently working at AM/FM, resume on request. Write: RW, POB 1214, Falls Church VA 22041. Attn: Box 9-2-88RW.

Contract eng tired of small stations, looking for FT job w/medium-large mkt, progressive station, 18 yrs exper, gen class license. Write to: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-3-88RW.

CE, 2 college radio stations, HBO CE, CET, amateur/gen licences, seeks FT/PT work radio/TV maint, 6 yrs exper. M Rakoff, 114-41 Queens Blvd Ste 148, Forest Hills NY 11375. 718-591-0002.

Audio assistant from NYC area, looking to grow w/company, flexible & hard working, for resume call: L Cordoza, RAI Corp, 485 NW 69th St, Boca Raton FL 33487. 407-994-6982.

Seeking FT radio CE position. Exper in AM/FM radio, prof audio sys, computers, design, installation, maint, proj mgmt, BS in engr, FCC license, new start-up or major upgrade situation pref. Write to: RW, POB 1214, Falls Church VA 22041. Attn: Box 8-1-88RW.

Pro program director seeks new challenge. CHR/AOR/AC, 15 yrs exper, strong promotions & mgmt skills. P Wilson, 801-566-2144.

HELP WANTED

Corporate CE for 1 kW daytime 1170 kHz, class A FM w/pending power incr to 50 kW & 3 tower direct 690 kHz. Moving to beautiful new facility. Excel oppor for the right person. Must have own tools. Call Jim at 414-324-4441.

Chief Eng for Northern CA combo. 100 kW FM & 5 kW AM DA-2. Looking for a knowledgeable team player to join a young growing group. Send resume to Jeff Martin, KARZ/KHTE, POB 1918, Redding CA 96099. EOE.

Chief Engineer, FT, hands on person to maintain leading 50 kW Fm radio station equipment. Should have FCC license or SBE certification. EOE. Curt Hansen, WEBE, 50 Washington St, Norwalk CT 06854. 203-853-9108.

Radio Engineer for WBBM AM/FM stations. Applicants should have in-depth experience in studio design, 50kw xmtrs, digital &7 analog circuits, & R.F. systems in general. Should also have a drive to suceed in the market & be able to interface w/other staff personnel. EOE. Send resume to Mark Williames, Dir Tech Ops, 630 North McClurg Court, Chicago IL 60611.

Chief Eng for AM/FM combo on the CT shoreline. WNLC/WTYD Radio in New London wants a hands on chief, comfortable w/a directorial 10 kW & semi-auto FM. Good people person, high energy level & gd communications abilities. If you qualify we'd love to hear from you. Send resume to Richard Wolf, VP/GM, WNLC/WTYD, POB 1031, New London CT 06320.

Bdcst Engs: growing contr eng co seeks engs w/2-10 yrs exper to work in Mid-Atlantic area. Immed positions for right persons. Salary, co vehicle & hospitalization provided. Contact John Rodman at 804-875-9430.

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The National Association of Broadcasters Science and Technology Department is seeking a Staff Engineer. BSEE or equivalent is preferred. Background in AM/FM/TV broadcast stations engineering is required. Knowledge of FCC technical rules helpful, and excellent writing and communication skills desired. Please send resume to Michael C. Rau, Vice President, Science and Technology Department, National Association of Broadcasters, 1771 N. St., NW, Washington, DC 20036. EOE M/F

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Non-comm ed FM seeks donation of junk antenna or components to be used for parts in reworking standby antenna, ERI pref but any make acceptable, attractive tax write-off may be arranged, will pick up if distance not too great, write or call. A Nielsen, WDNX, Route 2, Savannah TN 38372. 901-925-9236.

KBUT, small educ station, needs equip donations, cart machines, Marti remote systems, satellite decoders & demods, will pay shipping. M Olson, KBUT, Box 308, Crested Butte CO 81224. 303-349-5225.

Christian radio station seeks donation of 3.5-10 kW FM xmtr, antenna system & studio equip. J Cunningham, KRAS, Box 8, Stonewall OK 74871. 405-265-4496.

Donation of equipment to non-comm ed station, cart, R-R, patchfield, etc. M Blacc, WEOS, Hobart/William Smith College, Geneva NY 14456. 315-789-8970.

Donation of R-R, 10-1/2", 2 chnl stereo recorder & 16mm film sound projector for religious educ, tax deductible. Rev J Acuna, POB 760273, OKC OK 73176. 405-632-8844.

TEST EQUIPMENT

Want to Sell

Potomac FIM-71 FM/TV field strength meter, like new, $2750. K Thomas, POB 207, Atlantic Beach FL 32233. 904-388-7711.

G-R primary freq standard, BO. J Keller, WKOK, RD#2, County Line Rd, Selinsgrove PA 17870. 717-286-5838.

EICO 950 capacitance resis bridge, $25; Bird 43 Thruline wattmeter w/detectors, $195; RCA Voltomyst electronic multimeter, $45; HP 200C audio osc, $75. J Dexter, 1604 Missouri Ave, Artesia NM 88210. 505-546-6590.

Precision LCR bridge, AN-URM-90, w/book, $100. R Simonson, KHAT, 4949 Yankey Hill Rd, Lincoln NE 68516. 402-423-1530.

EICO 377 audio gen, $50. S Weber, KGRV, POB 1598, Winston OR 97496. 503-679-8185.

HP audio signal gen for parts, missing power xfmr, BO. P Dowie, Gd Snd, 171 Drexel, Lansd, PA 19050. 215-626-9322.

dbx 10/20 computer EQ/analyzer, stereo 10-band EQ w/10 memories, digital SPL meter, pink noise gen, mic & manual, rackmt, EC, $395. S Hofmann, Cameron Univ Theatre, 2800 W Gore Blvd, Lawton OK 73505. 405-581-2428.

Goldline ASA30B 1/3 octave portable spectrum analyzer w/PN2 pink noise gen, never used, $500/BO. N Lederman, Oval Window Audio, 78 Main, Yanmouth ME 04096. 207-846-6250.

Leader LDM-170 dist analyzer, A-1 cond, $450. E Braun, KODA, 4810 San Felipe, Houston TX 77056. 713-622-1010.

Tex 529 video waveform monitors (12), all gd cond, $400 ea. G Urban, 314 W 52nd, NY NY 10019. 212-677-2200.

Gates MO-3625 gain set, $35; B&W 410 noise & dist meter, $35. L Owens, 2824 Dan Patch Dr, Lexington KY 40511. 606-252-5072 aft 5 PM ET.

Tek RM-529, waveform monitor, gd clean cond, $250. M Murphy, 11621 Valle Vista Rd, Lakeside CO 924040. 619-561-2726.

Wavetek 1801A RF sweep gen, 1-900 MHz; Tek 560 scope plug-ins. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Tek 527 waveform monitors tube type, as is, $75. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Trompeter LPL-75 video patch plugs, gd cond, 1" pin spacing, $4 ea; Cohu 2614-400 (2) video multiplexers w/cables & manuals, $50 ea. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

Tek 146 video test signal generator, excellent condition, $1200. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

TS-27 line fault test set, $25. A Weiner, 178 Lawrence Pk Terr, Bronxville NY 10708. 914-337-4554 or 212-517-3265.

Tek 454 portable, $600; Tek R454, $700; HP 183C scope w/1830 A & 1840 A, $250. D Green, 3011 Oregon Ct, Stockton CA 95204. 209-467-0317, PM only.

Want to Buy

Potomac AM field strength meter, gd cond. V Baker, POB 889, Blacksburg VA 24060. 703-552-4252.

Probe for Boonton 91H RF sensitive voltmeter. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

TRANSMITTERS

Want to Sell

PR Z-1A (2) & Z-1R crystals for LPB carrier current xmtrs, 522, 580, 590 kHz, all for $20. M Pinhero, 1528 4 Delane Ave, Charlotte NC 28211. 704-365-4912.

Marti M10/FME 10 watt educational xmtr w/meter, panel tuned for 91.9 mHz, $250/BO. J Burt, POB 1572, Durango CO 81302. 303-247-8060.

Gates FM5B 5 kW FM. W Carnes, KIIRT, POB 8234, Jacksonville TX 75766. 214-586-2162.

Westinghouse FM-10, 20 yrs old w/manuals, you remove & haul, BO. G Liebisch, WPTF, POB 29521, Raleigh NC 27626. 919-876-0674.

RCA 500MX AM xmtr. P Habecek, KACO, 238 W Main, Belville TX 77418. 409-865-9448.

Collins 21-E 5 kW AM, very clean in top shape, $8750 firm; also 1 kW FM Bauer 607, $3800 w/exciter, very clean. J Cramden, 315-487-2393.

CCA FM1000D 1 kW, W/130 cable & antenna whips, tuned to 91.3 MHz, gd cond, $5950. T Brandenburg, KGTS, College Place WA 98324. 509-527-2991.

Cetec/Sparta SS1000A, just taken out of service, excel cond w/spares, 1 kW AM tuned to 1240 kHz. M Young, WJON, POB 220, St Cloud MN 56302. 612-251-4422.

Visual DFM-10K-B/DFM-10-A 10 kW FM xmtr w/harmonic filter & 10 W FM exciter, needs some work, $2500. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

LPB AM RC5A 640 kHz; (7) T-8 interfaces; T2-4; (3) splitters, BO. M Black, WEOS, Hobart William Smith College, Geneva NY 14456. 315-789-8970.

Harris TP-10, excellent working condition, stereo exciter, $750. L James, BEST Prod, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

LPB 6B carrier current AM. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

McMartin B-910T 10 W xmtr or 15 W exciter, comes w/stereo gen, set for 91.1 MHz, $1000. P Russell, WBOR, Bowdoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

Gates 250C1 w/exciter on 1240 kHz, gd working cond, BO. K Chestnut, WSFC, POB 740, Somerset KY 42501. 606-678-5151.

FM translators, boosters & related hardware, priced right & can install. L Smith, Sword Systems, POB 1339, Frederick MD 21701. 301-662-0040.

Harris/Gates FM 10G in vgc, 260' of 1-5/8" transmission line. D Wiitala, WLDR, 118 S Union, Traverse City MI 49684. 616-947-3220.

Parts, large inventory for RCA BTF-20E1, all in gd cond, BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

ITS 1615 ITFS system, xmitter, antenna & 377' 6" waveguide, $42,500 2 yrs ago, sell for half price or trade, avail 10/30/88. B Ellis, KOZK, MPO Box 21, Springfield MO 65801. 417-865-2100.

BE 30 FM exciter, perf cond, c/w manual. $5000. J Smith, Mobile Bdct Srvs, 758 St Michael St, Mobile AL 36602. 205-432-7807.

RCA mod xformer for BTA 5F xmtr, new in orig crate, $600 plus shpg; RCA BTA 50F, 50 kW AM in excel cond, complete, in storage ready for use, w/electro-static air filter, solid state rectifiers & much more, w/manuals & floor layouts, $18,000 plus shpg; RCA BTA 5F, 5 kW AM ready for immed use, excel cond, w/manuals & floor layout, $10,000 plus shpg. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

GE 4BT1A1 250 W FM xmtr & exciter, '64 vintage, vgc, w/manual, $1500/BO, you ship. D Willey, Life Bdctg, POB 96, John Day OR 97845. 503-575-1840.

RCA BTE-15A FM exciter w/built-in BTX-1B SCA gen (manufactured by Moseley), $175 all. M Gollub, WMJS, POB 547, Price Frederick MD 20678. 301-535-2201.

Xmtr, 50kW AM, old but great, RCA BTA 5-H 5 kW AM & 250W AM xmtr, all used or in use. J Kramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

Rust FM xmtr, 33,000 hrs, tube type, gd 3.5 kW, $3500. P Martin, Pioneer Bdct, 4359 S Howell, Milwaukee WI 53206. 414-482-2638.

CCA FM 10 kW, never used, back up, $5000. D Miller, KNPT, POB 1430, Newport OR 97365. 503-265-2266.

Harris AM MW-5A 5 kW tuned to 1 MHz, excel cond, $23,000; Collins 830-D, 5 kW FM, $7,000; Collins 20-T 1 kW, gd working cond, tuned to 630 kHz. B Securo, WXRC, 357 First Ave NW, Hickory NC 28601. 704-322-1713.

RCA TTU-12 UHF TV xmtr, 12 kW, no exciter (2), one for parts w/heat exchange & 2 diplexers, as is, $2000. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Continental 316-S 10 kW, excel cond, avail soon. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

RW Broadcast Equipment Exchange

TRANSMITTERS ... WTS

Gates BC-1F (MO-3693) perf cond, tuned to 1350 kHz, Peerless S-75 frame (gray), $3000. J Creveling, 103 Colonial Dr, N Syracuse NY 13212. 315-458-2367.

Rockwell Collins 820D2 1 kW, 500 W, 740 kHz, gd cond, $7500. E Harrell, WMBL, POB 1015, Moorehead City NC 28557. 919-247-2002.

LPB AM100 100 W pre & post xmtr, almost new, type approved, $2000. B Mountjoy, WIDD, POB 1240, Elizabethton TN 37644. 615-543-5849.

Power Pak 40 W field selectable broadband stereo exciter, $2000. J Phillips, All Star Bdctg, 414 Washington Ave, Defiance OH 43512. 419-782-8591.

Harris FM1H 1 kW FM, 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, in use, $3400. KFXY, POB 1430, Morgan City LA 70381. 504-384-1430.

RCA BX250 GAM, gd cond, BO/trade. T Thomas, WDNY, 129 Main, Dansville NY 14437. 716-335-2273.

Harris BC500GY, 500 W, 220 V single phase w/some spare tubes, now in use, $2750. KMRC, POB 1430, Morgan City LA 70381. 504-384-1430.

Collins 310Z-2 FM exciter, 20 W, 88-108 MHz freq range, power source 117/234 IPH 50/60 Hz, $2000. KFXY, POB 1430, Morgan City LA 70381. 504-384-1430.

Collins 830D, 1.2 kW FM, 1970 vintage, well maintained, 310Z-2 exciter 94.3 MHz, recent tubes & filament xfmr, avail Fall '88, BO. GC Kincer, WIFX, Box 312, Jenkins KY 41537. 606-832-4655.

Collins 820D, 1 kW, 250 W AM, perf cond, recent plate xfmr, Canadian mod modif 1 kHz, avail Fall '88, BO. GC Kincer, WIFX, Box 312, Jenkins KY 41537. 606-832-4655.

FM 1 kW 20 yrs old & 2.5 kW 4 yrs old, just removes from service. J Cramden, KJKL, 183 Jane Dr, Syracuse NY 13219. 315-487-2393.

TTC MA-TVF-10, 10 W VHF Chan 11 xmtr w/RCA CTM-10 modulator. W Carnes, K11RT, POB 8234, Jacksonville TX 75766. 214-586-2162.

Gates HFL3000, 3 kW linear amp, 2-30 MHz, front panel tunable, excel cond, J Pagano, Pagano Ent, 1234 Southampton Rd, Philadelphia PA 19116. 215-464-3157.

Want to Buy

Panaxis FM10S, used 10 W stereo FM exciter, or similar 10-20 W needed ASAP. J Smith, 516 Leedom St, Jenkintown PA 19046. 215-572-6953.

Carrier current xmtr; also want gd 5 kW AM xmtr. P Habecek, KACO, 238 W Main, Belville TX 77418. 409-865-9448.

Exciter in gd cond, mono or stereo needed immed, will give payment & tax writeoff. D Alan, Jamestown Comm College, 525 Falconer St, Jamestown NY 14702. 716-483-0302.

Gates/Harris FM20H3 or FM20K, must be within 500 mile radius of St Louis MO. K Brooks, KREI, POB 461, Farmington MO 63640. 314-756-6476.

UHF 1 kW TV xmtr. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 614-846-9234.

Continental 20 kW FM xmtr, negotiable. L Blakeney, WBBN, Rt 2, Box 273B, Taylorsville MS 39168. 601-729-8100.

Harris FM2.5H3 in gd cond. A Stinnett, WPTN, 528 N Willow, Cookeville TN 38501. 615-526-7144.

Harris TE-3 exciter. D Van Zandt, Cornerstone Radio, POB 500, Petersburg IL 62675. 217-632-2266.

FM xmtr, old junk, or manuals to learn from, cheap. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

FM xmtr, 20 kW Harris, Continental, BE w/late mdl exciter. D Agnew, 402-488-4275.

Parts needed for RCA BTE-10C FM exciter & BTS-1A stereo gen, cheap. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

AM xmtr, 500 or 1000 W. C Ratliff, WADE, POB 1210, Wadesboro NC 28170. 704-694-2175.

Plate transformer, single phase 220 V w/sec at 4K, AC at 3 A. J Pagano, Pagano Enter, 1234 Southampton Rd, Philadelphia PA 19116. 215-464-3157.

Will buy any new or used xmtr, top dollar. L James, KCCI, 611 N Greer, Pittsburg TX 75686. 214-856-2892.

LPTV 1 kW, any make. AACT Inc, 156 Lazelle Rd, Worthington OH 43085. 615-846-9234.

Parts for RCA BTA-1M. J Cunningham, Radio YSDA, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496

Misc parts for RCA BTA-1M xmtr. J Cunningham, WSDA, Rt 2 Box 113-B, Stonewall OK 74871. 405-265-4496.

Harris or Continental, 20 kW or better FM xmtr. D Agnew, Sante Fe Bdct Eng, 825 Calle Mejia #1234, Santa Fe NM 87501. 505-983-1638.

FM xmtrs, (2) 1-3 kW, about 91.9 & 107.3 MHz solid state pref. B Seier, KZKX, 4435 O St, Lincoln NE 68510. 402-488-9601.

TUBES

Want to Sell

Saticons (6) from RCA TK-45; Vidicons (5) from RCA TK-27/28; Image Orthicon 5820A; RCA TK11; receiving tubes, spans 40 yrs from 0A2 to 5025, 750 + pieces. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

4-500A (4), pulled from service, $50 ea. D Handy, WTIF, 104 E 7th St, Tifton GA 31794. 912-382-1340.

RCA 4665 power tetrodes, new, 1 or 2 small dents in fins or rings, make offer. Deborah Proctor, WCPE, POB 828, Wake Forest NC 27587. 919-556-5178.

Want to Buy

Ind & bdct triodes, TH-150, 6366, 6425F, 6696, 7237, 7804, 8132, 8670A, 5-4/5-6, 6-3, 3CX2500H3, 3CX5000H3, 3CX20,000H3. P Nemeth, 5901 W Hwy 22, Crestwood KY 40014. 502-241-1502.

RCA or Westinghouse 575A. R Smith, KF6EA, 2245 Felspar St, San Diego CA 92109. 619-483-9331.

Desperately seeking 6072/6072A, need 1000 pieces, send quantity & price. Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403, 818-766-9101. 10 AM-noon PST.

TURNTABLES

Want to Sell

Gray Research 108B viscous-damped 16" tonearm, w/extra slides, silicon fluid, like new; GE VRII phono cartridge w/stilus; PS audio II phono preamp stereo/mono switch, very high quality. P Dowie, Gd Snd, 171 Drexel, Lansdown PA 19050. 215-626-9322.

Rek-O-Kut BH12, 3 speed, $150. Mr. Oliver, 212-874-2074.

Sparta (2)/QRK12C (3) TTs, need work, $200 or $50 ea. D Loucks, KTKL, 2132 W 42nd, Casper WY 82604. 307-265-6700.

Micro-Trak 303 12" tonearm, as new cond, $50. B Leslie, Pro Recdg Svc, 13709 Maple Leaf Dr, Cleveland OH 44125. 216-662-1435.

Rek-O-Kut CVS12 w/variable speeds, 25-100 rpms (2), $110 ea; Rek-O-Kuut B12H 3 speed, hysteris motor, $110. Mr. Oliver, 212-874-7660.

Gates Solid Statesman TT preamp in operating cond w/manual. $50 plus shpg. G Heidenfeldt, 2880 W Lake Rd, Wilson NY 14172. 716-751-6187.

Technics SP 25 TTs (2), $300 ea. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

Sparta TEP2 (2) mono preamps, $15 ea. C Springer, KLMR, POB 890, LaMar CO 81052. 719-336-2206.

Denon DP600 direct drive, w/base, dustcover, Fidelity Research tone arms •No64S, excel cond, $400. F Sinjuschki, Saraphin Comm, 1568 Eutis, St Paul MN 55108. 612-645-9173.

Sparta GT-12 (2) w/1 for parts, 2 arms included, $220/pkg. A McCarthy, KUIC, 419 Mason Ste 203, Vacaville CA 95688. 707-446-0200.

QRK 12-C (2) in new cond w/Micro-Trak arms & QRK stereo Alpha preamps, $250 ea. M Morrissey, KYGO, 1095 S Monaco Pkwy, Denver CO 80224. 303-321-0950.

Gates 16" (2) transcrip TTs w/Micro-Trak tonearm, $225 for both. C Lawson, L&N Eng, 106 Skyline Dr, Bristol TN 37620. 615-764-3625.

Sparta TEP-3 (2) stereo TT preamps, very clean. H Kneller Jr, WKII, 2500 Edwards Dr, Ft Myers FL 33901. 813-639-1112

Want to Buy

Any make/model, need one or two working used TT's, pref w/preamps & tone arms. J Smith, 516 Leedom, Jenkintown PA 19046. 215-572-6953.

Mint 16" transcription TT, complete w/arm, cartridge(s) & preamp. C Fuller, VOICES, 119 S Constance Ln, Countryside IL 60525. 312-579-9578

TV FILM EQUIP.

Want to Sell

Laird Telemedia 5050 telecine auto light control, working when removed, no manual, BO. D Slentz, Gemini/Dover, Box 1678, APO NY 09283.

RCA TK27 w/TP66 16mm & Simplex 35mm & slide projector, complete, excel cond, $2000; Buhl biplexer w/JVC camera, 16mm & 8mm & Super 8mm projector, $2000. T Judge, TAG Comm, 75 Weaver Rd, W Milford NJ 07480. 201-697-8454.

Telecine & film equip: 16mm RCA TP66 (6). $4,995; 35mm FR35B, $15,750; TP55 multiplexer, $1750; TP7B slide proj, $1500; TK27B camera, $2500; eastman PD1 multiplexer, $1500; 16mm CT500, $4500. Accept film cameras, editing, studio equip as part trade. Intl Cinema, 6750 NE 4th Court, Miami FL 33138. 305-756-0699. Fax: 305-758-2036.

Want to Buy

LPTV equip, camera equip, recorders, etc. AACT Inc, 156 Lazelle Rd. Worthington OH 43085. 614-846-9234.

VIDEO PRODUCTION EQUIPMENT

Want to Sell

CVS 516 digital TBC, $1500. A Denke, American Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Microtime Digitrol, 4-VTR controller w/cables, $675; Microtime Digitrol II, 8-VTR controller w/cables, $975; Microtime 2121 Faroudja image processor, $875; Microtime start/stop tone gens (4), $75 ea. C May, Rural Route Video, 360 Browning, Ignacio CO 81137. 303-563-9533.

Switchcraft audio patch bays (2) w/ADC terminal block, $75 ea; Trompeter JS1-40/J3W video patch bay, $75; (4) rack mount VTR I/O patch panels, $10 ea; lot cords, 50#, $50. C May, Rural Route Video, 360 Browning, Ignacio CO 81137. 303-563-9593.

Rack mount 4 x 1 video/audio switchers (2), passive for monitors, $25 ea; (2) 4 x 1 rack mount audio monitor/speaker, $40 ea. C May, Rural Route Video, 360 Browning, Ignacio CO 81137. 303-563-9533.

JVC CR-6000U U-matic video recorder, $200; JVC CP 5000U U-matic video player, $150; Ikegami PM 171-T 17" B&W TVs (2), $100; JVC KY 1900 TV camera, $1500; Leitch SPG 120 N pulse gen, $1000. R Ose, Am Comm Svc, 1 American Plaza Ste 310, Evanston IL 60201. 312-869-8001.

Panasonic NV9200A 3/4" VCR, excel cond, $495/BO. A Chaney, Video Eng, 1415 Oaknob Way, Sacramento CA 95833. 916-922-3456.

Systa-Matics RAIM-1000 TBC w/proc board & docs, trade/BO; Panasonic editing controller NV-A950 & NV-A820 interface adaptors (2), works w/NV-9500A 3/4" or NV-8200 1/2" machines, trade/BO. M Dilley, Producers Studio, 86 E Broadway Ste 10, Eugene OR 97401. 503-683-1400.

Datatek D4300 Series 6 x 2 switchers & remote keyboards (2), $1650 ea; (2) Lenco proc amps w/5 cards, $575 ea; (3) 10 x 1 bridging vertical interval switcher, (3M, 3M, ISI), $350 ea. C May, Rural Route Video, 360 Browning, Ignacio CO 81137. 303-563-9593.

A/V Eng Co video hum stop coil, model HSC-1, like new, $90. G Peterson, KIMM, POB 8205, Rapid City SD 57709. 605-348-1100.

Microtime Digital 2 automatic sequencer for VCR's, gd cond, $1000; Used 1 pass Scotch pneumatic 3/4" UCA60s video tape (minimum 35), $1 ea. G Sive, The Video Connection, 31844 Rancho Amegos, Borsall CA 92003. 619-749-7662.

Showtime Showmaster SEG, audio & video switcher, wipes, cuts, dissolves, colorizes images, generates patterns, keys, etc, 4 RF inputs, $700. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Telemation TSE-200 SEG, $300; Panasonic 13" color video monitor BT51300N, $175; Panasonic 10" CT-110M color video monitor, $150; American Data vertical interval color productivity switcher 553A, $175; Pelco switcher MS512DT, 12 in 1 out, $50; Telemation bdct sync gen TSG-2000, $300; Panasonic dual 9" B/W monitors TR930U, $100. C Haynes, WJMI, POB 31235, Jackson, MS 39206. 601-948-1515.

Want to Buy

DVS Phaser II frame sync & color osc module for RCA TG3. L Johnson, WGNX, POB 98087, Atlanta GA 30029. 404-375-4646.

VIDEO TAPE RECORDERS

Want to Sell

JVC CP-5000U 3/4" U-matic players, $200; Panasonic NV-9400U porta 3/4" w/Portabrace, 2 battery chargers, serv man, gd cond, $2500. R Nimtz, Univ of Notre Dame, Box 1088, Notre Dame IN 46556. 219-239-6423.

RCA TR600A (2), full blown, excel cond, never used in bdct, $8000 ea/trade. H Henson, Henson Prod, 3796 Bethania Sta Rd, Winston-Salem NC 27106. 919-924-8717.

RCA MI-40691B rem ctrl pan for TR-50 VTR, $25; RCA MI-557301 mod extender, $25. B Humpherys, Utah State Univ, Logan UT 84322. 801-750-3133.

IVC 1" VTR, $250; NEC 3/4" video cassette player, gd cond, $300; JVC 3/4" video cassette player, like new 5200U, $500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

Sony 2850, 2860, RM400 edit system. $1800. Bob, RC Video, 2953 First St, Napa CA 94559. 707-252-2396.

Want to Buy

Ampex/RCA VR 1000 & on, 2", 1", ½" etc. older espec. J Anthony, Video Parts Co, POB 25, Shenorock NY 10587. 212-713-5757.

High band RCA headwheels #5 MIL, need sev; RCA TCR 100A's & parts, need sev. H Henson, Henson Prod, 3796 Bethania Station Rd, Winston-Salem NC 27106. 919-924-8717.

Ampex/RCA/etc, VR1050 & on, all 2", 1", ½" VTR's, older espec. J Anthony, Video Parts Co, POB 25, Shenorock NY 10587 212-713-5757.

ACTION-GRAM

Equipment Listings

Radio World's Broadcast Equipment Exchange provides a FREE listing service for all broadcast and pro-sound end users. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

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Make: _____ **Model #:** _____
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Price: _____
Contact Name: _____
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BROADCAST EQUIPMENT EXCHANGE
PO Box 1214, Falls Church, VA 22041

A SUCCESS STORY

THE OBJECTIVE was no small task: design a radio console that would become the new standard.

THE METHOD involved listening to veteran broadcast engineers and installers. After all, they're the people who have seen and experienced all the ideas that came before. From this research we learned of the problems that had to be solved and the features that broadcasters required. We then added ten years of console building experience and innovation, and created the A-500a console.

THE RESULT: An unsurpassed console that exceeds prior broadcast standards. Its module mainframe interface borrows from the computer industry, utilizing all-gold contact insulation displacement technology. The logic system is based on programming the module slot, allowing full module interchangeability. It also provides for separate programming of the module's "B" input selection, thus avoiding embarrassing false starts and mutes. Full console-to-machine control is supported without extensive use of interface boxes and cables. Three audio busses are provided to enhance talkshows and remote functions. There are separate processing loops for the speech and music paths, as well as individual channel insert points. A complete line of microphone and line inputs, remote selectors, and machine control modules is offered in virtually any combination, configuration or mainframe size you desire. The A-500a also features a full family of studio turret and turret components to ease facility design.

THE PERFORMANCE: Needless to say, it's a new age for audio and the A-500a is a step ahead. While specifications don't say it all, ruler flat frequency response, .003% distortion, crisp square wave response and a noise spec that's unheard of deserve merit. Couple such performance, reliability and innovation together, and a new broadcast standard is set.

THE SUCCESS: WHEATSTONE broadcast consoles are installed in major markets all over the country, from frontline independents to national networks. They are in use right now at some of the world's largest institutions.

THE POSSIBILITIES: The possibilities are up to you.

Wheatstone Corporation

6720 V.I.P. Parkway, Syracuse, N.Y. 13211 (315-455-7740)

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