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Radio World

Broadcast Equipment Exchange See pages 40-47

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FM Antenna Plan Opposed

by Alan Carter

Washington DC ... Broadcasters generally continued their opposition—or only gave conditional support—to an FCC proposal that would allow increased use of FM directional antennas in short-spaced situations.

The FCC issued a Notice of Proposed Rule Making, Docket MM 87-121, earlier this year stemming from a Notice of 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.

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

Potential problems

Among the more long-standing opponents to the proposal, the NAB claimed the signal pattern of directional antennas are hard to maintain. "Any use of FM directional antennas would cause interference to existing FM service unless such use is very carefully controlled," NAB stated.

NAB maintained that tower mounting hardware, coaxial connectors and switches, additional proximate antennas, and the tower itself could all cause distortions to the intended FM radiation pattern.

But if the Commission insists on letting FMers use directional antennas, it should retain the current mileage separation requirements and not adopt a contour protection system, the NAB argued.

" ... NAB believes that the Commission's current rules, that have led to the successful development of the FM service, have served the public interest well and are the cornerstone of the continued development of the FM service," the NAB stated. "In short, the FM service is far from broken; we urge the Commission to refrain from making repairs."

The association said current rules provide an orderly procedure for allocating channel space where a new channel can be accommodated without causing interference with existing stations. The group maintained that the proposed contour overlap system does not provide such protection.

"Under the Commission's proposal, the FM service would be subject to the 'shoehorning' of additional FM channels, a process long recognized as detrimental to the AM service," the NAB

(continued on page 19)

Editors Swap Razors for PCs

by Charles Taylor

Washington DC ... A new editing system employed by CBS Radio here symbolizes a new generation for broadcast production, where splice and cut is replaced with plug in and punch.

Its innovative technology involves the darling of modern electronics—digital—in a computer program that works on an IBM XT computer or compatible equipment, including lap top models.

The editing program, known as SpeakEasy, was developed for the radio network by Glenn Herb, president of IPS in Weston, MA. Beginning this month IPS also plans to market the product to the industry. CBS has served as its beta site with four of the machines for the past eight months.

Development of the system was prompted seven years ago, when CBS began looking for ways to convert from its combined use of quarter-inch tape and cassette to a cassette-only format.

"The obvious problem in a radio atmosphere would be the editing capability," said Jim Hargraves, now recently retired but then manager of audio systems for CBS in Washington. "For as long as I've been in the business, it's been the razor blade cut and splice. To go to cassette, the question was how you're going to get a razor blade into that thing."

Finding the answer took nearly five years and a number of associations with various manufacturers, who either went out of business or whose interest in the project eventually waned. The solution led CBS into the realm of digital editing.

Dream machine

In 1986, Hargraves discussed CBS's idea with Herb and a partnership ignited. Hargraves engineered the role of defining the parameters of CBS's desired system—including screen design, ease of use, frequency bandwidth and length of

(continued on page 15)

Jim Hargraves, who defined the parameters of the SpeakEasy digital PC-based editing system, stands with one of CBS's units. The system, designed by IPS in Weston, MA, now is being marketed to the industry.

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Circle Reader Service 8 on Page 38

FM Emits RF, KOs Phone Co.

Lake Havasu City AZ ... Lee Shoblom has a problem and he's not sure what he should do.

On the night of 6 July Shoblom switched on KBBC-FM's brand new 20,000 W transmitter. Upgrading for a 3000 W transmitter, KBBC would become a regional station with a stronger signal that could be heard 120 miles north in Las Vegas to about 150 miles south to the Mexican border.

It worked perfectly, he thought.

Shoblom, who is president, GM and CE for KBBC and sister station KFWJ-AM in this town of 5700 on the Arizona and California line, vividly recalled what happened when his pager beeped later in the evening.

"It said we don't seem to have any long-distance phone service in the entire county and five towns. We think it's you."

The "it" was the Citizen Utilities Telephone Co. that has a telephone microwave facility adjacent to KBBC's transmitter on Goat Peak about one mile north of Lake Havasu City.

Not only did the transmitter knock out the long-distance service, it shut down 70 special telephone circuits—including hotel reservation lines, computer links and burglar alarm connections, according to Shoblom. And there's more.

One of the special circuits was the Arizona Lottery for Mohave County. Said Shoblom, "They were not happy." The system was down for three hours just be-

(continued on page 3)

World Radio History

NRSC

The FCC took a first step toward making the NRSC audio standard mandatory with a proposed rule making, but also included an RF emission standard, to which some broadcasters are expected to object.

The Notice of Proposed Rule Making, MM 88-376, was adopted 20 June. Comments are being sought on either the audio (NRSC-1) or transmission (NRSC-2) standard or a combination, but no comment deadline had been set as of mid-August.

In addition, in a second part of the NPRM, which stems from the FCC's inquiry into AM improvements begun in 1986, Commissioners would give AM stations the option of proposing facilities whose coverage area would be subject to some interference from other stations.

The audio standard was developed by the National Radio Systems Committee and is in voluntary use. It establishes a 75μsec preemphasis and a 10 kHz stopband.

NRSC-2, the RF emission standard or "RF mask" that addresses the signal from the transmitter out, has a station's signal parallel to the NRSC audio standard to 10 kHz.

For information on MM 88-376, contact the FCC at 202-632-9660.

FCC FILES

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

AM Synchronous Transmitters

Several trade groups asked the FCC to slow down or halt proceedings on AM synchronous transmitters in comments filed in May.

The proceeding already has been delayed more than a year because of problems in obtaining data on transmitter tests. The Association for Broadcast Engineering Standards recommended that the Commission suspend or terminate proceedings until test results are more complete.

The NAB also asked the FCC not to issue a rule making until there is "significant and consistently positive data" on experimental operation of the transmitters.

There was support for a rule making from the Corporation for Public Broadcasting, which said that AM licensees could expand their coverage with multiple synchronous transmitters.

The docket is MM 87-6; contact Gary Thayer at the FCC, 202-632-7010.

AM Band Expansion

Comments were filed 11 August by three organizations regarding the Commission's plan to add 10 new channels to the AM band by 1 July 1990. (See separate story this issue.)

CBS, the Association for Broadcast Engineering Standards (ABES) and the NAB centered their comments around the FCC's proposal to establish national licensing among the new channels. All three vehemently opposed the idea.

ABES urged the Commission "to avoid using the new channels as an administrative test tube to introduce radical changes in the traditional regulatory approach to the issues of diversification of ownership and network broadcasting."

The NAB, similarly, cautioned that "an undeveloped, short-sighted regulatory scheme could lead to the kind of interference climate, application processing dilemmas and other problems with which the Commission currently is grapling in other parts of the broadcast spectrum."

The organizations also commented on the Commission's suggestion that assignment preference go to current daytime-only stations. The three groups supported the idea, also recommending a stay of duopoly rules to allow those stations to operate both their daytime frequency and expanded-band station until the new band frequency has had time to prosper.

See related story in this issue on Docket 84-467 or, for more information, contact Wilson LaFollette at 202-632-5414.

AM Technical Deregulation

Broadcasters called on the Commission to take action to reduce AM interference but have asked the FCC to move cautiously in revising technical rules that control the band.

Comments were filed in June on the second phase of the FCC's comprehensive review of AM assignment criteria, Docket MM-267.

Broadcasters also indicated in their filings that they needed more time to review two comprehensive listener studies the NAB included in its comments. More suggestions were expected in reply com-

(continued on page 14)

NEWS BRIEFS

Radio Campaign Delayed

Washington DC ... The NAB and RAB's joint radio awareness campaign will not be launched at Radio '88 as planned.

An "interim report," however, will be presented on the public relations campaign, the theme of which is "Radio. What would life be without it?" according to NAB Radio Senior VP David Parnigoni. The new projected launch date is January 1989.

The creative design of the campaign is "far from being completed," Parnigoni said, and market testing is not finished.

NAB and RAB are contributing $300,000 each for the start-up. The annual scope of the campaign is expected to total $100 million in actual cash expenditures and time donated for spot announcements that will be broadcast by stations nationwide.

For information on the campaign, contact NAB's radio department at 202-429-5420.

Harris Buys GE Solid State

Melbourne FL ... Harris Corp. and General Electric have reached an agreement in principal for Harris to acquire GE Solid State. Terms of the agreement were not disclosed.

Harris Chairman and CEO John Hartley said the acquisition fits well in the company's strategy of building on its three major markets—semiconductors, information processing and communications. GE Solid State would be a part of Harris Semiconductor Sector.

Harris Semiconductor is a supplier of standard, custom and semicustom integrated circuits for military and commercial markets. It is headquartered in Melbourne and employs about 4000 people worldwide and has annual sales of about $300 million.

"This acquisition will strengthen Harris' market position in analog, digital signal processing, data acquisition and CMOS logic for communications, industrial, automotive and military markets," Hartley said.

Olympic Connection

Washington DC ... The South Korean government has authorized amateur station 6K24SO to exchange third-party messages for athletes and members of the United States Olympic Team with amateur stations in the US during 0001 UTC 1 September and ending 2400 UTC 5 October, according to the FCC.

The Commission also announced it has no objection to amateur stations exchanging similar third-party messages with amateur station 6K24SO during the same time period.

All radio communications must be in plain language and consist only of messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified, the FCC said.

For additional information contact the FCC's public affairs department at 202-254-7674.

Circle Reader Service 26 on Page 38

INDEX

Making Your Station Reliable
by John Shepler 23
Transducer Operating Specs: The Basics of Mic Application
by Bruce Bartlett 24
Taming Your "Tough Dog" Gear
by Jim Somich 28
FCC Transmitter Operator Rules
by Harold Hallikainen 28
The State of the Art of Digital Technology
by Skip Pizzi 30
Reflections on Customer Service
by Barry Mishkind 31
A Look at Booster Problems
by Ed Anthony 32
Life on the Road with a Traveling Engineer
by George Riggins 34

World Radio History

Letter Decries Interference Trend

by Charles Taylor

Washington DC ... Six broadcast organizations have written to the FCC about what they see as the Commission's relaxed attitude toward interference.

The groups wrote a joint letter to the FCC pleading that it address the "trend" permitting "mounting interference and other forms of technical degradation to the public's over-the-air broadcast service."

The outcry was prompted, according to the groups, by a number of policy changes enacted by the Commission that they say undercut interference safeguards.

Addressed to FCC Chairman Dennis Patrick, the 3 August letter includes signatures from the presidents of the NAB, the Association for Broadcast Engineering Standards, National Public Radio, the Association of Independent Television Stations, the Association of Maximum Service Telecasters and the Corporation for Public Broadcasting.

In the letter, the groups asked for "a constructive dialogue regarding the overall goals and consequences" of recent spectrum allocation and related proposals and decisions.

"We must have the capability not only to maintain our current level of service but to match the technical quality of other media through improvements such as advanced television, digital radio transmission and AM stereo," the letter said.

Several factors were listed as contributors to what the groups called an increasing tolerance for reduced interference protection standards for broadcast service.

First, the groups claimed that current FCC proposals involve new or expanded services that are perceived as desirable. "In choosing to permit these new facilities or services, the Commission has almost universally ignored or given short shrift to maintaining the public's existing service and to preserving opportunities for expansion and quality improvement," they complained.

Second, the mass of proceedings involving interference issues obscures their overall pattern and impact, according to the organizations. Each proposal, standing alone, might not have devastating interference consequences, but the cumulative effect can be severe, they said.

Another factor cited was the Commission's increasing reliance on marketplace forces as a substitute for regulation. "The primary and most basic function of the Commission is to act as the 'traffic cop' of the electromagnetic spectrum," they wrote.

In reviewing FCC proceedings pertinent to the groups' complaint, the letter noted they have in common one or more justifications for weakening interference standards: redefinition of interference so that it appears less extensive; and an assumption that interference exists only if the FCC receives consumer complaints.

The dockets mentioned in the letter include the FCC's technical review of AM standards (MM 87-267); FM short spacing (MM 87-121); AM expanded band (Gen. 84-467); FM translators (MM 86-112 and MM 88-140); IF spacing (MM 86-144) and a variety of RF interference issues.

Also mentioned were future options to shut down secondary-status services if they cause interference; unwarranted reliance on purported technological or methodological advances; the availability of substitute service; and the substitution of a case-by-case flexible approach for clear-cut go-no-go standards.

For more information, contact the Association of Maximum Service Telecasters, 202-457-0980; the NAB at 202-429-5350; National Public Radio at 202-822-2300; Corporation for Public Broadcasting at 202-293-6160; the Association for Broadcast Engineering Standards at 202-824-5660; or the Association of Independent Television Stations at 202-887-1970.

Station RF Blanks Out Phone Service

(continued from page 1)

fore a $3 million drawing.

Shoblom called in an engineer from the transmitter manufacturer to test the equipment. Of particular concern to Shoblom was the closeness of the telephone company's microwave frequency at 100 MHz to his station's at 101.1 MHz.

"We were concerned that we were just trashing them and would have to change frequency," Shoblom said. "It turned out that it was not frequency sensitive. It was just plain old RF. And the RF on any frequency was the problem."

He deduced the blame may have been the fact that the KBBC transmitter facility is only 75' away from the microwave facility on top of Goat Peak.

Shoblom said the closeness of the two operations was never considered to be a problem because a similar situation exists for another radio sta tion. Those operations, however, are 400' apart.

The first step Shoblom is taking is to shield the telephone microwave facility with copper wiring. He also is going to work to see how the RF affects the telephone company's AC input.

"So, we're going to take it step by step," Shoblom said. "The FCC is being most cooperative with our problem."

After the copper wiring is installed, Shoblom said KBBC will turn up the transmitter to the full 20 kW, and lock it in at the power rate that throws the microwave operation out of service. Then, he will turn the transmitter back by 1000 W and ask the FCC for a special temporary authority to operate at that level.

If the copper wiring doesn't solve the problem, Shoblom said the worst possible scenario is he will have to move the transmitter. "There's a whole lot we're going to try before we consider moving that thing. That would be just an incredible cost." Shielding the building with copper wiring is costing about $40,000, he said.

Some broadcasters and engineers aware of his problem have suggested changing his antenna configuration. He wants suggestions, if anyone has ideas to volunteer.

Said Shoblom, "It's frustrating to have it run like a top, and there is sits—all paid for—and I can't use it. If somebody has some voodoo-magic out there, I'd love to hear about it."

To reach Lee Shoblom, call 602-855-4098.

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Circle Reader Service 43 on Page 38

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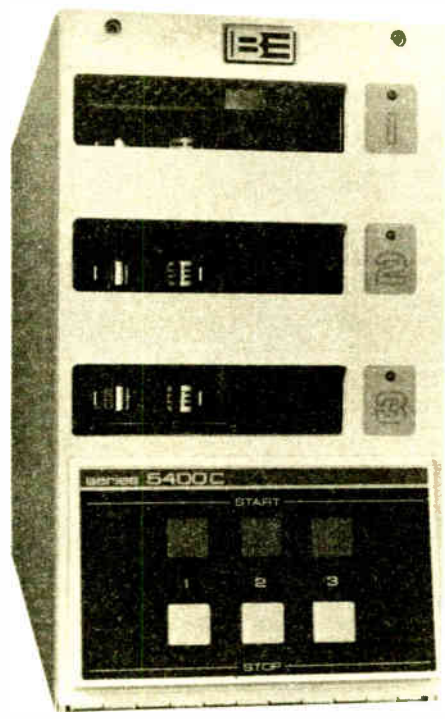

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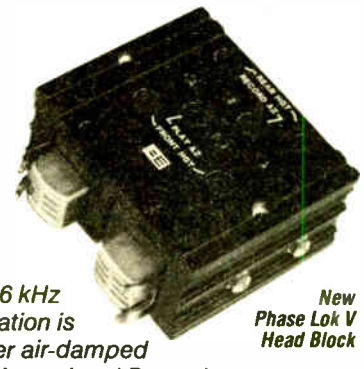

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Circle Reader Service 18 on Page 38

World Radio History

And Now, The Envelope Please

by Judith Gross

Falls Church VA ... And the winner is ... OK, we do have a winner for the "**Name That Noise**" contest as promised.

Just to refresh your memory: after there were objections about calling **AM incidental noise** in FM transmission "multipath," because it really is different from what most engineers mean when they talk about multipath, *Earwaves* held a contest to come up with a better name.

Did we succeed? Well, you be the judge when I tell you the winning entry. But we sure had a lot of **fun** trying. Some of the **non-winners** which deserve **honorable mention** were AMGrass, AM No, Ampathy, Amplifuzz (or Ampliphuzz, if your prefer), Ampliscatter, Garbulation, Grindge, Phitz and (my personal favorite) Schmeck.

As **WHEN/WRHP's Al Peterson**, who submitted that last one reasoned, why come up with a formal, hard to pronounce name when we all know the engineer is just going to go to the GM or PD and say the transmission is "**schmecky?**"

There was also the longest entry submitted: **Interamplimodulation**—a mouthful, even for engineers (heck, even for lawyers, and they talk that way all the time!).

But none of these were deemed worthy of the honor of becoming THE official term by our **blue-ribbon panel**. By the way the judges, who were consultant **Oggie Prestholdt**; **Geoff Mendenhall** from Broadcast Electronics; **Lloyd Berg** from WDAE and a skeptical **John Kean** from Moffet, Larson & Johnson, came up with a unanimous choice from the list on the first go-round.

And now the moment you've all been waiting for (drum roll please ...). The **winning entry** for our Name That Noise contest is: **ICAM**, for incidental carrier amplitude modulation, submitted by **Bill Canady**, CE of KVII-TV in Amarillo, TX.

Bill wins himself an H-P calculator donated by **Radiotechniques** *and* a coveted **RW** mug. Congrats, Bill, even if you do work in TV, which we like to think of around here as radio with pictures.

Now, to be fair, a second engineer, **Aldo Cugnini** of Broadcast Technology Partners also submitted ICAM (and I thought you guys were too busy with FMX to enter contests!).

But sorry, Aldo, I received Bill's entry **first**, so he's our official winner. But, what the heck, I'll send you a coveted **RW** mug too, OK, as a consolation prize.

Thanks to all who entered. Maybe we'll come up with another nifty contest soon.

☆☆☆

But if you think that the choice of ICAM **settled the question** of AM noise once and for all, think again. First of all, the judges rejected any entry with the term "path" because the idea was to get away from the similarity to multipath.

But Oggie Prestholdt also told me he would have preferred something which emphasized the **synchronous characteristic** of the problem. He suggested **S-CAM**, substituting synchronous for incidental.

Ran that one past the other esteemed judges, and seems Oggie set off another controversy here. Lloyd Berg said he disagreed, because the AM component is **not in sync** with incoming modulation of the FM signal.

Lloyd goes on to say the AM being generated is actually **twice the modulating frequency** because of the upper and lower slopes of the transmitter bandpass and there is also considerable distortion due to the non-linearity characteristics of these slopes.

So Lloyd, unlike Oggie, likes the choice of ICAM just the way it is. Well guys, all I can say is the contest is over; the winner is picked. You're going to have to **slug it out** between yourselves, maybe at an **engineering session** at one of the conventions.

Come to think of it, a debate of this sort would at least be a **refreshing** change from the endless overhead-and-circuit-diagram-slide presentations which produce loud snores at many of the engineering conferences these days.

☆☆☆

I was only kidding about that autographed picture of **Fidelipac's Art Constantine** in leiderhosen with his favorite beer stein for every customer who wins a trip to the Hamburg AES when they buy three Dynamax cart players and one recorder.

But darling that he is, Art sent me my very own copy, which I'm sharing with you. Now tell me, wouldn't you like to **party in Germany** with this mensch?

Well, NAB really kinda backed itself into a corner with **Radio '88 guest passes** (see story, this issue). Yeah, we know that some slimy types are **sneaking into the sessions** without paying the registration fee, but the exhibitors needn't be penalized for that. **Better security** is the answer.

Fortunately **cooler heads prevailed** when several exhibitors balked at the no-guest-pass dictum and now they **will be available** after all. But it's a warning sign. The radio show can't afford any more of this kind of controversy.

See where the NAB has also come up for a new name for **Richard Sequerra's** design incorporating all the latest high tech state-of the art for AM and FM. Since "super" radio was taboo, they're now calling it the "**ultimate**" **radio.**

Hmmm. Perhaps the last radio you'll ever need? Let's hope it's not just the last radio or in AM's case, the **last of radio.**

Got a **sad tale** recently from Troy Langham, formerly CE of **KVLT, Tulsa, OK.** Apparently one particular day will forever be known as **Black Friday** there, because when the new owners put in new management they cleaned house in a big way.

All except for the morning man, two

Ach du lieber!

sales people and the assistant CE **got the axe**, eleven folks in all, so there was a virtual entire staff ready to be hired somewhere else. That's not a way to make friends and influence people, even if necessity dictated sharp budget cuts. Hope you all go on to bigger and better things.

Also been hearing some not so good news about those **giant boom boxes**. Some advice: if you're thinking of buying one, know that they are not the easiest things in the world to pull around to remote sites, back up, etc.

If you can shell out the bucks for the box, shell out the bucks for **someone to drive it around.** Your engineer is swamped with other station duties, and why pay a skilled professional to stand around at a 10-hour remote?

And I couldn't fail to mention the topic for the **NAB/RAB's joint campaign** to promote our favorite medium which is slated for early 1989 debut.

You might remember the "I Saw It On the Radio" sketches which were quite creative a few years back.

This new one will be "Radio. What Would Life Be Like Without It?"

Well ... *radio-less.*

And awfully, awfully quiet, especially around here.

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.*

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Circle Reader Service 11 on Page 38

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Circle Reader Service 46 on Page 38

World Radio History

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 #302-7772). All letters received become the property of Radio World, to be used at our discretion and as space permits.

Plan for more FMs

Dear RW:

Most of us have read about Larry Tighe's FM2 plan that would create new FM channels in the 220 MHz band. I would like to suggest a plan that would create 100 new channels that would accommodate over 5000 new FM stations, and we don't have to move out of the present band.

An FM channel is 200 kHz wide and a station is at 100% modulation when it has a frequency deviation of ±75 kHz. If the frequency swing was reduced to ±37.5 kHz for 100% modulation an FM channel would only need 100 kHz of width.

With this width channel a new channel could be placed between each of today's channels. Where today we have channels at 92.1, 92.3, 92.5, 92.7, 92.9, etc., we could also have new channels at 92.0, 92.2, 92.4, 92.6, 92.8, etc.

No existing station would have to change frequency, decrease its ERP or reduce its coverage; however, we would double the amount of FM assignments available.

A 100% modulation of the FM aural TV transmitter has only a ±25kHz deviation. It sounds great and has stereo too. The new FM 100 kHz channel with its ±37.5 kHz would be better. I don't believe we would have any trouble in accommodating present SCA uses in this plan; however, if needed all of these secondary services could be moved to the 220 MHz band.

Canada and Mexico would probably welcome the additional new FM channels, however, if they did not accept it we would only have to restrict any new USA channel assignments for about 200 miles along our borders with these two countries.

Since the FM band was moved from 40 to 50 MHz in 1946 it has taken over 40 years to fill up 88 to 108 MHz. By doubling the number of available channels we shouldn't run out of space until 2030.

Willam O. Barry, President
WAMB, Great Southern Broadcasting Co., Inc.
Nashville TN

Sales considerations important

Dear RW:

A letter from Robert Landry, ACE of WCRB-FM in Boston caught my intrest in your 15 July issue, as it dealt with one of John Cummuta's articles entitled *The Engineer as Salesperson* (RW 15 March). I find myself in slight disagreement with Landry.

Landry concludes with what seem to be two contradictory statements, to wit: " Engineers are not supposed to interface with clients," in one paragraph, and yet in another he says, " . . . he (the Chief Engineer) should be just as much a part of the stations's management team as the program director or sales manager."

I cannot see these conditions as being mutually exclusive. In order for the team membership to be granted to a CE, he needs to be actively aware of the fact that there will be times when client interface will be necessary.

It may not be his job description to market the advertising services of the station, but there can be no doubt that the client must be handled carefully for one outstanding reason: there is enough competition for any advertising dollar that an unhappy client may decide not to continue a schedule because of anger over treatment by a station employee.

That client may even throw good business sense to the winds and cancel in the face of tremendous ratings. Grudges in business can be very long-lasting.

Further on Landry questions why a remote broadcast that Cummuta refers to had an engineer in attendance. At KMEL we almost always maintain an engineering presence at remotes. It assists the DJ/operator, who is probably running equipment that he or she sees only rarely, and it allows us to make immediate repairs in case of some sudden failure.

True, we do have what we call "self-sustaining" remotes, where the announcer/operator sets up and strikes the equipment, but only in the case of weekly ongoing broadcasts. These require many hours of careful engineering and training of the person involved. All "one-shots" have an engineer present at the remote site.

Landry comments on a remote that did not get a line ordered for it. Who should order remote lines? Isn't that an engineering management function? This is one of those tasks that an engineering department should aggressively take over—for the good of the station.

There was a time when many engineers made themselves valuable to a stations's ownership by keeping the wiring and schematics to the plant in their heads. I believe a much better form of job security is to make the position of Chief Engineer and the results of the work of the entire engineering department highly visible to the station's management.

The CE especially must elevate him/herself above the level of "repairman," even if this means a re-education of other departments in the station. Accomplishing this requires skills beyond those in electronics, encompassing everything from personnel handling to budget accounting, and must number salesmanship (in one form or another) among those skills.

Paul T. Black, CE
KMEL, Century Broadcasting Corp.
San Francisco CA

Better way for EBS

Dear RW:

I read with interest Mr. Belik's letter, re EBS, in the 1 August edition. I am in agreement with his comments, with one exception.

Here at KDKA producers are transmitter duty operators. They know well how the Emergency Broadcast System works—be it day, night or weekend.

As the CPCS-1 station for southwestern Pennsylvania we transmitted 20 or more alerts during 1987 on behalf of, and at the request of the National Weather Service. During the first seven months of 1988 the system has been activated on a similar number of occasions.

Back in 1984 when tornadoes hit a wide area of eastern Ohio and western PA the lack of timely warning via EBS was identified as a major problem.

Once a tornado (or other severe weather) watch or warning is issued by the NWS it first goes on the NOAA Weather Radio. Next comes the weather wire. Finally a telephone call would be made to KDKA.

The call could have gone unanswered or inadvertently put on hold by a very busy producer screening calls for a talk show. Investigation showed that 25 minutes could easily elapse from the time an alert was issued until it got on the air. No particular person was at fault—the entire system was faulty!

We reasoned that there must be a better way. The 1050 Hz tone used to alert the public via NOAA Weather Radio was not the answer. It is used, at times, for material that was not intended to be aired via EBS.

To use this method, the producer would have to make the decision to activate the EBS. That decision should remain in the hands of the National Weather Service.

In cooperation with the Pittsburgh office of the NWS, a system using DTMF tones was designed and built in-house.

When NWS initiates a severe weather watch or warning, immediately preceeding its airing on the weather radio it transmits two Touchtone™ digits.

This data is used to supply AC power to a dedicated cart machine in the KDKA producer area. It also lights lights and

(continued on page 18)

Rethink Fall Show

The recent problem over Radio '88 exhibitor's guest passes is one symptom of the difficulties surrounding the fall show.

Unlike the NAB's spring convention, which is virtually a "must" for everyone, the radio show comes at a time of the year when other shows compete for the industry's attention.

To make the much smaller radio show work, every detail—from scheduling to location to attracting the right mix of attendees to wooing exhibitors—needs to be handled just right.

As last year's disappointing Radio '87 and this year's problems illustrate, that is clearly not the case with Radio '88.

Past engineering programs have failed to draw the number of engineers and engineering managers needed to keep equipment exhibitors happy.

This year's close timing to the SBE convention, along with the NAB's treatment of the radio show as more of a conference than a convention have not helped matters.

Nor has the lack of focus in trying to be everything to everyone, resulting in a show not clearly aimed at any one slice of the industry but a mix of programming, management and sales elements with a small amount of engineering thrown in.

If the NAB wants to have a successful fall show for radio only, an all out effort is needed to attract both exhibitors and attendees.

At the very least, the NAB should be aiming toward some way to receive input from the industry—including major equipment suppliers—to define the problems and generate solutions.

The NAB faced a near revolt of exhibitors at the spring show several years ago and was able to improve the situation through its exhibitors' advisory committee and by hiring a professional, competent show manager.

If they are determined to have a successful fall radio show, they should become more aware of the problems that exist and more sensitive to the concerns of those needed to insure its long-term success.

—RW

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World Radio History

RADIO '88

CONVENTION PREVIEW

Radio Show a "Capital" Event

by Alan Carter

Washington DC ... NAB brings its Radio '88 convention to the nation's capitol this year, the first time the association has held a major event on the East Coast in 12 years.

The convention is scheduled 14-17 September at the Washington Convention Center.

NAB Joint Board Chairman Wallace Jorgenson, president, Jefferson-Pilot Communications Co., Charlotte, NC, called the upcoming event a "real radio rally." He said Radio '87 in Anaheim, CA, "wasn't one of our better efforts," but he had high expectations for the 1988 version.

Although he didn't have pre-registration figures, NAB senior radio VP David Parnigoni said at press time in mid-August that pre-registration was running ahead of last year. Last year's total registration was 6,500. Hospitality suites are in excess of 100, he noted, compared to last year's number that was just shy of the figure

In addition to 36,000 square feet of exhibit space, up one-third from 1987, the event includes management and engineering sessions.

A highlight for AMers will be an "AM Rally" scheduled 15 September. Leading a discussion on how AM service can be improved will be FCC Commissioner Patricia Dennis and Mass Media Bureau Chief Alex Felker. A panel discussion also is planned.

FCC Chairman Dennis Patrick is scheduled to speak the following day.

Among the engineering sessions (for details see 1 August RW) are three consecutive full-length seminars and special sessions on AM and FM improvement, with reports and papers on the latest in technology.

There are five technical panels and an FCC Engineer's Forum. Also included are a two-day Directional Antenna Seminar and a new Digital Radio Station Seminar as well as the NAB's RF Radiation Seminar. The digital program is a day-long look at the major broadcast technologies used in converting to and producing in digital audio.

Among the management sessions, there is a seminar on marketing for the 1990s. Experts will discuss future marketing techniques for stations.

A top-to-bottom review of new station opportunities highlight a seminar on radio allocations for the 1990s which the NAB says will cover "everything from Class A upgrades to daytimer advances; from FM drop-ins to the expanded AM band."

A Daytimers' Forum will provide information on current issues. There will be an opportunity for daytimers to exchange ideas on a variety of topics in a roundtable setting.

Another seminar will focus on radio license renewal, during which broadcasters will be updated on issues/program lists, FCC public file rules and EEO requirements.

Convention activities begin with a welcoming reception 6-8 PM, 14 September, at the Washington Convention Center where most of the events will be held.

On 15 September from 9:15-11:15 AM, the Crystal Radio Awards will be held with co-emcees Bruce Williams, NBC Talknet host, and afternoon personality Renee Chaney of WGMS in Washington.

That evening an "Exhibit Hall Celebration Party" will be held with "a taste of excellence and technology," plus a wine and cheese sampling.

The Radio Awards Luncheon Friday, 16 September will feature a presentation of the National Radio Award to Ben Hoberman, former president of ABC Radio.

The closing dinner banquet will be Saturday, 17 September at the nearby Grand Hyatt, with vocalist Natalie Cole scheduled to perform afterwards at the convention center.

Radio '88 planners pointed to the show being brought to the East Coast as an opportunity to reach a different market than the past few shows. The show will be in New Orleans in 1989, Boston in 1990 and San Francisco in 1991.

For information on Radio '88, contact NAB at 202-429-5300.

Guest Pass Policy Contested

Washington DC ... After a preliminary decision not to issue guest passes for Radio '88 exhibitors, the NAB reconsidered and has rescinded the policy.

The NAB, after receiving complaints from several exhibitors, reinstituted guest pass privileges for Radio '88 after first cancelling the tradition without consulting exhibitors, Exhibits Director Rick Dobson confirmed. At least two exhibitors were reconsidering plans to exhibit at the show before the matter was resolved.

According to NAB policy, exhibitors at Radio '88 are supposed to be given a limited number of passes, based on the square footage of their booths, to invite clients to the exhibit floor free of charge.

But Dobson said because of the "very, very small percentage" of guest passes used when compared to total attendance, NAB assumed the passes were of little significance.

It will cost attendees without a guest pass $100 to view the exhibits only at the annual fall show, scheduled here 14-17 September at the Washington Convention Center.

But that's not all

But NAB also had another motive for eliminating guest passes. The association wanted to stop broadcasters with guest passes from attending seminars—without having paid any registration fee, according to Dobson. Those fees range from $295 for full registration prior to 5 August to $345 after that date.

Dobson said NAB wasn't trying to "punish" people "who have been sneaking under the tent." But he continued that the association would check credentials to make sure those people who paid the fee know that others were not getting in free of charge.

NAB officials feel "very, very strongly" that the radio convention is more a conference than an exhibit, when compared to the spring convention, Dobson said. "We feel that with all the effort and planning that goes into putting the radio convention together ... people who are benefiting from their attendance ... ought to do so through registration."

He presented a scenario where broadcasters will come to the radio convention, get hotel rooms, obtain guest passes, visit hospitality suites and maybe a seminar or two.

These individuals "attend the convention without attending the convention," Dobson added. "I think that is very unfortunate. I think that opinion is shared by a lot of people at NAB."

Although NAB will tighten security for the sessions, no one with a guest pass will be turned away if they want to sit in, Dobson said. There, however, will be one stipulation. " ... We'll be happy to point them to the appropriate registration desk if they choose to upgrade."

Looking at the number of guest passes

(continued on page 11)

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Circle Reader Service 33 on Page 38

World Radio History

AM Studies Slated for Convention Release

by Alan Carter

Washington DC ... Three major NAB research projects examining AM listenership—or the lack thereof—are scheduled for presentation at Radio '88.

Results from a nationwide study of listener perceptions toward AM and a separate survey of programming directors will be released. A third project on AM psychoacoustic listening tests, which the NAB included in a filing with the FCC on AM technical review, also will be highlighted.

Initial findings from the listener perception study and programming director survey were not expected until the first week of September, according to NAB Research and Planning Senior VP Rick Ducey. He, however, said the final results would be ready for the convention, 14-17 September in Washington.

"They're scheduled," Ducey said. "They have times for presentations and ... we're counting on them being ready."

The listener perception study is being conducted by Bill Moyes, chairman of The Research Group and based in Colorado Springs, CO.

"It is designed to be a marketing research study for the AM band," Ducey said. "In any kind of marketing study, you look for competitive strengths and weaknesses, competitive advantages; beyond that, we're looking to see how AM fits the American lifestyle."

A telephone survey of 1,800 persons nationwide was underway.

The findings will be presented 17 September, in a session titled "America's Thoughts on AM Radio: A National Survey."

Preliminary findings from the first phase of the study reported that AM listening declined 3-11% from 1986 to 1987. The decline varied with age groups.

The Moyes study said that the 11% decline in AM listenership was reported in the 55-64 and 35-44 age groups with a 10% dropoff in the 45-54 and 12-17 age groups; a 6% dropoff among listeners 25-34 and a 3% decline in the 18-24 age range.

In addition to listener percentages, the study seeks to explore positive and negative beliefs about AM.

Ducey said radio broadcasters should be able to use the findings to learn what the US public thinks about AM.

"If I were running an AM station, I would want to know some of the dominant perceptions of AM radio," Ducey said. "One of the things I might find is AM itself might be positive, but if you combine AM and stereo, that might be a negative."

If that were a finding, Ducey said, AM stereo broadcasters would be better off promoting their station as "Stereo 1030" rather than "AM Stereo 1030."

The survey of program directors is being conducted by John Perikhal and John Oakes, two researchers from Toronto.

"The idea there is to access program director's awareness and reactions to several major trends that are happening in the country," Ducey said.

Based on the survey, the report should make some analysis as to what program directors should be doing and what they are doing in programming, marketing and research.

The findings will be presented 15 September, in a session titled "The New America: Radio Programming Strategies."

The survey is examining a variety of formats including CHR/Top 40, Adult Contemporary, AOR, Urban Contemporary/Black, Country, News Talk/All News, Beautiful Music/Easy Listening and Hispanic/Spanish Language.

A final research project to be presented is the psychoacoustic listening tests

(continued on page 11)

Radio '88 Highlights

Tuesday September 13

11:00 AM - 6:00 PM • Engineering Forum I (Directional Antenna Seminar - Part I)

Wednesday September 14

8:00 AM - 6:00 PM • Engineering Forum I (Directional Antenna Seminar - Part II)
12:15 - 1:30 PM • EEO/Hiring-Firing: Getting Things Right the First Time
• Marketing for the 1990s
2:00 - 5:00 PM • Radio Station Bus Tours
• Radio-Only Legislation - Laying the Foundation
6:00 - 8:00 PM • Welcome Reception
8:00 PM • Hospitality Suites Open

Thursday September 15

8:30 AM - 4:00 PM • Engineering Forum II (Digital Radio Station Seminar)
9:15 - 11:15 AM • Opening Celebration
11:00 AM - 6:00 PM • Celebration of Radio Exhibit Hall Open
11:30 AM - 1:00 PM • Exhibit Hall Lunch
12:30 PM - 1:45 PM • AM Rally
• Grassroots Lobbying in Major Markets
• Concurrent management, programming and sales sessions
2:00 - 3:15 PM • Daytimers' Forum (Part I)
• Concurrent management, programming and sales sessions
5:00 - 6:15 PM • Interference: Complaints and Cures
• Daytimers' Forum (Part II)
• Concurrent management, programming and sales sessions
6:00 PM • Hospitality Suites Open

Friday September 16

7:30 - 8:45 AM • Breakfast with Alfred Sikes, Asst. Secretary, Dept. of Commerce
8:00 AM - 12:00 PM • Engineering Forum III (RF Radiation)
9:00 - 9:45 AM • FCC Chairman Dennis Patrick
9:00 AM - 6:00 PM • Celebration of Radio Exhibit Hall Open
9:45 AM - 12:00 PM • Bus Tour - Spanish Language Broadcasters
10:15 - 11:30 AM • Concurrent management, programming and sales sessions
11:00 AM - 12:00 PM • Coffee Hour - Exhibit Hall
12:30 - 2:15 PM • Radio Award Luncheon
2:45 - 4:00 PM • Listener Expectations (Psychoacoustic Research)
• FM Technical Improvement
• Concurrent management, programming and sales sessions
4:00 - 6:00 PM • Exhibit Hall Party/Programming Showcase
4:00 PM • Hospitality Suites Open

Saturday September 17

9:00 AM - 1:00 PM • Celebration of Radio Exhibit Hall Open
10:00 - 11:15 AM • AM Technical Improvement (Part I)
• Concurrent management, programming and sales sessions
10:00 - 11:00 AM • Coffee Hour - Exhibit Hall
10:00 AM - 12:00 PM • Computer Fair - Exhibit Hall
11:30 AM - 12:45 PM • AM Technical Improvement (Part II)
• Improving Stations; Creating New Ones
• Concurrent management, programming and sales sessions
1:00 - 2:15 PM • FM Directional Antennas
• Concurrent management, programming and sales sessions
2:30 - 3:45 PM • PCs for Engineers
• Emergency Broadcasting System
• Concurrent management, programming and sales sessions
4:00 - 5:15 PM • FCC's Engineers Forum
• Concurrent management, programming and sales sessions
7:00 PM • Dinner/Entertainment with Natalie Cole

Consult NAB program for complete listing and changes.

RADIO '88 EXHIBITORS

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ABC Radio Networks
Absolute Broadcast Automation
Accu-Weather, Inc.
All Star Radio
American Image Productions
American Medical Association
American Sports Line
Arbitron Ratings Company
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Associated Press Broadcast Services
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Bradley Broadcast Sales
Brite Voice Systems
Broadcast Audio Corporation
Broadcast Components Corp.
Broadcast Electronics, Inc.
Broadcast Financial Mgmt. Assn.
Broadcast Investment Analysts
Broadcast Products, Inc.
Broadcast Supply West
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Show Trend is Digital

by Alan Carter

Washington DC ... By mid-August, 165 exhibitors had taken space at Radio '88, which will be held 14-17 September here at the Washington Convention Center. Exhibitors at last year's event in Anaheim, CA, totaled 143.

One of the trends expected to continue at the show is the move toward digital products; several exhibitors are featuring digital audio to help attract attendees.

And because many see the fall convention as one which draws programmers and management rather than engineers, some of the new gear is targeted toward PDs and GMs as well as engineers.

Radio Systems will debut what it calls a "true professional DAT recorder."

"We are excited about it because DAT is very much a programming (tool)," said President Dan Braverman.

The unit, which was in prototype at the spring NAB, features secondary end of message cue, cart machine-type logic and functions and full remote control allowing interface for console or automation.

Radio Systems also will have the new RS console line series with 6, 12 and 18 channels, remote control, three output busses and P&G faders.

Braverman said the company will display its regular line including broadcast furniture and turn-key systems.

Fidelipac will continue to promote its free trip to the AES Convention in Hamburg, West Germany in March 1989 for the purchase of one Dynamax CTR100 series recorder and three CTR100 players before 31 December.

The company will display the CTR100 and CTR10 series in separate studios, as well as the new Dynamax Cobalt tape cartridges.

From Circuit Research Labs (CRL), on display will be the BAP 2000 FM/TV monaural processor, according to Bill Ammons who is in charge of radio products marketing.

Ammons said he is "a little bit worried" about walk-in traffic but believes overall the show will go well.

Broadcast Electronics will have a variety of products including the new Phase Trak 90 cart machine, said Tim Bealor, audio products manager and trade show coordinator.

Also at the booth will be the Mix Trak 90 on-air board and the FM 20 transmitter. There will be an operational on-air studio and an operational automation system.

Bealor had some reservations about Radio '88, after talking to potential customers. He said he finds stations are not willing to send engineers to two shows, and engineers find the spring convention more beneficial.

Making an appearance after several years absence will be Pacific Recorders and Engineering.

RADIO '88

The company will have demonstrations of the ABX and AMX broadcast/multi-track production consoles; the BMX Series II and BMX Series III broadcast consoles; the TomCat cart machines and the MicroMax cart machine. Also the company will have the StereoMixer and NewsMixer rack mount consoles for studio or field use.

According to Anders Madsen, sales manager demonstrations will also include the Dolby SR (Spectral Recording) System headroom expansion/noise reduction system for cart machines.

Another exhibitor will be Harris Broadcast Sales, which will divide its booth into sections focusing on AM, FM and audio, according to Domestic Radio Sales Manager Ron Frillman.

The exhibit will include a DX-10, the company's 10,000 W digital AM transmitter. In a surprise debut, Harris will also have a module from the its 50,000 W digital AM transmitter, the DX-50 currently in development for which it will be taking orders.

Other products in the Harris exhibits will be its DAT unit working with a Gold Medalist console.

Harris also plans to introduce a HT35 FM 35,000 W transmitter, and the company will have a new FM product line including equipment from a 3½ to 35 kW transmitter. A final product on display will be the Harris 55 W FM exciter called "THE-1."

Harris strategic marketing Director Bob

(continued on next page)

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Circle Reader Service 39 on Page 38

World Radio History

NAB Reinstitutes Guest Passes

(continued from page 7)
used last year, he said of 6500 registrants, less than 400 were guests. Approximately 40 percent of the total registration for NAB's spring shows are guests, he added. Guest passes at the spring show cost seven dollars apiece, with no limit on the amount issued.

"When you take those two examples and try to compare and contrast them, you can see why it would not be unreasonable for NAB to come to the conclusion that guest tickets for the radio show were not particularly an important thing," Dobson explained.

Some exhibitors, however, thought differently, as Dobson and NAB quickly found out. Exhibitors learned of the change in policy when they received $50 discount tickets that clients could use towards any Radio '88 registration fee.

"I personally got about six calls and of those six, there was a very strong consensus among them that guest tickets were very valuable," Dobson said, "and each of those companies was aware of individuals that they wanted to invite to the show that they knew would not be there for the whole convention, but just wanted to visit the exhibits."

Passes' value

Pacific Recorders and Engineering President Jack Williams, who contacted Dobson after learning about the policy change, told Dobson that if guest passes were unavailable he might need to reevaluate his decision to exhibit at the show.

Auditronics Executive VP Steve Sage also said he told Dobson that his company would have to reconsider exhibiting if NAB would not issue guest passes.

Within 48 hours after the initial contact from exhibitors, Dobson said guest passes were printed and in the mail. Dobson called the move by NAB not to issue the passes an "error in judgment."

Williams said he was pleased that NAB reversed its position. He pointed out that programmers and general managers will come nationwide to attend, but the draw to equipment exhibits is only local, and he said the passes help companies encourage clients to attend.

But Sage said it was "after the fact" because by the time the matter was resolved companies did not have time to survey their potential customer lists to find out where the passes could best be used.

Bill Ammons, who is in charge of radio marketing for CRL, said he was pleased guest passes were going to be available. He also noted that the $50 discount coupons, of which he had about 12, "will go very quickly."

Tim Bealor, audio products manager and trade show coordinator at Broadcast Electronics, noted his company has always taken advantage of guest passes as a promotion for potential clients.

Rick Dobson can be contacted at 202-429-5335.

AM Surveys

(continued from page 9)
conducted by Chicago-based B. Angell & Associates.

They found current FCC interference protection contours are sufficient for co-channel AM stations but woefully inadequate for adjacent channels.

The survey also concluded that listeners generally accept much less interference on talk segments than they do on music, and interference tolerance can vary according to the types of music a station plays.

The tests will be discussed 16 September, in a session titled "Listener Expectations."

Among the findings Ducey found interesting was the point that listeners could not tell the difference between cuts on AM NRSC nighttime and FM.

"So from a technical viewpoint, there's no reason to expect that people are going to like FM any better than AM," he explained.

For information on the research projects, contact NAB's research and planning department at 202-429-5380.

Trade Show

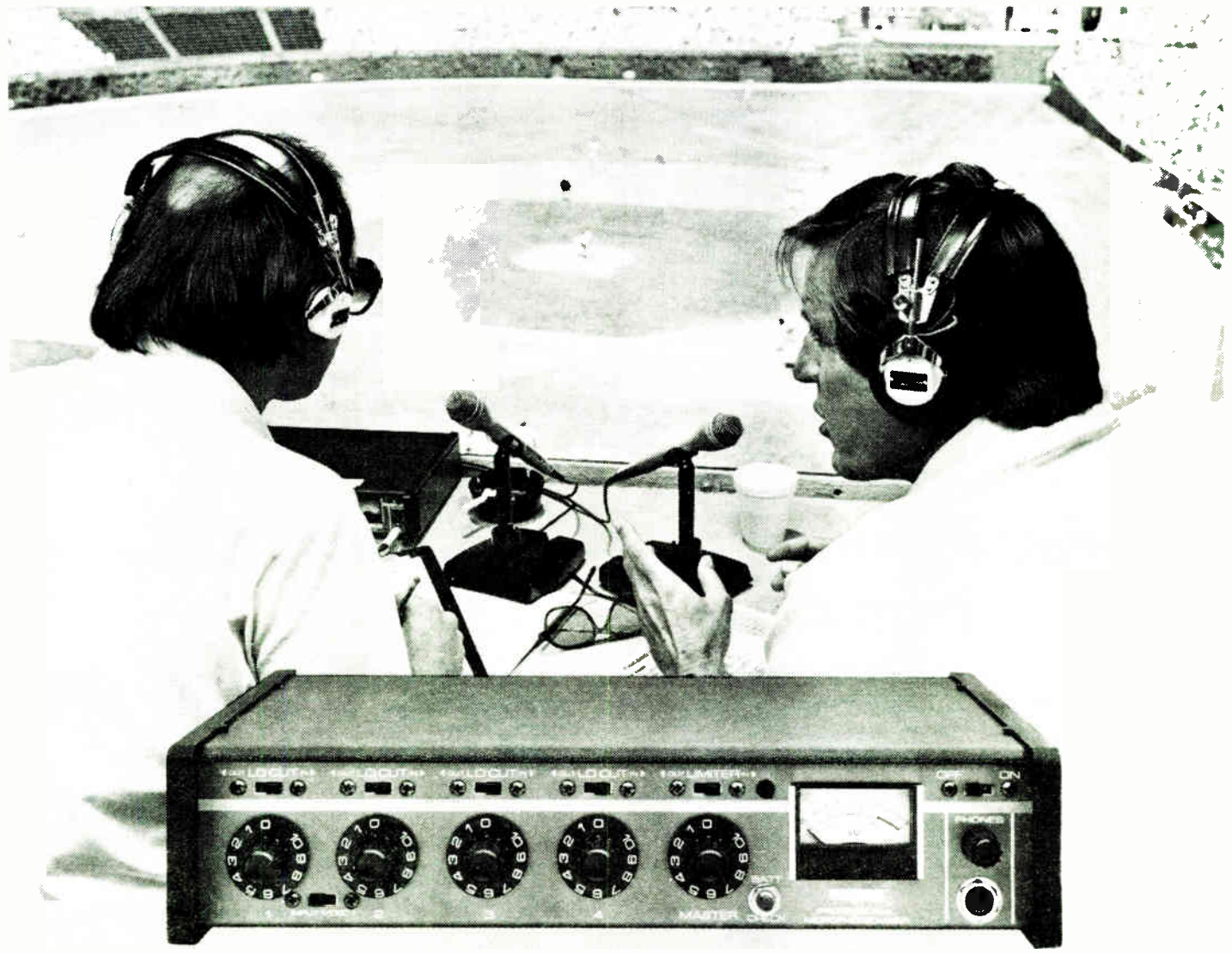
(continued from previous page)
Weirather was looking forward to Radio '88. "We don't see it as being an off show. I guess I would see it as being a pretty high show."

Although Allied will not have a booth, the company will display products at the J.W. Marriott in Suite 1131, according to National Marketing Director Dave Burns.

Among its display at the hotel will be the Denon CD cart machine; the new Technics SL-P1300 compact disc player; the Valley Internation DDP digital processor, and the new DSI Contest Computer.

While a surprising number of equipment exhibitors are scheduling product introductions at Radio '88, many companies are waiting to introduce new products at the SBE Convention—which attracts mainly engineers—in Denver the following week.

To contact the various representatives call: Dave Burns, 317-962-8596; Ron Frillman, 217-222-8200; Dan Braverman, 215-356-4700; Fidelipac, 609-235-3900; Bill Ammons, 602-438-0888; Tim Bealor, 217-224-9600, and Anders Matsen, 619-438-3911.



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World Radio History

AM Band Plan Gets Failing Grade

by Charles Taylor

Washington DC ... Key suggestions from the FCC on how best to utilize a proposed expanded AM band were struck down by organizations filing comments on the Commission's Fourth Notice of Inquiry, while other ideas did find some support.

Groups were particularly opposed to the FCC's proposal to establish national licensing.

The rule making to establish 10 new commercial AM channels, from 1605 to 1705, is scheduled to take effect 1 July, 1990. In its Fourth Notice of Inquiry released in June, the FCC presented a full discussion of the issues involved in the expansion, as well as ideas for specific uses.

Foremost was the concept of allowing single licensees to control portions of the band nationwide, though the Commission maintained that the national broadcasting proposal was "not an either/or situation in which we are forced to choose between the traditional approach (of licensing) and a new one involving national licensing. Rather, consideration can be given to a combination of approaches."

Groups filing, however, showed no interest in the idea, claiming its implementation would overshadow any good that came from the additional channels. The organizations also said the proposal violated localism standards stated in the Communications Act of 1934.

Threat to rationality

"More than any other proposal in the Fourth Notice, the national licensing option poses the greatest threat to rational communications policy and compliance with the Commission's statutory obligations," said the NAB in comments filed.

The NAB also disputed the Commission's suggestion that once a licensee has been assigned a certain channel, it should be responsible for determining power levels.

Implementation of such self-regulation would create "an entire scheme of self-licensing over which the Commission would have statutory authority, but impermissibly would exercise no control. The effect of such an arrangement would be an abandonment of the essential regulation of an entire portion of the broadcast spectrum," the organization said.

In addition, national licensing would strike against the fundamental goal of serving community needs, the NAB insisted.

"A national licensee that might enjoy only limited success in a certain market might be indifferent to that station's attentiveness to the community's needs, because it can rely on its more profitable stations to compensate for those less successful operations.

Stick with traditional

The Association for Broadcast Engineering Standards (ABES) also voiced concern that community needs would be stifled by national licensing.

"The concepts of national licensing and localism are obviously opposite to each other," ABES said. "Is it really necessary that stations belonging to a single system be commonly owned and controlled? The more traditional system of affiliation of independently owned stations is (better) since it renders it more likely that local factors, issues and characteristics will influence program decisions."

ABES added that the FCC's "utopian reasoning" that the interests of the public and the economic interests of a national licensee will coincide is "patently imperfect."

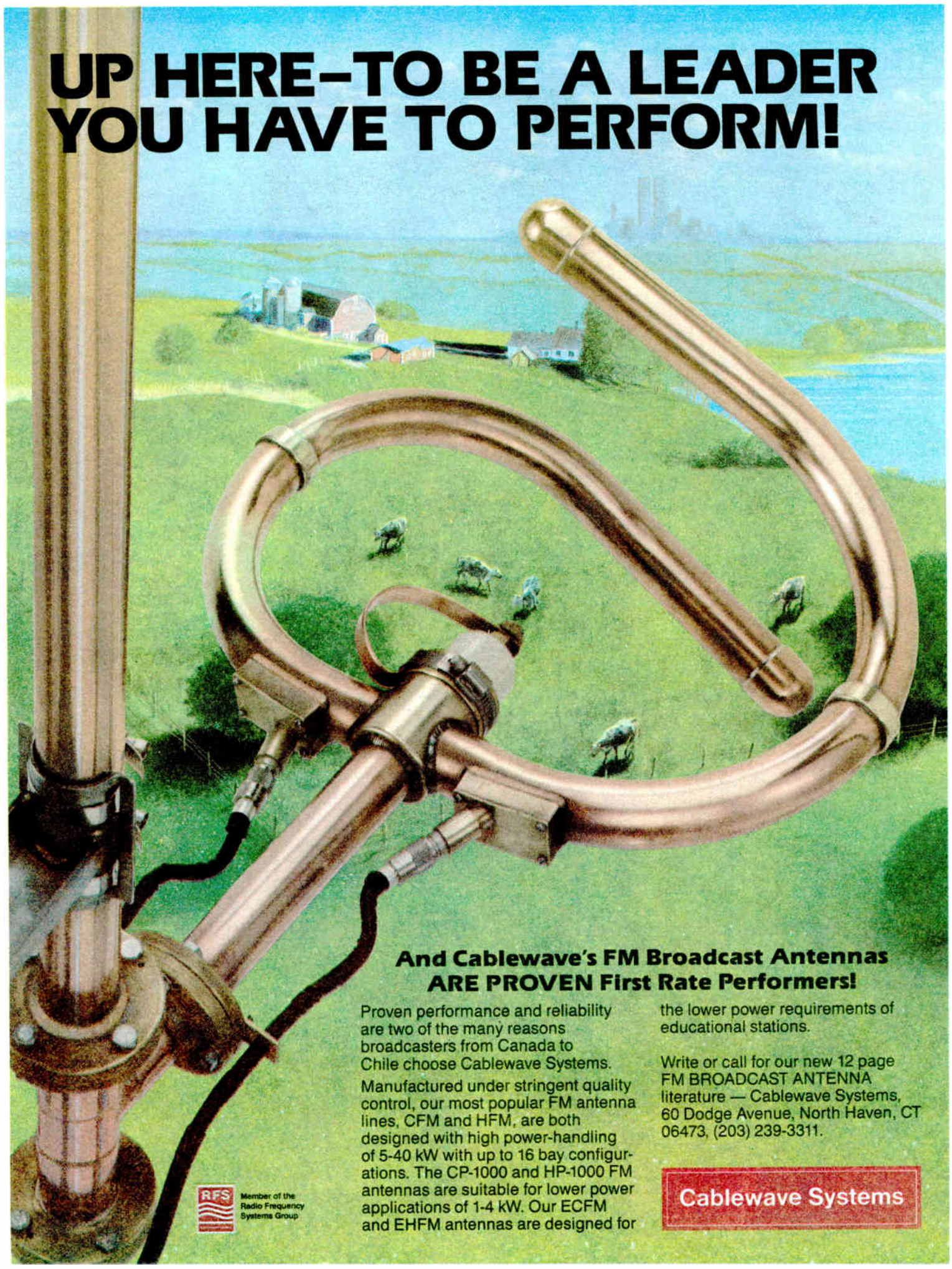
ABES also reasoned that if national licensing were implemented on the expanded AM band, it would be only a matter of time before the concept spread throughout AM and into the FM band.

"It is unthinkable that over time stations operating in the continuous band from 540 kHz to 1700 kHz, stations that compete for audiences and for national, regional and local advertiser support, could be subject to such an unequal regulatory climate. Eventually, FM would have to be treated as AM is, and the parallel restrictions on FM ownership and network affiliation would likewise disappear," ABES said.

Degree of demand

"The degree of demand is already at such a level that there is little chance that the highly artificial stimulus of national licensing will be needed to attract the interest of potential applicants," said ABES.

(continued on page 21)



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World Radio History

New Translator Objections Filed

by Charles Taylor

Washington DC ... Yet another round of filings has produced a near carbon copy of complaints previously filed regarding a March rule making permitting noncommercial FM translators owned by primary stations to use alternative signal delivery methods.

Such methods include satellite or terrestrial microwave, which are designed to substantially increase coverage area over feeding a translator from the station's over-the-air signal.

Two groups recently commented on MM Docket 86-112: the NAB, in reply comments to its Petition for Reconsideration; and National Public Radio (NPR), in reply comments to the Commission's Further Notice of Proposed Rule Making.

The Further Notice, released in April, proposes to extend the adopted rule change to include noncommercial FM translators that are owned by parties other than the primary station.

NPR's primary basis for contesting the proposed change is its allegation that there is no legal basis in the record for such a move.

"The record contains absolutely no support for the proposed expansion of permissible ownership for (noncommercial educational) translators," NPR wrote in its 15 August filing. "Hence, the Commission should reject the proposals and terminate the instant proceeding."

Any Commission action to the contrary, NPR said, would be "arbitrary, capricious and an abuse of discretion."

Much of the remainder of NPR's filing restated its disdain with the original April rule making.

In addition to its filing, three representatives of NPR and three public radio station executives met 14 July with FCC Mass Media Bureau Chief Alex Felker regarding a 26 May Petition for Reconsideration filing.

The groups discussed with Felker their opinions on the impact of alternative signal delivery on the noncommercial educational spectrum, raising vocally the issues in previous filings.

These included the potential for a filing "landrush" and the impact on public radio stations, interference and localism.

Felker suggested that in order to receive a license, the Commission could require applicants placing FM translators with alternative signal delivery beyond a certain distance from the primary station to show the existence of at least one vacant noncommercial FM channel for the proposed service area.

The suggestion, according to NPR, was not directly raised by the Petition for Reconsideration, though it was related to the conditions suggested and issues raised in that filing.

The NAB's reply comments on the Petition for Reconsideration basically reiterated arguments that the use of alternative signal delivery by noncommercial stations will result in "critical impediments to the maintenance, creation and expansion of full-service public radio service."

The NAB also alleged again that the rule will form a low-power FM radio service in the noncommercial spectrum, as well as making it difficult for small market stations to compete with potent station owners in bringing service to a market.

"The revised rule allows translator licensees in remote markets, with minimal investment, to compete for subscriber support against full-service stations who bear a relatively large economic burden in providing issue/responsive programming to serve the needs of their respective communities.

"The playing field could be no more tilted," the NAB said.

It also argued that localism is seriously threatened by "the attractiveness of the possibility of feeding hundreds of translators nationwide from a single primary station."

As one remedy, NAB supported allowing only microwave signal input (and forbidding satellite delivery) with translators, which it said might enhance signal quality and availability without jeopardizing localism.

For more information on Docket 86-112, contact Tatsu Kondo at the FCC, 202-632-6302; Henry Baumann at the NAB, 202-429-5430; and Karen Christensen at NPR, 202-822-2000.

MORE FCC FILES

(continued from page 2)

ments 17 August.

In the first round of comments, broadcasters urged the FCC to take a more aggressive role in controlling the AM airwaves. The NAB, among others, urged the Commission to place a freeze on granting new AM stations and major change applications for existing AMs in an effort to reduce interference on the band.

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

In the second round, the NAB charged that the Commission's current technical standards "fail to depict with accuracy" the levels of interference actually experienced by AM listeners. The NAB "strongly" urged the Commission to establish AM interference standards and calculation methods that "more precisely characterize AM coverage and interference."

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

Other points addressed in the proceeding include co-channel and adjacent channel protection ratios, propagation models such as skywave curves and emission limitations. The inquiry will also examine the methodology to account for multiple undesired AM signals at protected contours.

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

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

FM Translators

The FCC and industry organizations are still locked in debate over the Commission's 24 March rule making that allowed noncommercial translators to use "alternative technologies" for signal delivery. Previously, the translators were required to be fed by an over-the-air link.

First, in May, the NAB, National Public Radio (NPR), the National Federation of Community Broadcasters (NFCB) and the Association of Maximum Service Telecasters filed a motion of stay with the FCC, claiming the rule making would deplete currently limited noncommercial educational FM spectrum, undermine localism and community access to local spectrum, create a land-rush application process and lead to interference on the reserved FM band and to channel 6 TV stations.

The FCC a month later denied the groups' motion, stating that they failed to demonstrate any irreparable damage

(continued on page 20)

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Circle Reader Service 32 on Page 38

World Radio History

Editing Enters the Digital Age

(continued from page 1)
recording—while Herb oversaw development of the software and programming.

"We took a computer programmer engineer type into the operating world and gave him a few suggestions just to make the product a little more user friendly," said Lynwood Heiges, director of facilities administration for CBS-Washington's operations and engineering.

Part of the result included easily deciphered controls, according to Hargraves. "There are 12 function keys and they literally have names that we all know and love like 'stop,' 'forward,' 'play,' 'mark in'—where you want to start the edit—and 'mark out'—where you want to stop the edit," he said.

"We can take a person with no computer or editing capability, people from the news desk and technicians, and within two days, they're editing."

But the real advantages of the system revolve around its actual functions, Hargraves said. It operates by inputting up to six audio inserts from any source totaling 30 minutes into a Compaq computer with a 40 Mbyte hard disk.

SpeakEasy then processes the information on the disk, allowing the operator to edit as desired, all at a speed comparable to or faster than traditional editing methods.

As fast as cut and splice

"It had to be as fast and accurate as razor blade editing, which has been the challenge up to now," said Herb. "If you want to insert a piece into a longer piece, just take a razor blade and chop and glue, all in a few seconds."

With SpeakEasy, he said, "You can do inserts faster because you can actually preview the insert edit, which is extremely difficult with razor blade edits."

According to Heiges, start and stop points can be located faster because you're recording on a hard disk. "You don't end up with a bunch of tape on the floor when you're editing," Heiges noted. And one other advantage of digital over analog—"you don't lose any of your original."

Another advantage is that the editor can move from the beginning of a 30-minute program to the end of the program with simply the touch of a button, Heiges said. Other devices would require fast forwarding the entire tape.

Once edited the result is 7 kHz mono audio which Herb said is "designed for speech cuts." An audio segment can go direct to air or be transferred to cassette or another tape format. Also, because of its digital abilities, the audio remains first generation quality, Heiges said.

The program also has the capability to process networking functions.

"Because it runs on an IBM XT, you can use networking abilities that (they) have these days," said Herb. "You can buy systems that tie a number of PCs together so that they can talk to each other or talk to a general purpose file server.

"And since once it's stored on a disk, the digital audio looks like any other data—whether it be a word processing file or a Lotus 123 file—the same network works with SpeakEasy audio files of data," he said. "That way, you can transfer the data back and forth, which can be quite useful for larger networks."

CBS pleased

CBS-Washington has been pleased with the product, Heiges said, and while using one of the units at the Democratic and Republican conventions to feed cuts to individual stations, SpeakEasy raised eyebrows from other markets.

"It seems that (CBS-New York's radio division) was very pleased with it at the conventions," he said. "We were the ones really pushing for it because we do more of this kind of work by the nature of business here in Washington, but eventually, I believe New York will be going to the same system."

Herb estimated it will cost in the neighborhood of $7000, depending on storage capability.

Despite its apparent success and Hargraves's prominent role in SpeakEasy's development, he shrugged off the accomplishment.

"Glenn (Herb) did it to come up with a product that he felt would be worthwhile to networks and local stations at a reasonable cost," Hargraves said. "He's achieved that."

For more information about SpeakEasy, contact Glenn Herb at 617-894-0565.

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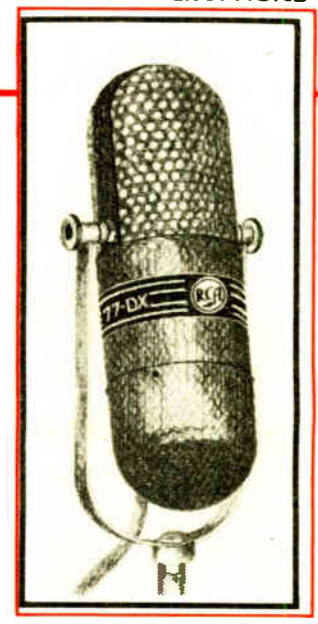

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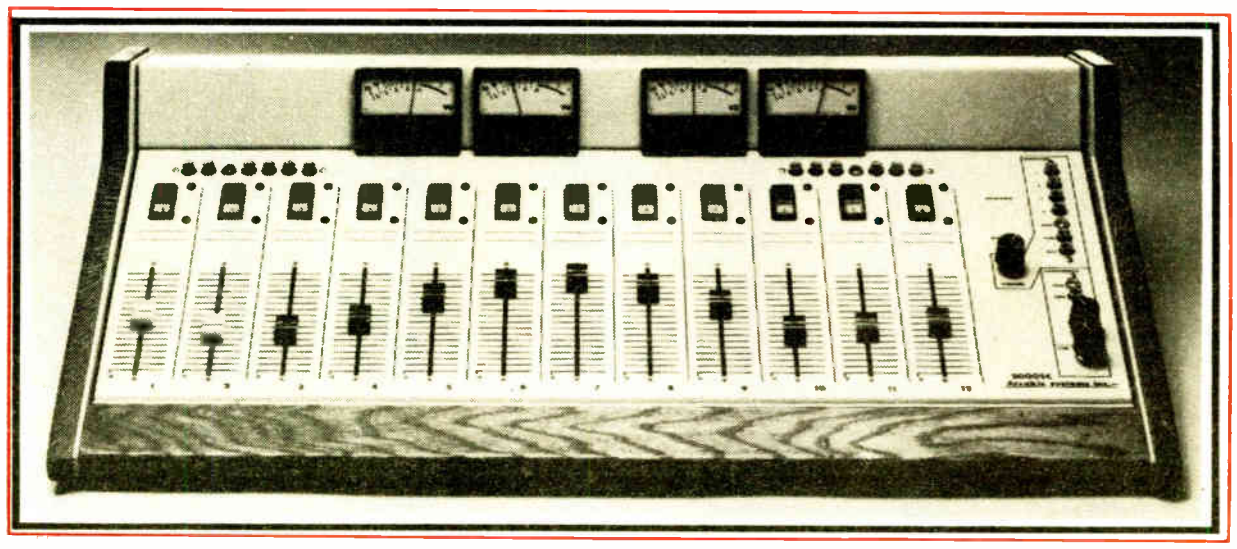

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World Radio History

ONE-ON-ONE

Spotlight On: Thomas Yingst

Washington DC ... At the end of May Harris Corporation appointed Thomas Yingst as VP and general manager of the company's Broadcast Division.

Yingst came to Harris after 13 years at Varian Associates, Inc. having held previous management positions with RCA Corporation, so his experience in the transmitter industry is extensive.

Harris, which is a $2.1 billion supplier not only of broadcast equipment but also of products to other communications and information markets, is experiencing, in Yingst's words, "a steady growth."

This rebound comes after Harris suffered in the wake of a decline in the international market. On a recent trip to Washington Yingst provided RW editor Judith Gross his insight into the transmitter market and other markets Harris serves, as well as some forecasts for the future.

RW: *There have been many fluctuations in the transmitter industry over the past year or two. Could you comment on its general health, especially the international vs. domestic market?*

Yingst: The transmitter market remains stable worldwide, and is growing slowly —at about 5% per year. At present, the US market is mature and basically flat, showing peaks from time to time as a replacement cycle occurs. A replacement cycle can be caused by two things—transmitter age or new technology.

Internationally, the broadcast product market is showing continued growth with upgrades and the addition of new stations worldwide.

RW: *What about Harris' place in the market and its previous problems, have they been solved?*

Yingst: Harris plans to strengthen its position for AM, FM and TV not only domestically, but worldwide as well. Despite increasing competition, the broadcast division has held its own and is positioned to be even stronger in the future.

The division has been downsized from its peak a few years ago when a major international expansion cycle was occuring in oil rich countries.

RW: *What other specific changes had to be made?*

Yingst: Other changes have included the total reorganization and refocusing of manufacturing, because it was recognized that manufacturing can—and indeed, should—be a powerful competitive weapon.

In the past 18 months, the division has implemented a team manufacturing concept; "just-in-time" and other programs. The result has been substantial reduction of expenses that do not add value to products; shorter product delivery time and steady, measurable improvements in quality.

In its new lean and mean configuration Harris Broadcast has a clear vision of itself as the world's leading supplier of quality transmitters and as the top service organization in the industry. We're also working to strengthen our leadership position in the world broadcast market.

RW: *What new directions have you planned for Harris? How about new products—will Harris concentrate mostly on its transmitter line?*

Yingst: We're placing emphasis on the expansion of digital technology for AM products introduced recently with the DX-lO transmitter. Actually, the DX-lO is not just a single, isolated product. It was the first in a series of digitally modulated solid state transmitters Harris will introduce.

This year, the DX-50 will be added, and later, the DX-100 and DX-250 as dictated by the market. This transmitter family gives the users new levels of reliability and performance while increasing the overall efficiency to 86%.

Also in the works is an upgraded FM transmitter line with introduction of three HT families. The new series will combine state-of-the-art features with performance and reliability for the customer.

The major emphasis in the broadcast division will be RF transmission with transmitter and accessories components being the core of our business.

RW: *How is the DX line of digital transmitters being received? Are they in a competitive position in the marketplace?*

Yingst: Digital transmitters are being received extremely well. These transmitters are becoming accepted because of their excellent performance, high reliability and high efficiency.

Although priced slightly higher than PDM transmitters, the digitally modulated transmitters offer a fast payback (a few years) as a result of reduced electricity costs due to their high efficiency.

In addition to the 10 kW model, we'll soon add the 25 and 50 kW models to the family. We plan to take the DX technology to 250 kW or any power in between as required by the industry.


Harris VP and GM Thomas Yingst

RW: *How about for FM?*

Yingst: Harris has done considerable work on digital FM systems as well, but implementation of the system is three to four years away.

RW: *What's ahead for solid state transmitters, for AM and FM?*

Yingst: Solid state already is in a dominant position in AM but has not achieved dominance in the FM market. This is primarily due to the excellent reliability of the single tube FM transmitter and the higher cost plus lower efficiency of the equivalent solid state transmitter. Solid state approaches will be a factor in the FM market at power levels up to 5 kW during the next few years.

RW: *What about AM's declining position in the radio marketplace, how does that affect your market? And how about synchronous AM and AM stereo?*

Yingst: Well, we know of course that AM listenership has declined to less than 30% compared to 70% for FM. Economics dictate that this must seriously impact thousands of AM broadcasters.

We saw its first impact at lower power stations, but now this switch is affecting even the largest stations. At this past NAB show, however, we noticed that AM seemed generally more optimistic than it had in a long time. In fact, AM seems to be stabilizing and AM stations are doing several innovative things.

First, the number one stations have managed to adjust their expenses to revenues to survive. They're also offering programming different from the FMers.

AM has become more a medium for news, sports, weather, local talk, some music and recently the highly successful national talk shows. AMers seem to include more things of local interest with these new formats and thus offer diverse and often community-oriented programming.

Secondly, some AM broadcasters are attacking the FMer on his own turf, turning to a number of technical improvements. By using stereo, AM sounds indistinguishable from FM in an automobile.

Many AM stations are using the NRSC filter to clean up the entire AM spectrum, and others are using AM syn-

(continued on page 22)

. . . some AM broadcasters are attacking the FMer on his own turf, turning to a number of technical improvements.

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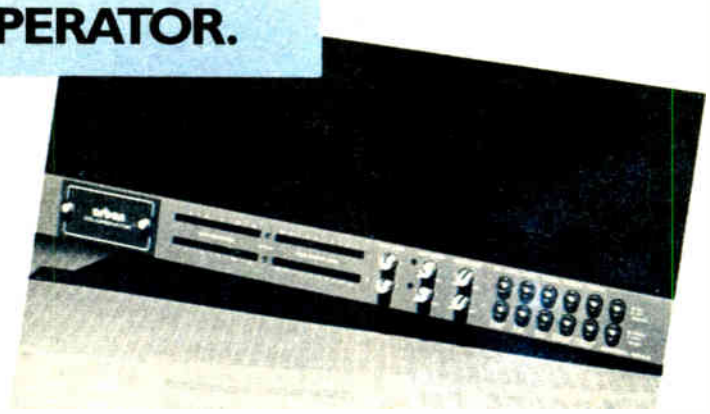

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Circle Reader Service 10 on Page 38

World Radio History

Opposition Strong to FCC IF Plan

by Alan Carter

Comments Suggest That Modification of "IF Taboos" May Cause Increased Interference in the FM Band

Washington DC ... Opposition was strong to a proposal by the FCC that would give FM broadcasters more flexibility in selecting antenna sites, according to comments filed.

In a Further Notice of Proposed Rule Making, under docket 86-144, the Commission sought comment on adjusting the intermediate frequency (IF) distance separation of domestic FM stations.

IF distance separation requirements are the minimum distances, by station classes, that each FM broadcast transmitting antenna must be spaced from the transmitting antennas of other stations that are IF-related. An example would be stations operating on frequencies 10.6 or 10.8 MHz above or below that of a specified station.

The proposed distances have been calculated to prevent overlap of the predicted 36 mV/m (91 dBu) contours of IF-related stations, regardless of class.

This level of protection, the FCC said, is equivalent to that provided by the least stringent current FCC requirements. The proposed distances are either the same as, or less than, those under present rules.

More static

One of the strongest opponents to the rule change, Greater Media, argued that any reduction of the IF mileage separations would create new IF interference to receivers now in use.

Citing an FCC study by the Office of Engineering and Technology (OET) and one by the NAB, Greater Media noted that the present restriction on stations separated in frequency by the FM-IF appears useful.

However, it noted an increase from a 20 mV/m to a 30 mV/m criterion may be feasible, depending on "the policy tradeoff of the additional degradation versus additional FM broadcast service."

Greater Media also critized the OET study, claiming it underestimated the impact of reduced IF standards on receivers currently in use.

> ***... the FCC ... was unaware of 'widespread' IF interference problems ...***

Greater Media pointed out that no tests were performed on receivers that were not equipped with external antenna terminals, disregarding portable and Walkman-type radios and many tabletop and clock radios.

"The failure to include this vast body of receivers wholly undermines the validity of the OET study and compels the conclusion that the OET study substantially underestimates impact of the proposed relaxation of IF standards on actual FM reception by the public," Greater Media explained.

In the notice, the FCC stated it was unaware of "widespread" IF interference problems, but Greater Media noted its experience with WHMP-FM, Northampton, MA, separated by 54 channels from public station WFCR, Amherst, MA.

Greater Media registered its problems in Northampton based on the experience of Milford Smith, who served as CE there from 1969-1970 and recently revisited the area to conduct a series of tests.

Same equipment

The stations virtually have the same facilities they had 20 years ago, according to Greater Media. WHMP-FM operated with an ERP of 3.0 kW and a HAAT of 322' (98.1 m), essentially the equivalent of a full-capacity Class A station.

WFCR operated with an ERP of 35 kW and a HAAT of 720' (219.5 m), a Class C-1 facility (by commerical standards) although operating with facilities well below those allowed for a fully developed Class C-1 facility (100 kW at 299 m).

The stations were sited at a 20.63 km spacing.

"They were and are effectively short-spaced under current FM-IF minimum mileage separations requirements, which specify a separation of 32 kW between such Class A and Class C-1 facilities," the group owner stated.

Greater Media noted Smith's complaints of "massive amounts" of FM-IF interference in the area surrounding Northampton and Amherst during his time at WHMP.

Based on recent tests he conducted with a broad variety of "typical off-the-shelf receivers," Greater Media said Smith found IF problems of 20 years ago unchanged. He also observed a number of automobile radios stopping in the "seek" and "scan" tuning modes on virtually every channel due to FM-IF interference.

In its comments Greater Media con-

(continued on page 22)

More Readers Forum Mail

(continued from page 5)

sounds off bells and whistles and applies weather radio audio to the cue system in all air studios.

Three seconds later the cart starts in the record mode. The warning/watch information is recorded directly from the NWR. At the end of the watch/warning announcement two different DTMF tones are transmitted. These cut audio from the input to the cart machine.

Once the cart recues, the producer has a clean cart that can be immediately aired in conjunction with the appropriate announcement and EBS tones.

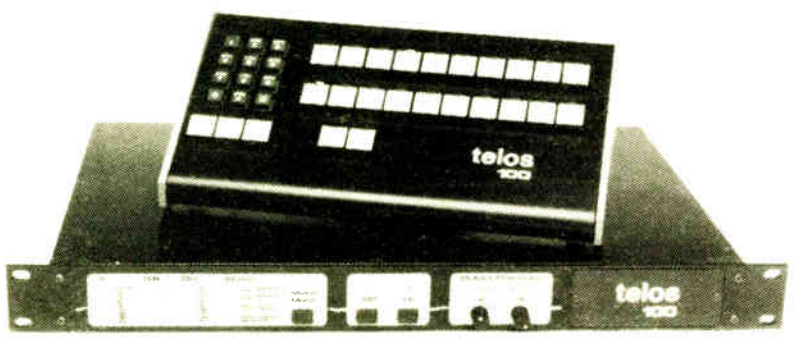
To detect a breakdown of the system, NWR monitors KDKA with an EBS receiver. If their receiver isn't tripped by the two-tone EBS signal within five minutes of their sending the DTMF tones they are alerted! A telephone call then serves as a backup.

The parts for this system cost less than $100, not counting the junked cart machine that was resurrected for this purpose. The machine is adequate as it is only powered when an alarm is received.

A cheap and dirty cassette machine could serve the same purpose. The National Weather Service tests the system on a weekly basis.

It seems to make sense that if we are going to have an Emergency Broadcast System we should have a system that is reliable and works when it is needed.

Jack Layton, Engineering Manager
KDKA
Pittsburgh, PA



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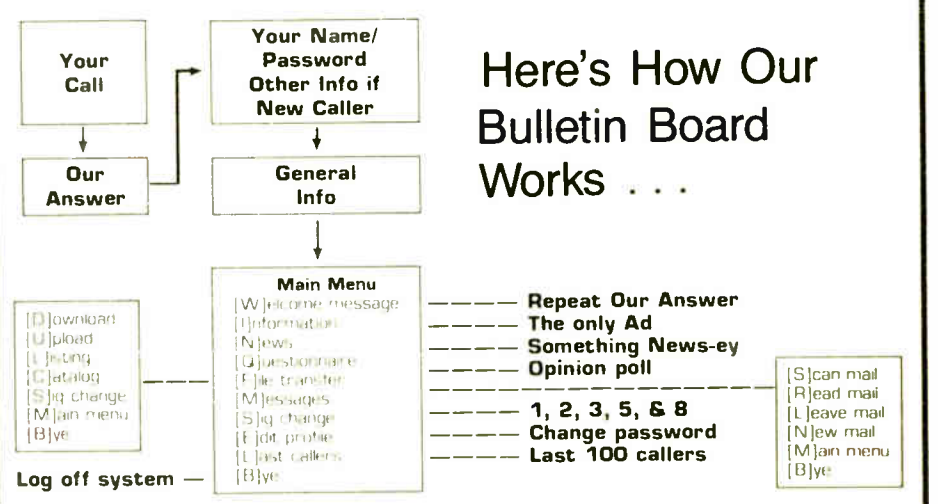

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World Radio History

Antenna Plan Draws Complaints

(continued from page 1)
stated.

Opposition also came from the Association for Broadcast Engineering Standards (ABES), which claimed a switch to primary service contour protection from mileage separation would create more interference. The group said the contour protection method is not accurate.

"In its notice, the Commission has largely ignored the cautionary statements of ABES and others who warned against the evils to result from starting down the slippery slope of compromise with the mileage separations standards upon which the structure of commercial FM allotments and station assignments rest," ABES wrote.

While noting the successful use of directional antennas in certain circumstances, the group, however, said that their adoption would mean converting to contour protection, "opening the door to new interference to existing service, and the eventual degradation of the commercial FM service."

Other opposition was registered by the Louisiana Association of Broadcasters, Eastern Broadcasting Corp., KXKZ-FM, Ruston, LA, and the Association of Maximum Service Telecasters.

Limited use

Taking a less stringent position, the Association of Federal Communications Consulting Engineers (AFCCE) supported use of directional antennas on a limited basis only for short spacing transmitter sites for otherwise fully spaced allocations.

But on the issue of accepting interference, AFCCE is opposed to the policy because the station agreeing to the interference may be "unnecessarily restricted" in making changes in the future.

Greater Media noted its opposition to the proposed reduction of Class B stations' protection down to 1 mV/m, under the rule making. The broadcast group also said it is opposed to the use of short-spaced directional antenna proposals in the FM allocation process, but supports limited use of short-spaced directional facilities in order to provide some flexibility for licensees desiring to relocate their stations.

On the issue of going from mileage-based to contour-based FM allocation, Greater Media claimed it would lead to increased interference and congestion.

"Greater Media believes that the need for flexibility in site selection could be accommodated by a rule which would permit licensees to create a maximum short-spacing of 10 kilometers," the group stated.

. . . the Commission has largely ignored the cautionary statements of ABES and others . . .

Greater Media was another opponent to accepted interference, claiming the proposal would permit licensees to accept interference when none now exists.

Restrictions suggested

Three broadcast groups, Infinity, Shamrock and Capitol, opposed the protected contour system and suggested that stations be permitted to operate at less than standard spacing so long as they do not extend their primary service contours beyond those to which such stations would be entitled operating at maximum height and power from their existing fully spaced site.

The groups also suggested that interference protection for short-spaced stations should not be limited to the service contours defined by their directional antenna in directions where no short-spacing is created.

Instead, they called on the Commission to protect the maximized primary coverage areas those stations would have when operated at their existing fully spaced site.

In line with other commenters, the three groups opposed the practice of accepted interference.

Shamrock went further and said steps should be taken which will ensure that technical operations of directional antennas used by short-spaced stations provide adequate protection to neighboring facilities throughout their operation.

Crain Broadcasting, licensee of WWUS-FM, Big Pine Key, FL, supported the rule making "where constraints beyond (a station's) control make the achievement of optimum coveraage impossible by traditional means."

In its case, WWUS cannot provide coverage throughout the Florida Keys because FAA, the Army Corps of Engineers and the commission's directional antenna rules limit it, the broadcaster claimed. "Use of directional antennas in cases such as Crain's appears to be the only possible means available to overcome governmentally imposed height restrictions in the Keys."

Fuller-Jeffrey Broadcasting of Sacramento, CA, noting opposition to directional antennas used in allocation purposes, supported their use to enable existing stations or CP to locate to a superior site.

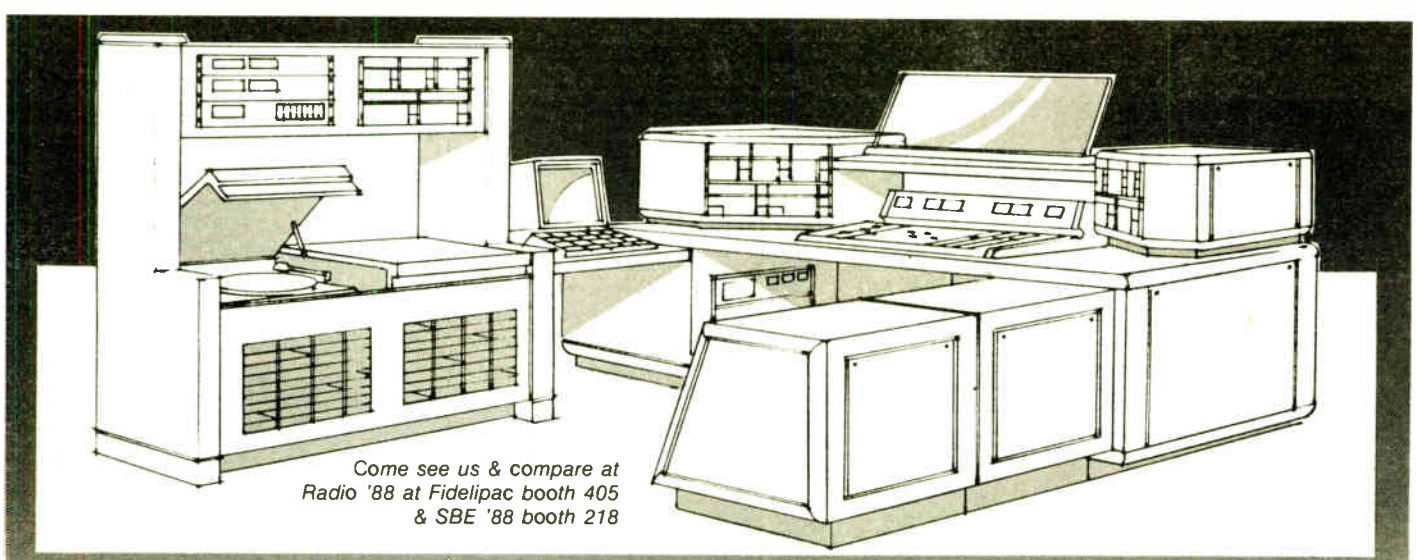
Scripts Howard Broadcasting said directional antennas should be used only where there are no other practical alternatives, and maintained directional antennas should never be used to effect a short-spaced drop-in or for the purpose of moving from a served market.

Support for the rule making came from several broadcasters including the Massachusetts Class A Broadcasters Association. The group said the proposal is a means to permit expansion of existing Class A service areas.

Edens Broadcasting said the proposal would be a step towards restoring licensees some flexibility in antenna site selection that was lost by the addition of new FM stations and by the higher re-classification of existing stations.

Reply comments are due 5 September.

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



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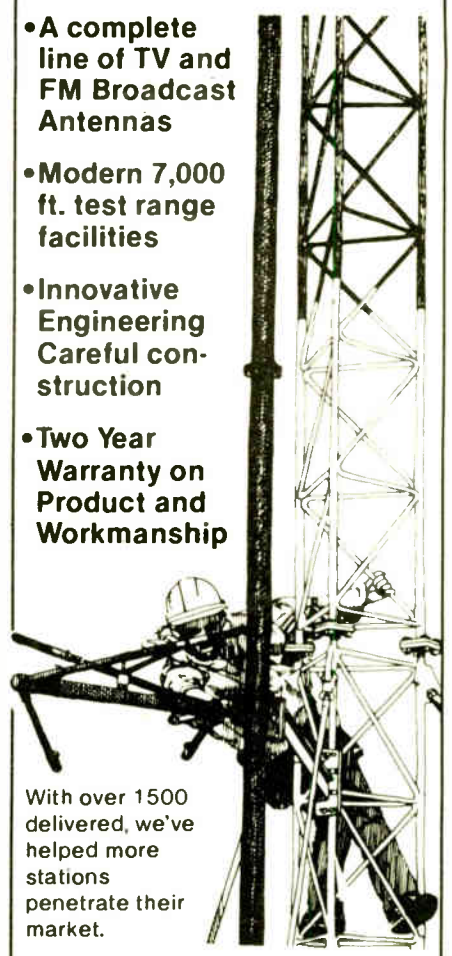

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Circle Reader Service 7 on Page 38

World Radio History

AM Jamming Probed

by Alan Carter

Washington DC ... Cuban interference not only continues to plague AM broadcasters in the US, but has started up on a third frequency.

Since 1 July, Cuba has broadcast on 830 kHz in addition to previous and continuing broadcasts on 1040 and 1160, distorting nighttime transmissions of AM stations from Florida to North Carolina, Tennessee and Texas.

The rash of interference began 16 June, a move the NAB alleged is in retaliation to US Senate action on a TV version of Voice of America's Radio Marti.

Cuba broadcast the Caribbean Music Festival 16-19 June from 6 PM to midnight. But broadcasts started again on 22 June and 28 June, a program of travel information Radio Taino and an occasional rebroadcast of Radio Moscow. The broadcasts have included news and sports in Spanish and English.

According to NAB spokesperson Bob Hallahan, "The announcer said this is going to be a regular service, and I hope you enjoy it."

(From left) RAC's Wallace Johnson, Wilson LaFollette and Ralph Justus discuss Cuban interference.

Seeking relief

NAB Regulatory and International Affairs Director Ralph Justus encouraged two subgroups of the Radio Advisory Committee at a July meeting to find ways to "relieve these long-standing interference problems. I see a long-term, 10- to 20-year problem."

FCC International Deputy Chief Wilson Lafollette said during the meeting that the US has had "discreet" discussions with the Cuban government. "We don't know whether they will ever agree or agree tomorrow," he said. "It's going to be a delicate and very complicated process."

The FCC has been hesitant to connect the Cuban broadcasts to the Senate action on TV Marti funding.

TV Marti facilities are planned to operate from the Florida Keys, using a tethered aerostat or blimp at an altitude of 10,000 to 14,000 feet. It would use a directionalized transmission antenna to broadcast VHF signals designed to reach Havana.

NAB has argued that TV Marti will create interference for US TV broadcasters and maintained that the Cuban government could easily render the signal ineffective with low power television transmitters.

Reports of problems

NAB has had various reports of interference and also has contacted stations seeking information.

Among those stations reporting interference at 830 kHz are WADU, Norco, LA; KABN, Long Island, AK, and WCCO, Minneapolis. Those at 1040 kHz are WYFX, Boynton Beach, FL, and WHBO, Pinellas Park, FL. Stations at 1160 kHz are WAMB, Donelson, TN; KSL, Salt Lake City, and WJJD, Chicago.

Hallahan said the NAB is encouraging stations experiencing interference from the Cuban broadcasts to register their problem with the FCC.

For information from NAB on TV Marti, contact public affairs at 202-429-5340. For questions about Cuban interference from the FCC, contact the enforcement branch at 202-632-6975.

MORE FCC FILES

(continued from page 14)

the ruling might cause and because their allegations were "nothing beyond pure speculation."

NAB then contested the denial, as did NPR, NFCB and three other groups in a joint filing.

In July, comments were filed on the FCC's Further Notice of Proposed Rule Making by many of the same groups, primarily with the same arguments.

Most recently, on 10 August, reply comments were filed by the NAB and NPR on the Further Notice, restating their previous complaints.

For more information on Docket 86-112, contact Tatsu Kondo at 202-632-6302.

FM Algorithm

Comments and reply comments filed by broadcast engineers generally supported an FCC proposal to standardize the FM propagation algorithm, but not without amendments.

The FCC issued a proposed rule making in February that would designate the algorithm used in its computer programs as the official standard the Commission would use for FM propagation calculations.

The Association of Federal Communications Consulting Engineers endorsed

(continued on page 35)

Splatter matters.

Splatter is a form of radio interference that can drive listeners away from AM radio. It creates distortion in your signal, wastes transmitter power on undesired sidebands and interferes with other stations. Even with an NRSC audio filter, misadjustment of the transmitter or audio processing equipment can still produce an RF spectrum that can exceed NRSC or FCC limitations.

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Circle Reader Service 15 on Page 38

World Radio History

FCC AM Band Plans Criticized

(continued from page 12)

CBS, which also filed comments, agreed with the other groups that national licensing is without merit, calling it unnecessary, flawed and problematic.

The proposal "will likely open a Pandora's box of legal and policy issues, the resolution of which will long delay implementation of" the expanded band, said the network.

Operation of the frequency by the licensee also appears "suspect," CBS said, and would likely lead to unregulated interference.

Another issue the Commission addressed in its Fourth Notice was whether current daytime stations should be given preference to frequencies in the expanded band.

The NAB supported the idea as "an ideal method for the Commission to maximize genuine public benefits" of the expanded band, and suggested that channels 1620, 1640, 1660 and 1680 kHz be set aside for daytimer conversion because they afford the greatest domestic allocation flexibility.

Address duopoly

It added, however, that the daytimers should be allowed to maintain the daytime-only frequencies along with their expanded band allocations until whatever time that expanded AM band operations have attained significant success and audience penetration.

At that time, the daytimer license should be terminated—and not sold to another party—as a major step in lessening overall interference on the AM band, the NAB stated. Such an arrangement, however, would mean that current duopoly rules would need to be addressed.

CBS agreeed that such a ruling for daytimers would "permit the elimination of significant amounts of destructive interference in the lower-band during the critical post-sunset and pre-sunrise hours. Such deletions will also permit existing co-channel and adjacent channel full-time stations to improve facilities to the benefit of the public."

While ABES also supported daytimers receiving priority for expanded band allocations, it reasoned that following a seven-year period, the licensee be given a choice of which facility—the original or the expanded band—to maintain.

If the expanded band is chosen, ABES agreed, the original designation should be cancelled.

The three organizations also offered comments on other issues regarding the proposed expanded AM band.

The NAB advised the FCC to protect the 2 mV/m nighttime contour of expanded band stations and to include a requirement that new stations provide co- and adjacent channel protection to each other in accordance with two recent NAB technical studies.

It also recommended that existing RSS calculation methods be overhauled to provide an accurate indication of nighttime interference levels between stations; and that the effects of atmospheric and man-made noise should be considered in areas where those interference levels are significant.

To provide a wide-range, community-oriented service, the NAB suggested that the allocation scheme should be based on methods that limit the number of stations using directional antennas in the expanded band.

CBS and ABES agreed with the Commission's recommendation that the frequency 1700 kHz should be allocated to Travelers Information Service.

ABES recommended at least one of the 10 new channels be reserved for such, while CBS recommended that several be reserved.

"Increased AM band use by public noncommercial broadcasters will not only permit public noncommercial radio to serve presently unserved areas but, given the limited range of the FM signal, provide a particular benefit to the mobile audience," said CBS.

"While public noncommercial radio has made excellent progress in the FM band, the facts are that relatively few AM stations fulfill that function ... Given the nature and limitations of the FM signal, a national AM service would be of particular benefit to the traveling public," ABES said.

ABES, which addressed a number of technical issues within the expanded band, urged creation of a new Class V station, which could operate unlimited hours with a maximum power of 10 kW and minimum power of 250 W, except border areas where stations would operate with a 1 kW maximum; as well as opinions regarding protection standards, groundwave propogation, paragraph 48 skywave propagation, coverage and daytime skywave.

Reply comments on the AM expanded band, contained in Docket 84-467, were due 26 August.

For more information, contact Wilson LaFollette at the FCC, 202-254-3394; or Barry Umansky at the NAB, 202-429-5430.

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World Radio History

Yingst Addresses Radio's Future

(continued from page 17)
chronous sites to cover areas which were uncovered—usually because of terrain problems. These techniques can help AM stations stay competitive with FM.

The AM industry will upgrade to protect its large capital base. Harris is seeing a more upbeat approach in these markets. We sense that AM broadcasters have a renewed commitment and they intend to be successful.

RW: *Have you noticed any impact from station trading and mega-bucks deals on equipment purchases, especially high-ticket items such as transmitters?*

Yingst: While the station trading trend seems to be stabilizing, many stations upgraded their transmission equipment prior to sale or trade. With market stabilization, there are bound to be more equipment purchases for the smaller stations.

Many of the large groups which own several AM, FM and TV stations upgrade according to their three to five year plans and try to encourage long term multiple year purchases.

RW: *What about the CE's declining position in the radio industry? Who do you contact when the station doesn't have a full-time engineer and who's making the purchasing decisions these days? Will you shift your focus to GMs?*

Yingst: The chief engineer's role has changed dramatically in the broadcast facility. FCC requirements and economic changes have drastically reduced the number of technically trained people at all radio stations.

In fact, many smaller stations don't even have a resident chief anymore. Without this constant presence engineering representation has declined in day-to-day activities, crises situations, and the purchasing process.

We find that the studio-trained engineer now—more than ever—often must take care of the entire technical requirements of the radio station. This can present serious difficulties when maintaining an RF transmitter.

We also find a variety of talents responsible for tasks once within the sole domain of the chief engineer. Program directors, contract engineers, consultants and, of course, the general manager are influencing the purchase decisions.

There are many implications to a broadcast equipment manufacturer. The loss of the CE has placed an emphasis on Harris to build extremely high reliability equipment which is simple to service and does not require a high level of expertise to operate or maintain.

Simple module replacement in a solid state transmitter is a good example of the approach.

The purchasing focus by smaller or independently owned stations will move toward the GM and consultant. As the reliability of transmitters continues to improve, many of the lower power units could be purchased through distributors like Allied in the future.

RW: *The number of engineers with RF experience and expertise is also in decline. How does this affect maintenance and the longevity of transmitters?*

Yingst: It is true that the number of engineers and technicians with RF expertise is on the decline. This is one of the reasons Harris sponsors a Broadcast Technology Training Center with more than 50 courses offered each year.

This past January, Harris added general training programs—two week-long RF circuits courses and workshops in AM, FM and TV, to its course roster.

We also co-sponsor a two-year, degreed program in broadcast electronics technology with John Wood Community College, and, recognizing the importance of providing training for broadcasters from developing nations as well, we're a major supporter of the US Telecommunications Training Institute (USTTI).

RW: *Overall, it appears that the transmitter market generally, and Harris specifically, has overcome some stumbling blocks and is now looking at a much healthier future.*

Yingst: The AM, FM and TV market is a very viable market for Harris and will be a major part of its future. Harris will remain a full line of broadcast equipment manufacturer.

The industry is sensing the renewed vitality of the Harris Broadcast Division. A visit to Quincy to see the largest and most modern facility dedicated to the broadcast industry will support these observations.

The future will see Harris as a major supporter of transmitters to the world broadcast industry as has been the case for the past 66 years.

No Change to IF Rules, Groups Urge

(continued from page 18)
cluded that reducing FM-IF minimum separation distances "would reflect an unwise and unsound engineering judgement." It added that the test data was not complete and at best would support maintaining current separation requirements.

"The real world observations of Mr. Smith, in conjunction with the Commission's and the NAB's test data, demonstrate that relaxation of the IF rules will result in increased interference of significant proportions," Greater Media said.

Other opposition

Several broadcast trade groups also opposed relaxing IF separation requirements, as set forth in the notice.

The NAB urged the Commission to take a "go slow" approach. The group said a relaxation could produce significant additional interference.

Recent test data on receiver IF interference susceptibility indicate that no particular protected contour will assure all receivers protection from IF-induced interference, NAB wrote.

NAB also said tests reveal a performance degradation in a number of receivers when exposed to existing protected contours.

"With this in mind, NAB urges the Commission to heed recommendations of the receiver manufacturing industry. The Commission should not immediately use a 'blanket' IF spacing reduction approach."

NAB advised against modification of the "IF Taboo" due to the unpredictability of receiver-to-receiver performance. NAB also identified a number of instances where IF interference had been noted even where the involved stations complied with required separations. The NAB comments concluded that the IF interference problem could be lessened, if not solved, by improved receiver design.

In the latest comments, NAB suggested that the receiver industry should be given time to begin a standardization process, and its outcome should determine the contour to be protected. In the interim, the NAB continued, cases in which a waiver is sought due to inadequate IF separation should be treated on a case-by-case, technical basis.

Waging a bet

Implementation of the FCC's proposal would be a "roll of the dice," NAB claimed.

Also registering concerns were the Association for Broadcast Engineering Standard (ABES), the Association of Federal Communications Consulting Engineers (AFCCE) and Consumer Electronics Group (CEG) of the Electronics Industries Association (EIA).

EIA/CEG said adoption of the proposed uniform level of protection from IF interference would result in increased interference and a consequent reduction in the quality of the FM broadcast service.

ABES agreed that data concluded that any reduction in mileage separation among stations in an IF relationship is likely to cause increased degradation in reception as a result of IF-type interference.

AFCCE also opposed the plan but called for further definitive data than produced by the FCC study.

Among station owners, Edens Broadcasting, licensee of stations including WRBQ-FM, Tampa, FL, noted its support for the added flexibility with the proviso that IF-related stations be enabled to use directional antennas, and/or restricted effective radiated powers to avoid overlap of their predicted 36 mV/m field-strength signal contours.

In reply comments, Greater Media noted Edens as the only support for the proposal and called it a "self-interested endorsement that no way supports the Commission's tentative conclusion that a relaxed IF standard would provide licensees with needed flexibility in site selection."

Greater Media reiterated that the "overwhelming evidence" leads to the conclusion that relaxation of the IF standard would result in harmful interference nationwide across the FM band.

For information on docket MM 86-144, contact Jay Jackson at the FCC, 202-632-9660.

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Circle Reader Service 24 on Page 38

World Radio History

Making Your Station Reliable

by John "Q" Shepler

Rockford IL ... "OK, OK, I'm comin'!"

With that you slam the phone down. Geez, what a time for the phasor to conk out. You bound out the front door and head for the driveway.

Oh-oh. Little Billy has just shoved the tail of the inflatable zebra into the last remaining niche of the station wagon. Everybody is laughing and waving. It's time to head off for that two week vacation at the lake. Well ... almost time.

Their faces drop when you tell them there's trouble at the station. They know what that means. Last time there was trouble you didn't come home all night. That was only two days ago.

Q-Tips

In silence, the five of you drive to the radio station. As you get out of the car and trudge toward the back entrance, you turn to see the family, their expectant faces pressed against the windows of that crammed station wagon. Your stomach sinks. There must be a better way.

A better plan

What you need is a more reliable operation—one you can turn your back on. The question is ... how do you build a reliable station?

The first step is to understand what you're up against. Your nemesis is something very simple. It's called Murphy's law:

If anything can possibly go wrong—it will.

There really was a Murphy. He was an engineer, and he experienced the same equipment frustrations we do. His law gives us a hint of what to do to avoid trouble: fix it so nothing can go wrong!

A good plan would be to find out where the most troublesome areas are. Keep a log or review the trouble logs you already have. Do the same tape machines keep breaking? How many times did the high voltage rectifier blow in the last six months? Look for patterns.

You can make a list of the top ten troublemakers and start working on those right away. Don't just pick the things that fail the most often. Pick the ones that fail often and have the most devastating effects.

For instance, the start lamps in the automation cart machines may burn out all the time, but how important is that? A shut-down transmitter, however, gets everybody excited.

Here's a hint. Keep a log of everything that you get called into the station from home to fix. You know that these problems are important. Give special attention to anything that breaks twice.

An ounce of preventive maintenance is worth a pound of panic cures. If you don't already have a routine established, have another look at the top troublemakers. These items should get a regular once-over more often than the pattern of breakdowns.

If pinch rollers start slipping in a year, change them every six to nine months. The idea is to fix the breakdowns just before they naturally happen.

The manuals that come with your equipment often spell out the maintenance needed. Those plans can sometimes be overkill, since they take into account the heaviest users. You may not need weekly tape head alignment, but don't let it go more than a month or two.

Cleanliness is next to ... impossible

Personally, I like a clean operation. The equipment really does work better and the job is a lot more pleasant. It also impresses the higher-ups to see their expensive capital expenditures so well cared for.

It's relatively easy to keep the front panels clean with a little dusting. But the insides of amplifiers buried in the racks, and transmitters that haven't been off the air in six months are another matter.

One approach that makes sense is to take a faulty piece of equipment out back of the station before you start troubleshooting. Blast it with an air compressor nozzle until it looks like new. This makes the repair work easier, gets the equipment clean and helps heat dissipation by getting rid of all that insulating dust.

I can't stress the importance of daily cleaning of tape heads and pinch rollers. It even makes sense to the air staff, who can probably be talked into taking over this chore.

A special note on cleaning air filters. I didn't realize the importance of this until chips started failing in an automation system.

It didn't look that dusty, but after weeks of heated debate and hate mail with the manufacturer, I decided to play it their way for a while. The screen on the muffin fan got rinsed in the utility tub once a week. The chips never failed again.

Stress tests and burn-in

There is nothing worse than finally repairing a piece of equipment after days of struggle, proudly replacing it in the studio and having it fail within the hour. The embarassment alone is too much.

Next time you believe something is fixed, don't be so quick to get it back into service. Take a little time to make sure it is really fixed and not on the hairy edge of going out again.

Did a resistor open up? That's strange. How solid is the rest of the circuit card? Maybe something else would happen if you turned a hair dryer on the whole cir-

(continued on page 27)

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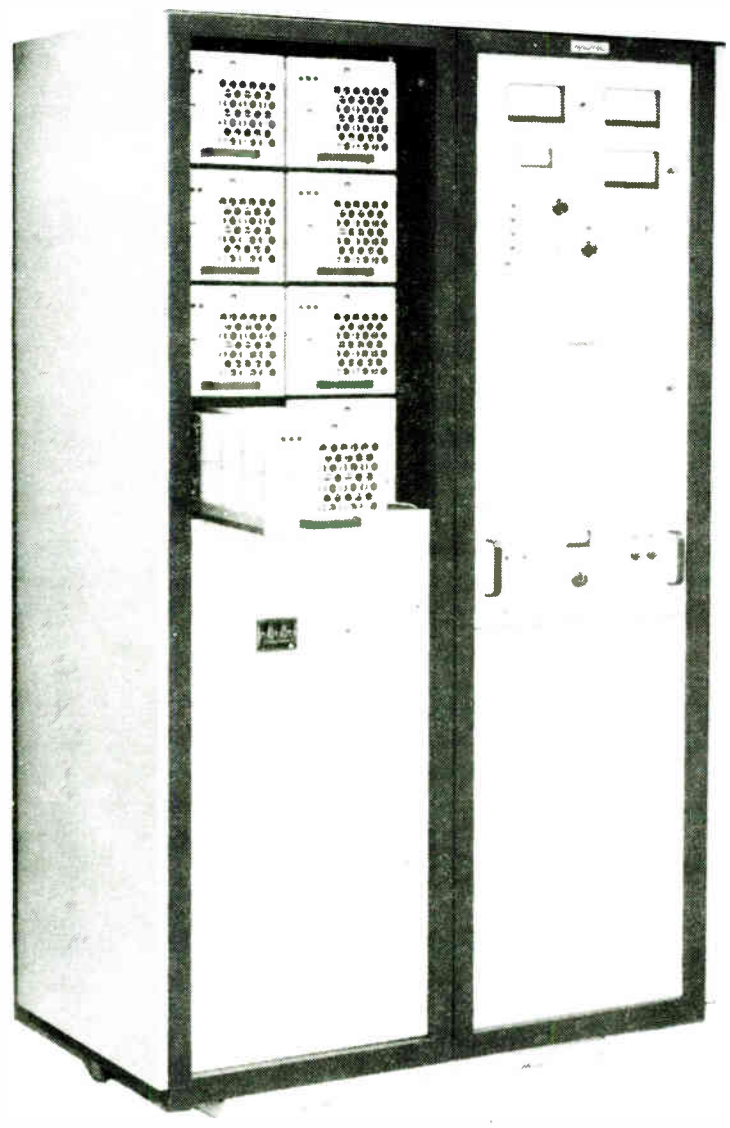

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Circle Reader Service 9 on Page 38

World Radio History

Transducer Operating Specs:

by Bruce Bartlett

Elkhart IN ... What microphone is best for voice-over? What's a good piano mic? Should the microphone be a condenser or dynamic, omni or cardioid?

These questions can be better answered once you understand the various types of microphones and their specifications.

After learning a few basic definitions you'll have a better idea what microphone to use in a particular application.

A microphone is a *transducer*—a device that converts one form of energy into another. Specifically a microphone converts acoustical energy (sound) into electrical energy (the signal).

Transducer types

Microphones for radio broadcast can be grouped into two types depending on their operating principle: dynamic or condenser.

In a dynamic microphone a moving conductor cuts magnetic lines of force to produce electricity. Two types of dynamic microphones are moving-coil and ribbon mics.

A moving-coil mic (popularly called a dynamic mic) is shown in Figure 1. A coil of wire attached to a diaphragm is suspended in a magnetic field.

When sound waves vibrate the diaphragm the coil vibrates in the magnetic field and generates an electrical signal similar to the incoming sound wave.

In a ribbon microphone, a thin metal foil or ribbon is suspended in a magnetic field as shown in Figure 2. Sound waves vibrate the ribbon in the field and generate an electrical signal.

In a condenser or capacitor microphone as in Figure 3, a conductive diaphragm and an adjacent metallic disk (backplate) are charged to form two plates of a capacitor.

Sound waves striking the diaphragm vary the spacing between the plates; this varies the capacitance and generates an electrical signal similar to the incoming sound wave.

Figure 1. A moving coil microphone

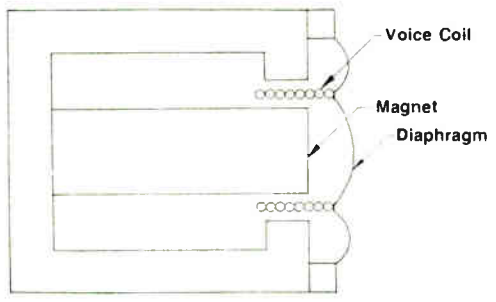
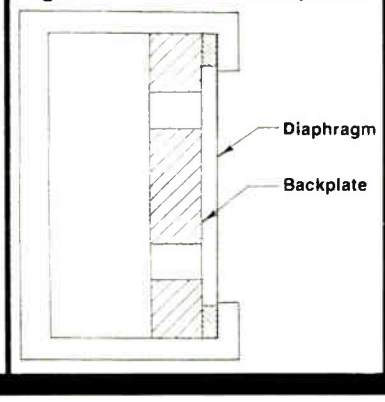


Figure 2. A ribbon microphone



The diaphragm and backplate can be charged either by an externally applied voltage, or by permanently charged electret material in the diaphragm or on the backplate.

Condenser benefits

The condenser type has several advantages. Owing to its lower diaphragm mass and higher damping a condenser microphone responds faster than a dynamic microphone to rapidly changing sound waves (transients).

The condenser microphone generally provides a smooth, detailed sound with a very wide frequency response. You can hear all the "ping" of the cymbals or the plucking of each string in a strummed guitar chord.

This clear, detailed sound quality makes the condenser microphone especially suitable for miking large ensembles, cymbals, snare drum, acoustic instruments and studio vocals.

Condenser mics can be miniaturized, so they make excellent clip-on (lavalier) mics for newscasters.

A condenser mic requires a power supply such as a battery or external phantom-power supply.

Simplex phantom power is 12 to 48 volts DC applied to pins 2 and 3 of the microphone connector through two equal resistors. The microphone receives phantom power and sends audio signals on the same two conductors.

Many mixing consoles supply phantom powering at their mic input connectors; the microphone simply plugs into the console for its power supply.

No power supply needed

By contrast, the moving-coil microphone works without any power supply and provides a reliable signal under a wide range of environmental conditions.

A well-designed moving-coil mic is quite rugged and can accept very loud sounds without overloading. This ability suits it for miking guitar amps and drums.

Because it is so reliable and can reproduce speech with adequate fidelity, a moving-coil mic is the first choice for announcing, DJ use and handheld news reporting.

The moving-coil mic generally has a slower transient response than the condenser type, so it can be used to soften the fine detail that the condenser picks up.

A flat-response moving-coil microphone might be a good choice for woodwinds or brass if you want to take the "edge" off the sound. Moving-coil mics generally have a rougher response than condensers or ribbons, although moving-coil units of excellent quality are available.

Ribbon microphones, while more delicate than the moving-coil variety, are often prized for their warm, smooth tone quality. They typically are used on brass instruments to mellow the tone.

Ribbons used to be popular announce

(continued on next page)

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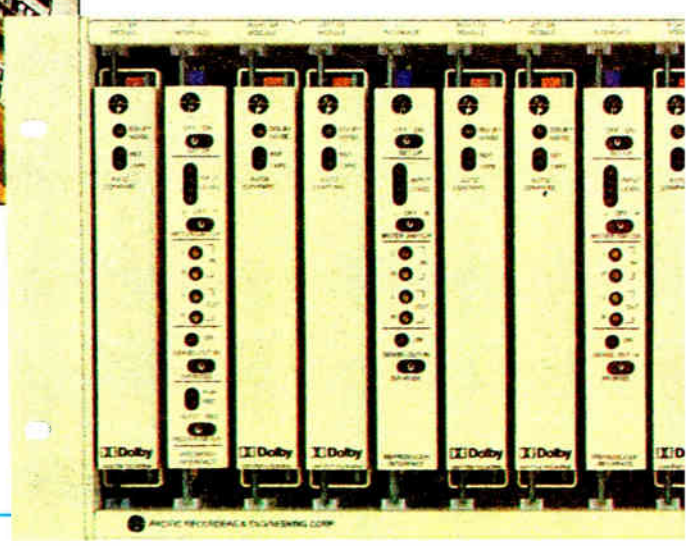

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World Radio History

The Basics of Mic Application

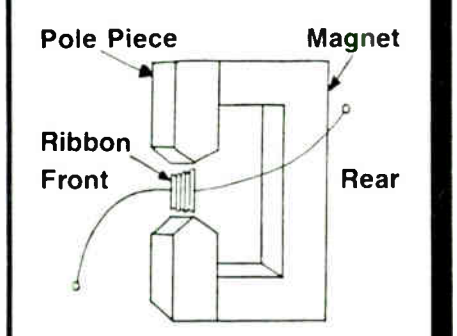
(continued from previous page)
mics in the 1930s and 1940s, but—used up close—they have been superseded by moving-coil mics designed to reproduce close speech more naturally.

Polar patterns

Microphones also differ in the way they respond to sounds coming from different directions.

An omnidirectional microphone is

Figure 3. A condenser microphone



equally sensitive to sounds arriving from all directions.

A unidirectional microphone is most sensitive to sounds arriving from one direction—in front of the microphone—but discriminates against sounds entering the sides or rear of the microphone.

A bidirectional microphone is most sensitive to sounds arriving from two directions—in front of and behind the microphone—but rejects sounds entering the sides. Figure 4 shows various polar patterns.

The unidirectional classification can be further divided into cardioid, supercardioid, and hypercardioid pickup characteristics.

A microphone with a cardioid pattern is sensitive to sounds arriving from a broad angle in front of the microphone. It is about 6 dB less sensitive at the sides, and about 15 to 25 dB less sensitive at the rear.

The supercardioid pattern is 8.7 dB down at the sides and has two nulls of least pickup at 125° off axis.

The hypercardioid pattern is 12 dB down at the sides and has two nulls of least pickup at 110° off axis. This pattern has the most rejection of leakage and room reverberation of the three types.

Talk test

To hear how a cardioid pickup pattern works, talk into a cardioid mic from all sides while listening to its output. Your reproduced voice will be loudest when you talk into the front of the microphone and softest when you talk into the rear.

Because they discriminate against sounds to the sides and rear, unidirectional microphones help to reject unwanted sounds such as room acoustics (reverberation), feedback or leakage (off-mic sounds from other instruments).

They also provide good isolation or separation between instrument signals in multi-mic applications.

Most unidirectional and bidirectional microphones boost the bass when used within a few inches of a sound source. This . . . is called proximity effect.

You've heard how the sound gets bassy when a vocalist sings right into the mic. This bass boost related to close mic placement is called proximitiy effect. It occurs in single-D directional microphones which have a single distance between the front and rear sound entries.

Warm sound

The warmth created by proximity effect adds a pleasing fullness to drums. In most recording or broadcast situations, however, proximity effect lends an unnatural boomy or bassy sound to the instrument or voice picked up by the mic.

Most unidirectional and bidirectional microphones boost the bass when used within a few inches of a sound source. This . . . is called proximity effect.

To minimize proximity effect, some microphones—multiple-D or variable-D type—are specially designed to reduce it. Others have a bass rolloff switch to compensate for the bass boost.

Alternatively, you can roll off the excess bass with your mixer's equalizer until the sound is natural. By doing so you also reduce low-frequency leakage picked up by the microphone. Or try an omnidirectional microphone, which has no proximity effect.

Use an omnidirectional microphone when you need all-around pickup; pickup of room reverberation; low sensitivity to "pop" (explosive breath sound); low handling noise; no proximity effect (no up-close bass boost); extended low-frequency response (in condenser mics); lower cost in general.

Use a directional microphone when you need selective pickup; rejection of room acoustics, background noise, and leakage; better gain-before-feedback in a sound-reinforcement system.

Some applications for radio include omnidirectional moving-coil for handheld news reporting; condenser lavalier (usually omnidirectional) for newscasters; variable-D unidirectional moving-coil for DJ or seated announcer; and for music: cardioid condenser, cardioid moving-coil, and ribbon.

Next time we'll cover frequency response, sensitivity, impedance, maximum SPL, self-noise, and polarity. Stay tuned!

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

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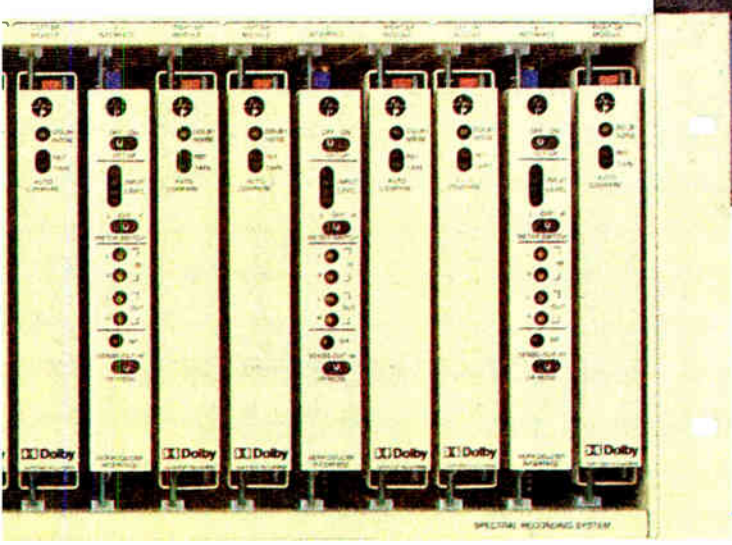

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World Radio History

Planning Reliability

(continued from page 23)

cuit. Perhaps you'll follow that with freeze spray to some selected components.

Connections are the worst offenders for intermittent problems and faults that occur after midnight. Wiggle those circuit cards and listen for audio snap-crackle-pops. The same advice holds for the input and output connectors.

If the staff isn't desperate for this piece of equipment let it cook overnight. Plug it in, give it an audio input and something to run, like an endless loop tape. Let RPU transmitters talk into dummy loads for a few hours.

The idea behind this is that many failures occur when the equipment or the repair is brand new. This is known as infant mortality. After a period of operating time, called burn-in, whatever was about to go bad, does, and the other parts will run trouble-free for months.

You may want to replace parts that keep going bad with better ones. Sometimes the manufacturer just guesses wrong on the size of a component or your station has unusual line voltage, enclosed spots where air can't circulate or lots of lightning strikes on the power lines.

For resistors, use the next highest wattage; capacitors: the next highest voltage; diodes: higher voltage and current ratings; heat-sink transistors and ICs that run hot: add a quiet fan. Put in some transient protection for voltage spikes.

Different grades

Did you know that ICs come in different grades for the same part number? Sometimes there is a commercial grade, an industrial grade with a wider operating temperature range and a military or hi-rel grade with a very wide temperature range and higher rated reliability.

You may pay five dollars for a TTL chip instead of fifty cents, but if that chip is really important and goes out a lot, consider an upgrade.

A fast way to cut your down-time in half is to have two instead of one. Two transmitters, two antennas, two control studios, etc. You can fix one while the other is doing its job. The listener doesn't even have to know that half the station's equipment is in the shop.

This idea works much better if a few rules are observed. First, the backup must be identical or at least capable of doing the job.

You must also know that the backup is working. What good is an emergency generator that hasn't been tested in a year and is out of fuel? Test your backup equipment regularly or rotate main and backup equipment so that they get used equally.

The backup has to be ready instantly. If you have to dig a spare recorder out of a pile of junk in the garage, it isn't a backup. In fact, it's a miracle if it works. The air staff must be able to switch the aux transmitter on the air in a few minutes. If you have to plumb the output every time, you haven't saved yourself a trip to the station.

The best backup is an automatic one. An STL with a silence sense to switch to the backup system is better than one that needs someone to turn it on.

Two FM transmitters supplying power through a hybrid combiner allow you to stay on the air automatically if either transmitter quits. A tape machine with a silence sense at the transmitter will put audio on the air if your phone lines or STL fail.

A well executed plan

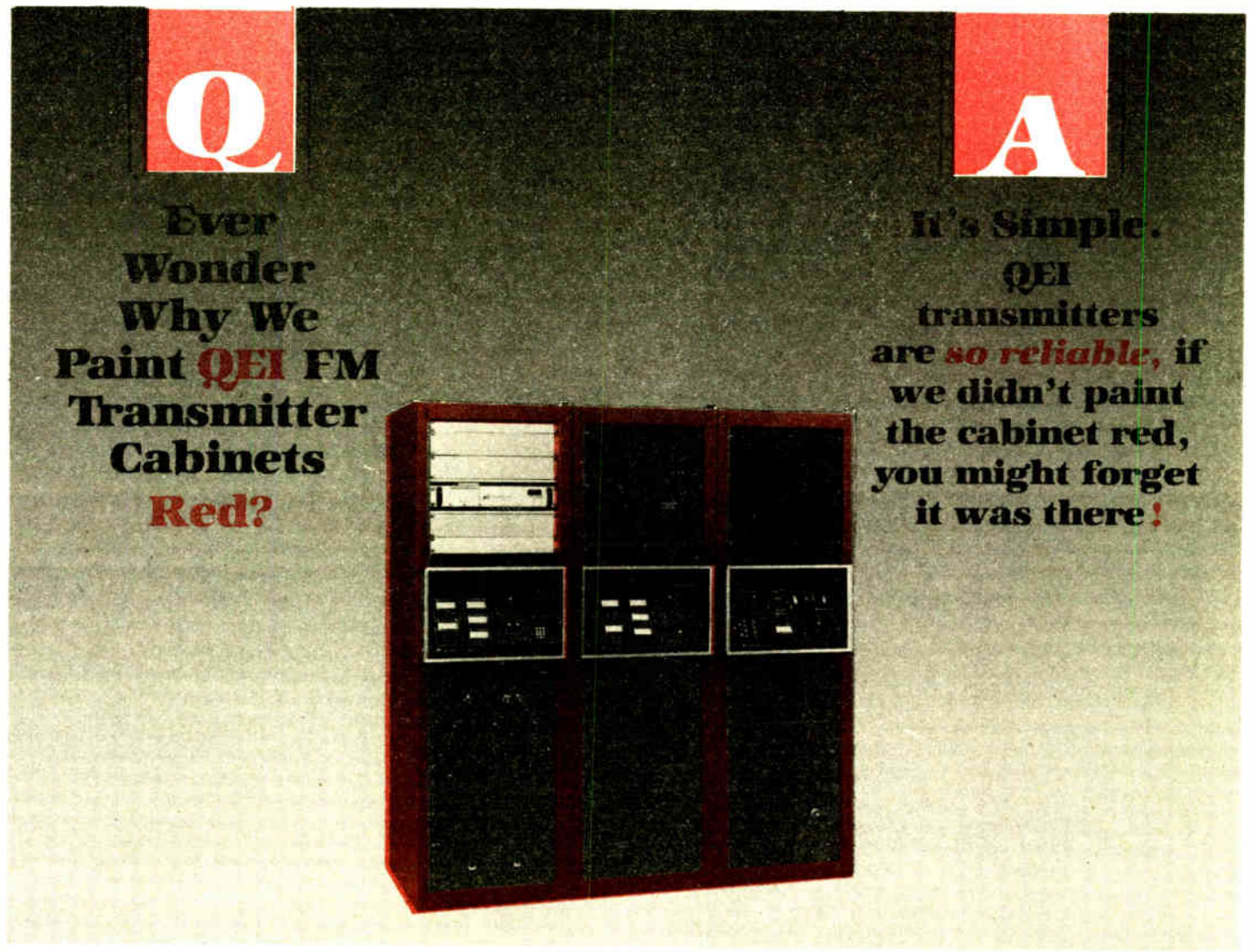
It's a year later. You have long since reviewed the maintenance logs, made and fixed three lists of top ten troublemakers, added automatic backups to the transmitter, STL, and audio chains and worked diligently on the preventive maintenance plan.

Your car is not sitting in the station parking lot. The smiling faces of your family are bouncing along on their way to the Grand Canyon and points west.

You are not concerned about being away from the station because there hasn't been a late night call in six months or a minute of unscheduled down-time in the last three.

Of course, you may get antsy and call the station anyway . . . just so they don't forget they have a chief engineer.

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



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Circle Reader Service 47 on Page 38

World Radio History

Taming Your "Tough Dog" Gear

by Jim Somich

New York NY ... Last month we looked at some basics of troubleshooting. This time we'll take a look at one of the most frustrating types of problems: intermittents.

Obviously, a failure that stays broke is easier to find than one that only crops up after a few hours or days of operation. At least if you are staring at a dead piece of equipment you will know when you have repaired it.

This is not always the case with intermittents. TV repairmen used to call these difficult cases "tough dogs." A good portion of intermittent problems occur after the gear has reached operating temperature.

Freeze spray is indispensible to finding these types of troubles. You can even accelerate the problem with your heat gun—but be sure not to overdo it.

Once the problem appears a carefully directed spray of the freeze mist to various sections of the PC board should reveal the culprit.

But remember that most equipment was not designed to work properly when frozen solid either. You have to use judgement with both heat and cold applications.

Making the connection

An intermittent not caused by temperature is usually the result of a bad connection somewhere. The only way to find these is to wiggle and prod until you discover it.

Remember that most modern equipment is static sensitive. It is imperative that you at least touch something that is grounded before probing these circuits.

An even better practice is to wear a grounding strap. These are available from most parts houses. Do *not* ground your body directly. You could be asking to be electrocuted!

Maintenance—Notebook—

The static straps ground you through a high Megohm resistor which will drain a static charge without making your body a direct path to ground for any appreciable current.

Most modern gear uses voltages low enough that you can use your fingers to prod. But be careful and of course, do not try this with the power supply.

A modern high-tech contact cleaner such as Cramolin Red Spray (2 or 5%) is indispensible when dealing with intermittent contact problems.

A good troubleshooting technique is to isolate the problem to as small an area of the circuitry as possible. This can be accomplished quite easily by determining which sections of the circuit are operating properly and which are not.

Too many novices concentrate on some part of the circuit that is functioning properly while ignoring a totally dead section.

It is obvious that you have a power supply problem when the equipment is totally dead, but less obvious are the symptoms of a power supply with an open filter cap (placing large amounts of hum on the power bus) or one that has fallen out of regulation due to a failed regulator chip.

Measure all power supply voltages and compare them with the service data. The power supply is the one section that can affect everything in a unit.

If everything you try fails and you have to get the equipment back into service it is always a useful ploy to get another opinion from a fellow engineer.

He or she might spot something quite obvious that you have been overlooking. Ego should not be a factor here ... this kind of help is usually a two way street.

If it is impossible to consult with someone else remember that all manufacturers will give you help over the phone. The quality of this phone help will vary from company to company, but on the whole it is usually pretty good.

A few companies have initiated a fee for telephone help, claiming that they can reduce prices by keeping this expensive service under control. Let's hope that this practice does not catch on.

It is quite possible that the problem you are experiencing is quite common to the manufacturers service department.

perhaps even a service bulletin was issued that you never got. The technicians at the factory are you best source of this kind of information.

(continued on page 38)

FCC Transmitter Operator Rules

by Harold Hallikainen

San Luis Obispo CA ... Last month we reviewed some background including revisions to the FCC rules operator requirements of the past decade. This time, we'll look at what is actually required today.

Rule 73.1860(a) requires an operator to be present at the transmitter, a transmitter remote control point, an ATS monitor/control point or an extension meter point any time the transmitter is in operation.

That operator must hold an FCC license or permit of any class, except those licenses or permits that prohibit broadcast operation (recent general radiotelephone licenses and Marine radiotelephone permits).

Insight on—Rules—

Rule 73.1860(b) requires the operator to be able to observe the required transmitter and monitor metering (although what is required is never spelled out in the Rules) to determine deviations from normal indications.

The operator must also be able to make the necessary adjustments from the normal duty position. The necessary adjustments are never spelled out, but we might assume that it is whatever adjustments are necessary to keep the transmitter within licensed parameters.

There are generally many transmitter adjustments (such as tower three phase) that are not available to the routine operator.

However, if the operator finds a parameter out of limits, he/she can shut the transmitter down if the required adjustment is not available. The station is then not operating outside licensed parameters (since it is not operating at all).

Training operators

Rule 73.1860(c) places the responsibility for properly training operators on the station licensee. Previous rules required the posting of step by step instructions, along with limit charts, for "lesser grade operators."

Now the Commission does not specifically require these instructions or charts but merely requires the operators to know what they're doing.

It still may be a good idea to post instructions and limit charts (as appropriate). Some more recent equipment provides limit alarms which may be used instead of limit charts, provided they always work.

When preparing limit charts remember that many readings have just a minimum and maximum permitted value. Some parameters, however, require more complex limit charts.

For example, stations determining power by the indirect method may want to have a chart that lists the minimum and maximum plate current for a variety of plate voltages.

Stations using a directional antenna with an antenna monitor that provides indications of loop current (instead of actually calculating the loop current ratio or deviation) should have charts that list the minimum and maximum loop current for each tower for a variety of reference tower loop currents.

Rule 73.1860(d) says the transmitter operator may be employed for other duties (like maybe being a DJ) if these other duties do not interfere with the operator's responsibility to insure proper operation of the transmitter.

The station license and other authorizations are to be "posted" at the principal transmitter control point. At other control points (remote control or ATS) a photocopy of the station license and authorizations are to be "posted" [73.1238(a)].

Operator licenses for all operators (whether employed full time, part time or serving through a contract) must be posted where the operator is on duty at the transmitter, remote control point or ATS point.

Where the operator serves more than one station and those stations are not co-located, the license is to be posted at one of the stations and a photocopy of the license posted at each other station.

That license or copy is to remain posted as long as the operator is employed (directly or via contract) by the station [73.1230(b)].

Finally the FCC allows some variation in the manner that the licenses can be posted. I believe this rule came about when NCE stations with large volunteer staffs found the entire control room wall-

(continued on page 38)

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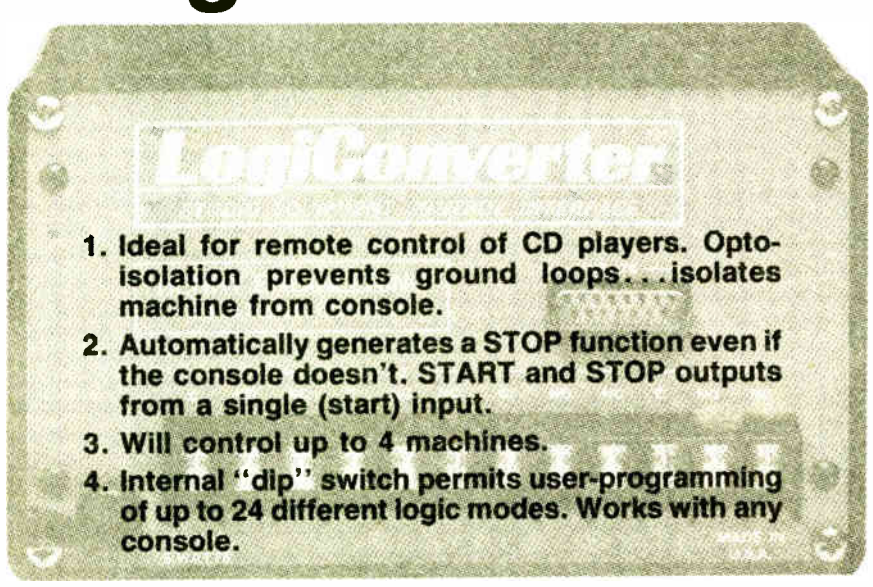

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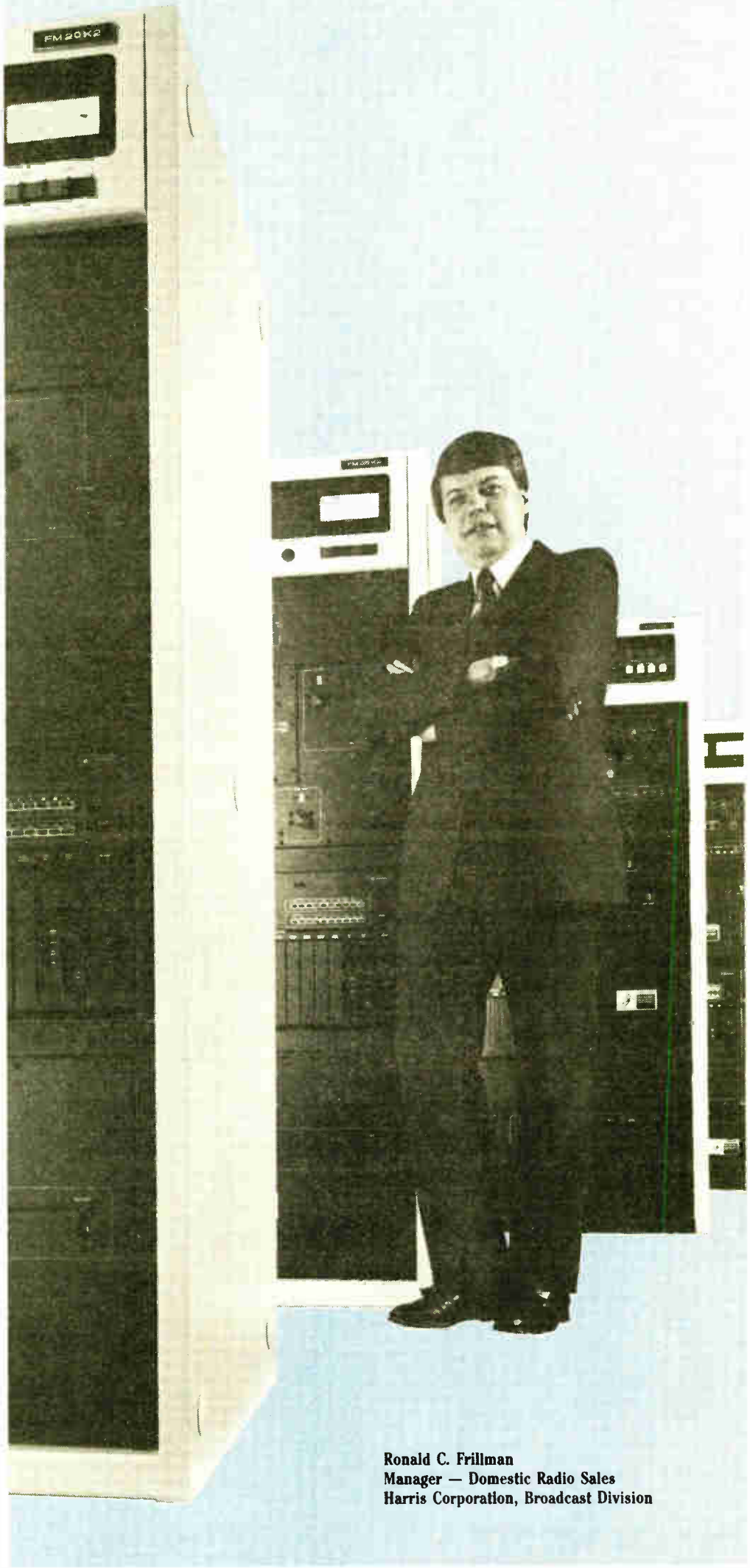


Ronald C. Frillman
Manager — Domestic Radio Sales
Harris Corporation, Broadcast Division

HARRIS

World Radio History

DIGITAL DOMAIN

by Skip Pizzi

The State of the Art of Digital Technology

Washington DC ... After the dust settled from Tandy Corporation's announcement of a domestic, compatible recordable/erasable CD player for under $500 a few months back, it became known that others were working on the same thing.

A half-a-dozen or more other, more professionally prominent companies (the usual audio suspects, and a few from the camera side) have been working on recordable CDs, with projected availability in two years or so and their consumer unit prices coming in around $1,500.

Tandy later said that their product won't be ready until about that time either and that the $500 price tag is a somewhat optimistic projection.

Assuming by then that the copyright issues have been settled (the current Congressional push is for a long-term solution to the problem), this could truly be the storage format of the future.

Merging it with the currently expanding "work station" hardware (almost all of which is now using magnetic disk storage technology) and the ever-increasing RAM chip capacity, things look bright for a cost-effective, user-friendly, all-in-one digital audio production tool, in as few as five years down the road, maybe less.

With it, previously recorded (digital or analog) audio could be edited, mixed, mastered and off-loaded onto a playback or distribution format.

Yet to be tackled, however, is a method of high-speed downloading into the work station of previously recorded audio material.

Solving this will complete the picture and our production lives will be altered forever, as will the size and design of our production rooms. Hopefully, our quality will increase accordingly.

By the way, WORM (write once, read many times) CD and other format optical recorders have been around for a few years, for both audio and video recording.

They are quite expensive and have not been widely marketed to the audio world, due to their fairly exotic nature and narrow audio applications (archival storage, for one).

Erasable optical disk recording, fully compatible with CD players—which the WORM CDs are not—will greatly widen the applicational range for all users.

Digital signal processing

Another very recent and exciting development concerns the use of digital audio technology for broadcast audio processsing.

The first of probably many of these products was shown at the 1988 NAB show (Valley International DDP—see Buyer's Guide, **RW** 15 June 1988).

Initial reactions to this class of product have been extremely positive in terms of the precision with which audio can be processed and the amount of processing that can be applied without audible artifacts.

Lots of multiband splitting and recombining is easy to achieve with much less worry about the ringing and phaseshift that all those steep analog filters might introduce.

Watch this space and others for more on this potentially major new product type.

Digital STL

This is an area that broadcasters have been struggling with for awhile, most of them using pseudovideo processors in the 23 GHz band.

Although spectrum is available here, it won't be forever and path length is limited, as well as sensitive to rainfall outages.

Worse yet, the inexpensive pseudovideo processors have become quite scarce and even if they are available, they are consumer-grade items. Many engineers are rightfully uneasy when a major RF link's investment revolves around such a tenuous system.

A fully professional pseudovideo system is readily available and seems market-stable for the time being, but its cost ($40,000 for the two processors—the same system on which most CDs are mastered—not including the link's RF hardware) is prohibitive for most budgets.

But the picture here seems about to change, thankfully. Purpose-built, low bit-rate, high quality professional digital audio systems for STL and other transmission purposes are being announced and will be available soon.

Under development

One system mentioned in this column (Dolby Labs Model 500) can encode two 15 kHz channels and an auxiliary cueing/data channel in about a 250 kHz bandwidth.

This compares quite favorably to the 2.5 MHz or more needed for the pseudovideo approach, and even becomes possible to utilize on some of the conventional aural STL bands.

An audition of an early implementation of this system recently showed that it is quite comparable to other existing, linear PCM systems in audio quality. Planned improvements in the final format will render it even more sonically pure.

Modulation formats and the rest of the RF segment of this system are yet to be determined, and will likely be done by another manufacturer in cooperation with Dolby.

The Model 500 itself will be designed for use meanwhile with any serial data link, using 384 kb/s or less.

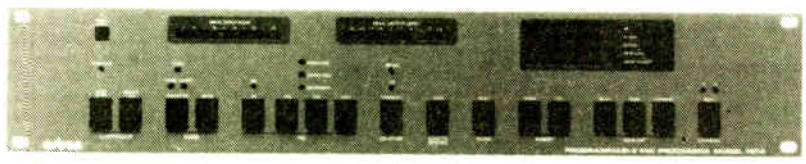
Availability dates are uncertain but one year is not unrealistic, judging from where Dolby is right now with the system.

This sort of spectrum efficiency means that serious implementation of flexible and affordable digital transmission systems is about to begin.

We've been talking about keeping up-to-date but many of us may feel that we somehow missed the boat on the basics here, and that we're always playing a big game of catch-up. In that case, here are a couple of good texts to get yourself up to speed and/or fill in the holes.

The Art of Digital Audio, by John Watkinson, Focal Press, Boston, 1988. Hardcover, 489 pages. This is an extremely current and comprehensive look at dig-

(continued on page 38)



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World Radio History

Reflections on Customer Service

by Barry Mishkind

Tucson AZ ... One of those sad little certainties of life is that whenever we buy a piece of equipment it will eventually break down and need repairs. This applies to everything from microphones to antenna.

And more often than most of us would like to admit, the equipment we are called upon to fix has either no manual, a poor one or is obsolete and parts are no longer made.

So what can we do to be ready for such situations?

Who will help?

Of course some stations purchase equipment from a supplier that offers them complete technical and service support. They can call up and quickly get help with any problem.

But support does not automatically accrue to the owner of a piece of broadcast gear.

This was graphically brought to the fore recently when one major manufacturer announced that, under certain circumstances, it would begin charging for customer support.

That policy caused a loud outcry on the part of some, as if the rules of the industry were being changed.

However, on closer inspection that new policy brings into focus some very important factors that likely affect us all.

Company X has to consider a number of factors when it builds an item for the broadcast market. Not only will its usage often exceed design criteria, but part of the sales price must pay for product support through the years.

That is why there is often a large difference in cost between two items. Take transmitters for example. When you are off the air at 3 AM Saturday, which is your pleasure: an answering machine or service to inform the manufacturer Monday morning, or an engineer ready to help you get back up quickly?

As you answer, consider how that engineer is paid. The money has to be generated somewhere. A cheaper transmitter does not allow the manufacturer as much margin to pay for customer services.

That is not to say that a more expensive unit is always better on this score. The point is that the cheaper unit's maker *can't* afford as extensive customer service.

That puts manufacturers in the middle. They find they are receiving calls from the third- or fourth-hand owner of their gear.

Since manuals rarely survive through that many changes of ownership, such calls are often for basic information. The owner may feel he got a real bargain on the unit, and the manufacturer is only too happy to tell his engineer how to fix it, putting the expensive customer support system at his disposal.

But who pays for this service? Someone, somewhere has to do it. Should the original purchaser pay the freight for *all* future owners? Or should the third or fourth guy in history expect to pay some modest fee for such help? That is the balance that many companies are seeking to find.

Other considerations

Let's consider the situation when you have purchased something brand new. What should you look for with the future in mind?

Does the manufacturer maintain an 800 number? Are the service techs knowledgeable or newly hired? Are they pleasant and helpful, or pressed to get on to the next call?

Does the company seem to take delight in ripping you on replacement parts costs? Are there any hidden "handling" charges tacked to your bill? How good are the manuals? Is there a realistic policy for updating manuals in the field?

... the cheaper unit's maker can't afford as extensive customer service.

If you are in a small market, there is likely heavy pressure to keep phone bills down. Companies with 800 numbers are therefore favored.

But who pays for the 800 number? These are expensive creatures, especially if you have calls all day, and at about $13/hour/line, plus the tech's salary, it puts a real burden on the equipment tag.

Not enough help

One of the minor problems that can become irritating is dealing with a customer service department that is so understaffed that it is hard to get through.

This is where the value of knowing other engineers comes into play. Ask them which manufacturers give the best help and which to avoid.

Some manufacturers refuse to acknowledge their failings, or worse, have 347 excuses for why their customers are unhappy. These are the ones of which to be wary.

Ask another engineer whose transmitters he would prefer to find at a 3 AM emergency. You may well be there some day, so find out now.

What can you do if you have a bad experience on the phone? Most manufacturers are sincerely trying to help you. So try reasoning with them, or ask to speak to someone a little higher up.

As a brief example, one of the engineers at EIMAC was very helpful recently when a distributor failed to resolve a tube problem for one station. He cut the red tape and made a happy engineer ready to buy more of the company's products.

Another often heard gripe from many engineers in the field is the lack of care many manufacturers seem to put toward their manuals.

It is not uncommon for a "preliminary" manual to be the only one *ever* issued, regardless of parts or schematic changes.

Part of this is due to poor tracking of customers. Many times the reps fail to communicate final user names to the manufacturers.

But even when the manufacturer knows who you are there is an alarming number of poorly written, confusing, incomplete and contradictory manuals in the field.

Don't forget the parts

Usually, when dealing with customer service you will need some part or parts. A good question is does the manufacturer list only proprietary parts numbers or can you care for emergency needs at the local parts shop?

Cost of parts often becomes an important issue, too. There are many items that won't be stocked locally in any event.

Is the pricing fair, or does it take advantage of your situation? Have you ever paid $150 for $20 worth of parts, just because you got single sourced? Or been forced to pay a $25 minimum for a $2.50 part?

And then there is a new tendency to pack the shipping charges with a "handling charge."

One large national company has quietly started tacking on a hidden "handling charge" to every order. If you make a lot of small orders, beware—"handling charges" can equal as much as 60% of the cost!

Similar to companies who won't update your manuals are those who accept an order, then back order your items and never let you know, even if you have specified quick shipping needs. You could get old waiting for the order to show.

Still another problem, exacerbated in recent years by stations that "stiff" manufacturers who grant open billing, is the credit hassles with which the field engineer doesn't need or want to get involved.

It is much more pleasant to deal with a company who sends the parts and doesn't treat you like a deadbeat because you asked for credit.

Nonetheless, please remember there are a lot of abusers out there, so don't get angry with a manufacturer because they won't ship open account. Your station may have outstanding bills you don't know about.

The broadcast industry has many companies that make customer service a top priority. By talking to your fellow engineers you can learn who the good guys are in the business.

As discussed above, there are instruction manuals that leave a lot to be desired. Some give wrong information, disasterous if actually followed. Others feature typos, or poor translations into English. Some contain just downright humorous errors.

I've decided to share some of the more astounding ones that I've read. You can help by sending your nomination for worst instruction manual, or worst instruction in a manual. I'll also accept nominations for the best manuals.

Barry Mishkind, aka **RW***'s "Eclectic Engineer," is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797.*

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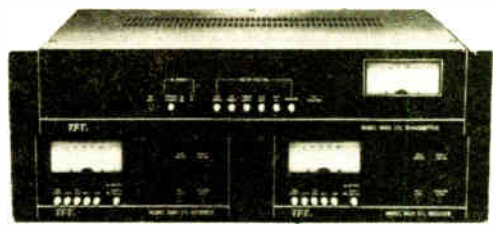

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Circle Reader Service 17 on Page 38

World Radio History

A Look at Booster Problems

by Ed Anthony

Quincy IL ... On 16 July 1987 the FCC approved Docket MM 87-13 which authorized FM stations to significantly increase the power of their on frequency booster facilities.

This decision has created a surge of interest from broadcasters as to the feasibility of a booster for their particular station and what means are available to accomplish this.

The increase in power brings with it new problems, including widened interference zones, adequate signal ratios and the need to synchronize carrier frequencies.

The FM signal can be defined by the familiar formula found in Equation 1.

The effects of adding a booster signal are the same as having a co-channel interference source. A second interfering carrier will both amplitude and phase (frequency) modulate an existing, desired carrier. The characteristics of this apparent modulation are given by Equation 2.

The end result is that an FM receiver detecting two carriers (unmodulated for simplicity) decodes a modulation tone equal in frequency to the absolute value of the frequency separation between the carriers. Moreover, the modulation index (both AM and FM) is simply the ratio of the carrier amplitudes.

Equation 1. FM Modulation

$$Xc(t) = Ac \cos [Wc(t) + B \sin Wm(t)]$$

Where: Ac = Carrier Amplitude (constant)
Wc(t) = 2πfc (carrier frequency)
B = Δf/Fm (modulation index)
Wm(t) = 2πFm (modulation frequency)

Equation 2. Characteristics of an Interfering Signal Modulating a Desired Signal

$$Fm = |fc - fi|$$
$$B = Ai/Ac$$

Where: fc = main carrier frequency
fi = booster (interfering) carrier frequency
Ai = booster (interfering) carrier amplitude
Ac = main carrier amplitude

Equation 3. Resultant Amplitude of Two Carriers

$$Ar = \sqrt{[(Ac + Ai \cos Wi(t))^2 + (Ai \sin Wi(t))^2]}$$

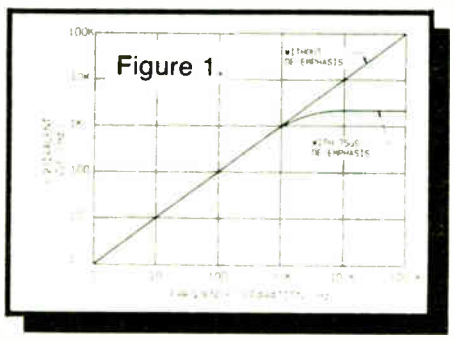
Where: Ar = Resultant Carrier Amplitude
Ac = Main Carrier Amplitude
Ai = Booster Carrier Amplitude
Wi(t) = Angle between Ai and Ac

and:

$$\Theta r = \text{Arctan} \frac{Ai \sin Wi(t)}{Ar + Ai \cos Wi(t)}$$

Where: θr = Resultant Carrier Phase Angle

Figure 1.



Synchronous carriers

A closer look at these formulas explains the need for synchronizing carriers.

Given a fixed carrier ratio (fixed modulation index), an increase in carrier frequency separation is equivalent to an increase in Δf, which for FM is equivalent to an increase in detected signal amplitude as shown in Figure 1.

Knowing this the advantages of frequency locking the carriers become obvious.

As the carrier frequency difference approaches zero, the frequency of the detected tone approaches zero and the equivalent FM deviation produced by that tone approaches zero. In other words, the interference disappears.

We are left with a single frequency carrier whose amplitude depends on the relative phase relationship between the two signals at any given reception point. The resultant amplitude and phase is shown in Figure 2 and can be derived by Equation 3.

The presence of two carriers and their resulting addition and subtraction produces an interference zone of varying signal amplitude.

If the exciters are phase locked these areas are fixed. In a mobile receiver, however, this phenomenon is virtually identical to the 'picket fencing' of multipath, the only difference being the interfering signal is not reflected but rather is a duplicate transmission from a booster site.

Figure 2.

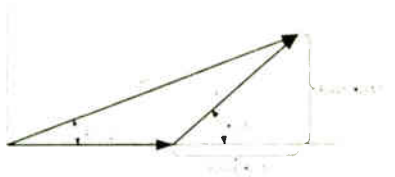


Figure 3.

Time delay equalization

So far we have dealt only with the effects of unmodulated carriers. The addition of modulation on each carrier greatly complicates the understanding of the effects of the booster station. But there are two areas of modulation equalization which are fairly straightforward.

Let's consider what happens to two identical signals which have a constant time delay between them.

At any frequency where the time delay is equivalent to 180° or N multiples of 180° there will be complete cancellation, producing a combing effect. This is immediately alarming especially for composite FM stereo and subcarrier performance.

Significant group delay frequently occurs by passing the composite signal through a low pass filter, such as is found in a composite STL receiver.

If the composite signal to the booster makes an extra STL hop compared to the signal to the main, it will be further delayed by the amount of group delay in the STL receiver at the booster site.

Even if the modulation information were to reach the transmitters at the same time, there is still delay introduced by the FM signal propagation.

For example in Figure 3 the reception point has been selected so that we are again in an equal carrier ratio area, at an additive location. However, the distance from the reception point to the main transmitter is 4.9 miles longer than it is to the booster.

Assuming the velocity of propagation is that of free space, this is the distance equivalent to 1/2 wavelength at 19 kHz.

Therefore we would again be in an area where there would be complete cancellation of the pilot tone, even though the modulation was equalized at the transmission point and we are in a constructive RF location.

This shows that time delay equalization cannot eliminate cancellation of modulation components in equal carrier areas. At best, the use of group delay can move the location of the nulls relative to the transmitters.

Great care must be taken to insure the network exhibits a constant group delay, as non-linear delay can seriously degrade stereo performance, especially stereo separation.

Deviation calibration

Strictly speaking, if both modulators are not precisely calibrated a condition of dynamic interference will occur during modulation.

In order to understand this phenomenon, consider the following. Two separate modulators are fed identical amplitude, delay equalized sine waves. The level is adjusted to produce a nominal 100% (±75 kHz)modulation. The first modulator swings the carrier exactly ±75 kHz, as predicted, but the second modulator only modulates its carrier ±74 kHz (98.67%).

Table 1. Selected Bessel Null Frequencies for ±75 kHz deviation.

Modulating Frequency	Type of Bessell Null Produced
31,185 Hz	Carrier Null (First)
19,470 Hz	First Sideband Null (First)
13,587 Hz	Carrier Null (Second)
10,690 Hz	First Sideband Null (Second)
8,667 Hz	Carrier Null (Third)
7,372 Hz	First Sideband Null (Third)

A closer look shows that the second carrier will interfere with the first in the following manner. Starting at time zero, we have two carriers of exact frequency producing a single carrier whose amplitude is derived from Equation 3.

As we move positively in frequency with the modulation the carrier frequencies diverge until, at the peak of modulation, the carriers are 1 kHz apart. From Equation 2 we see this produces a 1 kHz FM modulation at a modulation index of 1 (1 kHz deviation) and an AM modulation equivalent to 100% at 1 kHz.

More precisely, the detected interference is actually a frequency sweep from DC to 1 kHz to DC and back to 1 kHz

(continued on page 35)

Circle Reader Service 38 on Page 38

World Radio History

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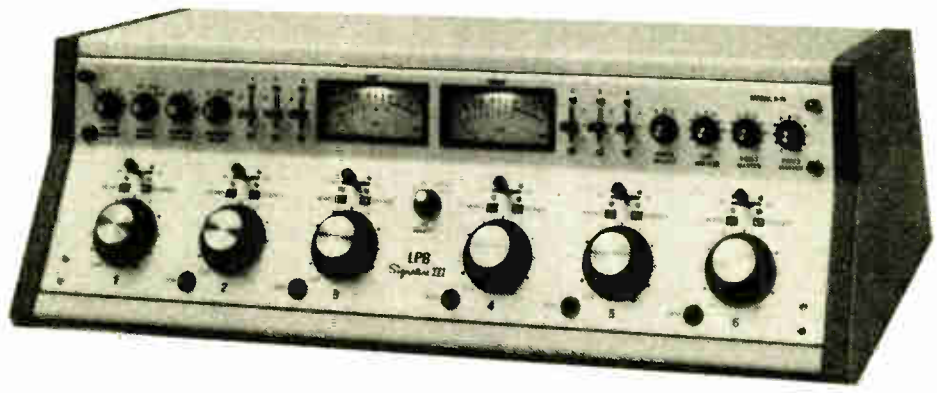
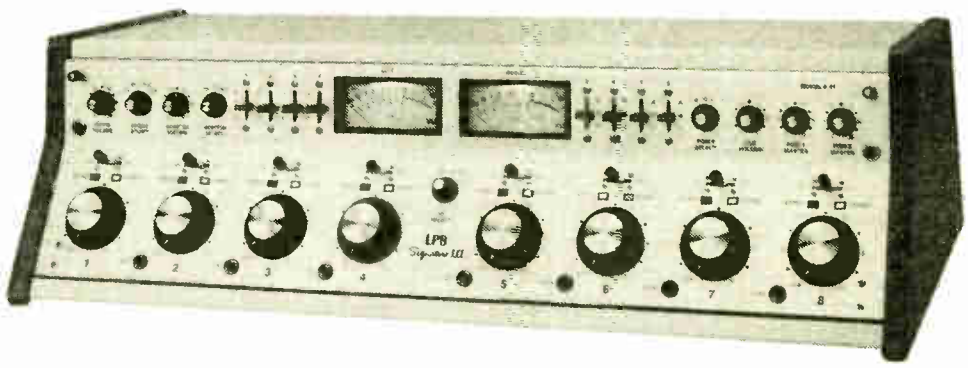


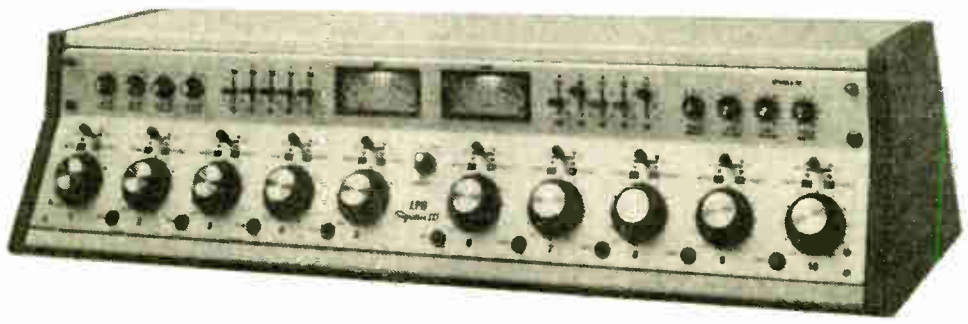


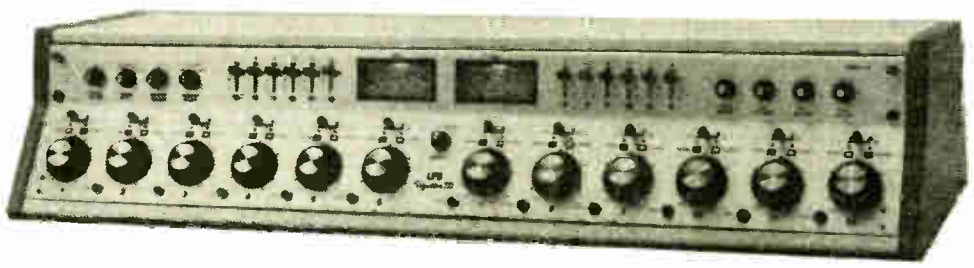
S-13 Dual Stereo
8 Mixer

S-15 Dual Mono
8 Mixer

S-20 Dual Stereo
10 Mixer

S-21 Dual Mono
10 Mixer





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World Radio History

Life on the Road with a Traveling Engineer

by George Riggins

Long Beach CA ... Continuing with my cross-country tour and listening to the airwaves from within the pleasant confines of a passenger vehicle I wonder how some of the advertising slogans and phrases can be justified.

Old Timer

Are automobiles so constructed that all the road and wind noises can be eliminated? In any case, after about 6000 miles of travel during the month of June and getting as far east as Johnson City, Tennessee, I wonder if it really matters that much.

Instead of taking Horace Greeley's advice to "go west," we went east. For entertainment across the desert between Barstow, California and Kingman, Arizona unfortunately tapes were in order.

Yes, after the local stations of Barstow were too weak to hear, the stations of Bullhead City, AZ and Needles, CA appeared about 1/2 hour west of the Colorado River.

If the station decides to go AM stereo the entire act must be squeaky clean.

That gave us about two hours with no or spotty reception. After Kingman there was not much until the Flagstaff stations were in order. (Amazing how far an FM signal will travel if the antenna is on top of 10,000 foot peak, and Northern Arizona State University has a large signal area, both east and west.)

The signals were spotty across the Continental Divide until Grants and Albuquerque. East of Albuquerque, Taos could be heard. Santa Rosa was dark and the Tucumcari stations do not carry too well to the west. After that, going east and northeast there were lots of signals, almost too many signals.

We listened to "S-K" country western, religion, talk and everything in between. We even found a couple of stations playing "Big Band" arrangements, some by the original aggregations and some re-recorded.

Amazing what many of the modern hits sound like when done in the "Big Band"-style arrangement with instrumentation to match.

Tuning in AM stereo

Several issues ago *J.G.'s Earwaves* reviewed the Summer CES in Chicago. Part of the column was how long it took to find the stereo AM receivers and obtain decent data.

After scanning about 200 to 250 stations, both AM and FM, I would estimate that less than 10% of the AM stations are broadcasting in stereo and 85% of the FM are in stereo.

Hard to identify stereo on the AM band unless the music was of the type that really stands out in stereo. The best way to tell if the signal was stereo was to look at the dial to see what the receiver told me. Perhaps if I had the rear speakers hooked up I could tell quicker if the station was in stereo.

Of course there is the question of which came first, the chicken or the egg. Which comes first, the transmission in stereo, or the stereo receiver and the marketplace clamoring for the better signal?

If someone knows the answer, there are many of us who would like to hear the it. The stereo AM stations seemed to be clustered according to market. Must be follow the leader.

One item is certain. If the station decides to go AM stereo the entire act must be squeaky clean. That means starting at the turntable and cart machine and properly phasing the R and L channels, and making certain that all of the transfer points have a good impedance match.

Then the transmitter and antenna system must be broadbanded to accept the wider frequency swings for a decent signal. The majority of the AM stereo signals sounded better to me with fewer noticeable differences between sources.

Lightning help

I had a question from a station owner (FM) who has been plagued by lightning at his location. He told me that he seemed to be able to protect the transmitter final from problems, but was having trouble protecting the input to the exciter.

Yes, there are telephone line protectors, but several years ago an engineer in Prescott, AZ had a very simple method of protecting the phone lines.

I did not write the info down at the time, but as I recall, he used the properties of dissimilar metals and bypass capacitors, perhaps gas discharge tubes, to do the job. I think that he went from the copper of the telco lines to an iron wire. Has anyone used this method, or do you have the definitive method?

Enough for this time. If the pot is not churning, it should be. Comments on a pet peeve—differences in audio levels and frequency response caused by improper impedance matching will be in the next installment.

Also to come, history from *Radio Doings, the Radio Authority of the Pacific Coast* Vol X, No. 15, April 10-16. 1927. Very interesting!

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.*

RCA COMPANIES FAVOR AN OPEN PATENT POOL

Washington.

For the first time in history the likelihood of an open radio patent pool has arisen, due to the readiness of the principal companies in the present closed pool to discuss the subject, in a co-operative spirit, with Federal Government attorneys.

The Department of Justice brought an anti-trust suit against Radio Corporation of America, General Electric Co., American Telephone and Telegraph Co., Western Electric Co., Inc., Westinghouse Electric and Manufacturing Co., RCA Photophone, Inc., RCA Radiotron Co., Inc., RCA Victor Co., Inc., General Motors Radio Corporation and General Motors Corporation.

Conferences between defendants' counsel and Department of Justice counsel developed the fact that the principal defendants are in a receptive mood.

Pointed Opinions

Announcers Strike for Five Minutes

Buenos Aires.

All radio announcers in this city went on strike, without warning, for five minutes one night recently, stopping all broadcast stations in the city.

At the end of the five-minute interval broadcasting was resumed with an explanation that the strike was in protest against a local campaign for suppression, or limitation, of radio advertising. Broadcast listeners were warned that if the announcers did not get their support the announcers might make the silence permanent.

E. H. SANDERS, Shell Oil Company: "Advertising is the life-blood of radio today. Private capital makes possible the superb shows heard nightly by millions seeking their entertainment at the dials. Without the competition born of progressive advertising policies, attainment of present radio entertainment standards would have required many more years. Without this keen rivalry an evening at the dials would provide no more than a month-old newsreel. Interrogation of the indignant fans regarding other methods of supporting progress usually brings forth a rather vague suggestion that taxation of receiving set owners would do the trick. Support of radio entertainment by taxation would create another government bureaucracy."

* * *

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With its microprocessor based control logic, the basic RC16+ provides 16 telemetry channels with automatic out-of-tolerance alarms and remote raise/lower controls; plus 16 status channels. The automatic functions — pattern shift, transmitter restart, power control — are preprogrammed in accordance with station license requirements and controlled with an accurate master clock.

The RC16+ is also expandable. In 16 channel increments, up to a total of 64 channels. With the remote video display option your chief engineer can get a detailed readout of all measured parameters. It's updated every 30 seconds and connects to any standard telephone. The optional plug-in automatic logger provides a permanent record of all transmitter activity. Log intervals, sequence, and alarm flags are user-selectable.

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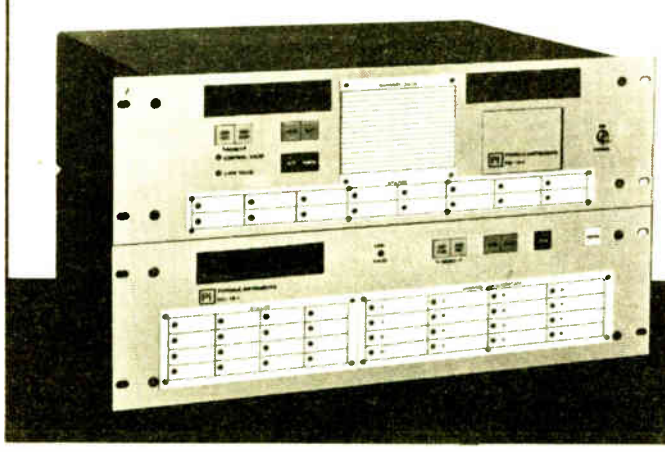

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Circle Reader Service 30 on Page 38

World Radio History

MORE FCC FILES

(continued from page 20)
the proposal, however, expressing concern about international agreements related to the proposed changes.

CBS supported it as long as it provides "grandfather" protection to any adversely affected station that required it and if the FCC continued to offer copies of the algorithm to consulting engineers and other interested parties.

For more information, contact Jay Jackson at the FCC, 202-632-9660.

RF Radiation

Results are in from a joint FCC/Environmental Protection Agency Protection Agency study, hampered by delays since November 1987, that addresses levels of RF radiation emitted by broadcast towers in Spokane, WA.

According to FCC Office of Engineering and Technology Physical Scientist Robert Cleveland, the report addresses the electrical current that was measured in an individual climbing an active AM tower; the interaction of magnetic and electrical fields within the human body at AM frequencies; and how large metal structures can interact with relatively weak AM electric fields and cause potential RF burns.

It also studied the possible fields experienced by people working in fire lookout towers near broadcast antennas; and measurement of ambient field strength in the vicinity of AM and FM and TV broadcast antennas.

Statistics were based on research conducted 28 June to 3 July, 1987, on RF emission levels from towers at Krell Mountain and Mount Spokane, two antenna farms in the vicinity of Spokane. Readings also were made of body current induced in tower climbers.

For the NTIS number needed for ordering, contact Robert Cleveland: 202-653-8169.

Class A hike

New Jersey Class A FM broadcasters persuaded the FCC to issue a proposed rule making in July for a power hike from 3000 W to 6000 W that would establish a new intermediate FM station class.

The Commission now is seeking comment on how to implement it. The rule making sought comment on whether a blanket increase would be appropriate or on a case-by-case basis as suggested in a plan proposed by the NAB.

In comments filed before the proposed rule making, a number of major broadcast group owners came out in opposition to the request for an across-the-board power hike, while Class A stations that would be affected registered their support promising to take advantage of the increase.

In reply comments, a group of New Jersey FM Class A stations stated that opponents raised unrealistic scenarios and challenged proposed remedies but not the basic premise.

The New Jersey group argued that commenters did not find fault with their theory that the power limit for Class A broadcasters increasingly prevents them from effectively serving the communities and produces other "deleterious" effects within their current primary service contours.

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

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

The Docket is MM 88-375. Contact the FCC at 202-632-9660.

FM Boosters

(continued from page 32)
for each complete cycle of modulation applied.

Both forms of modulation related interference are most prevalent in areas of nearly equal carriers. With "adequate" carrier ratios, both types are effectively eliminated by the capture effect in the FM receiver.

In some instances it may be desirable to add group delay to move a particular null. It is also preferable to have the modulators closely aligned.

It may not be strictly necessary, however, to go to such great lengths as calibrating both simultaneously by a Bessel null on a spectrum analyzer.

A high quality FM exciter with a carefully calibrated modulation display will most likely be adequate. However, great care should be taken to make sure both exciters are driven with the same input level.

If simultaneous calibration by Bessel nulls is desired, Table 1 lists several modulating frequencies which will cause either a carrier null or a first sideband null.

Simply inject the same signal into both exciters, preferably through the actual transmitter link and adjust the levels until the exciters indicate exactly 100% on the modulation displays. Then adjust each exciter modulation calibration for the desired null on a spectrum analyzer.

In Part II of this article we'll look at some practical ways to configure booster stations, describe a working system to lock two exciters on the same frequency and review the results of an actual booster field test.

Ed Anthony is a design engineer at Broadcast Electronics, Inc., and is responsible for the design and support of small signal RF products. He can be reached at 217-224-9600.

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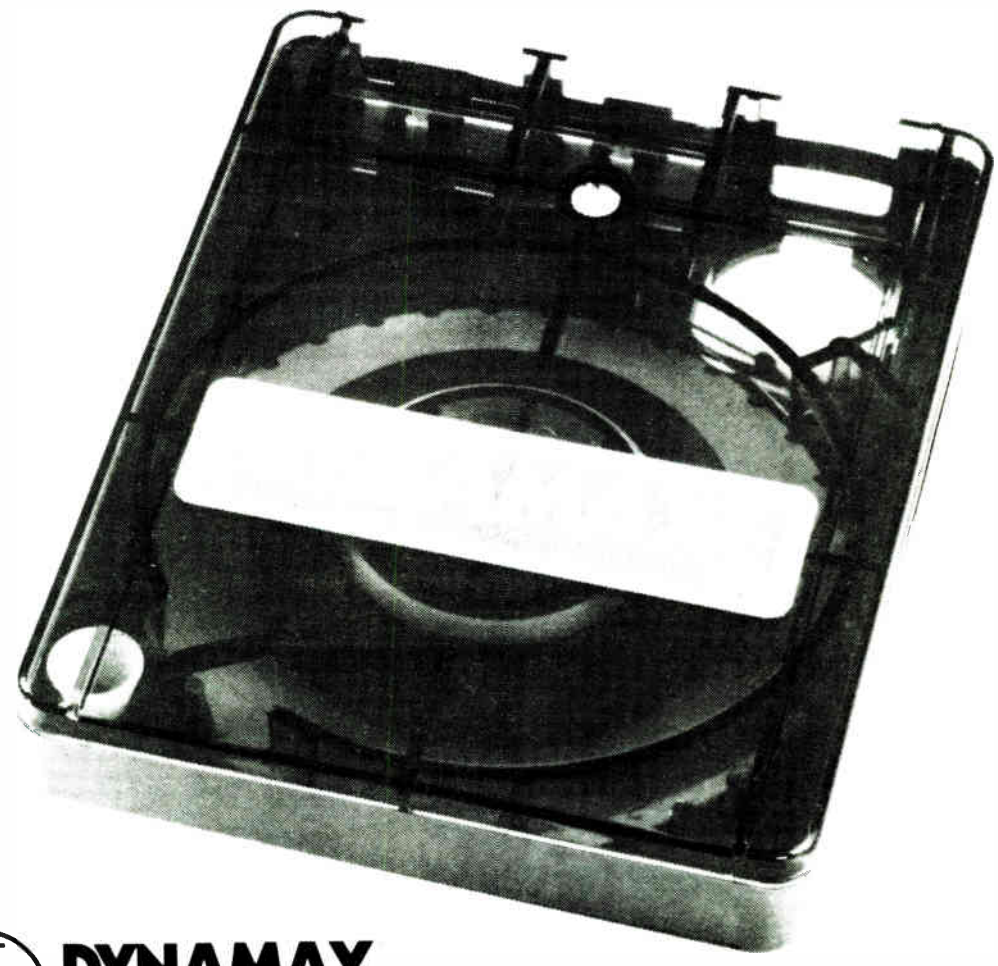

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World Radio History

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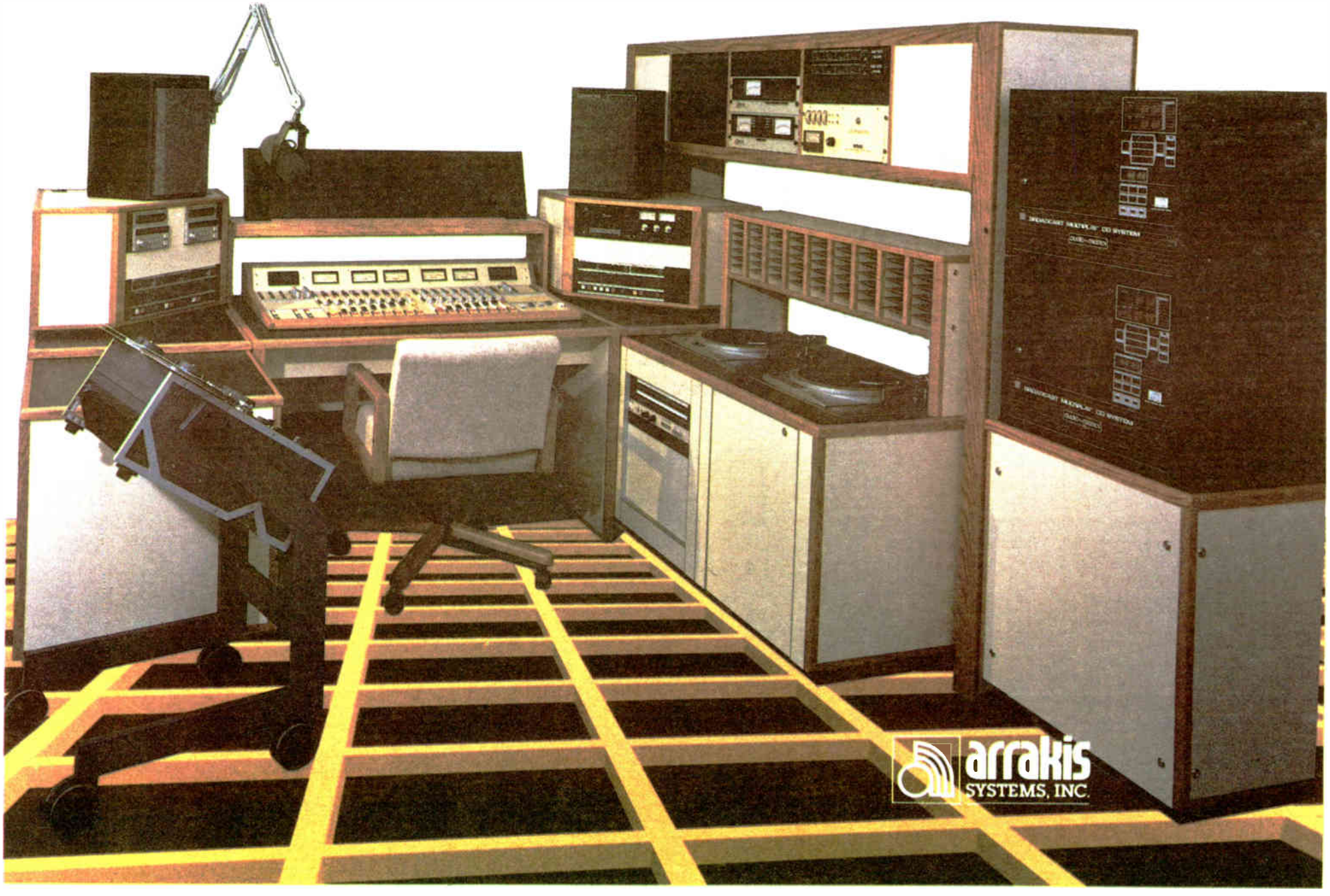

World Radio History

Fiber Network Debuts in Atlanta

by Charles Taylor

Atlanta GA . . . When the banners are gone and the cheers have faded, one star of the Democratic National Convention will continue to shine: a new fiber optics network like the US has never seen.

Southern Bell, the state's local telephone carrier, unveiled at the event a 1,063-mile fiber optic hook-up designed to help the more than 15,000 journalists in attendance transmit radio and television signals to home bases across the nation.

It also was the first step in the company's long-term design to equip Atlanta with a state-of-the-art telecommunications system.

"By utilizing part of our long-term plan to satisfy a short-term need, we now have a fiber optic infrastructure that has complemented an already growing fiber optic employment plan," said Paul Harman, a Southern Bell Communications official.

The web of hair-thin fiber strands links the Omni arena, site of the convention and the adjacent World Congress Center, which housed media work space, with dozens of transmission sites throughout metropolitan Atlanta.

A debut

For broadcasters, the system represented the first time such a major media event has been equipped with the sophistication of the technology, in large part because its applications remain relatively new.

Each of the major radio networks utilized fiber optics at the convention, and most agreed it has an edge over its transmission counterpart, the satellite. Still, it isn't yet perfect.

"Obviously, satellite coverage gave us an advantage over copper, the way we used to transmit," said Ray Weiss, manager of technical operations for NBC Radio, part of Westwood One. "Copper had inherent noise and a loss of level as it went from point to point.

"Then you came to satellites and you introduced delay because it takes a quarter of a second to go up and back 45,000 miles," Weiss said. "With fiber optics, your signal is going the actual distance and at the speed of light. Delay amounts to practically nothing."

Delay still

Practically nothing, however, still meant an instant of delay, which, for networks interacting live between convention coverage sites and home bases, created a problem.

To deal with the dilemma, Westwood created a special sound mix for reporters to be able to hear their own voices over headphones. Technicians had to remix the signal going from Atlanta to New York and returning to Atlanta so that the echo effect would be deleted.

ABC Radio, which also used fiber optics, also ran into delay troubles at the Democratic convention. "It was more of a problem than we thought it would be," said Horace Easterling, manager of technical operations in the Washington news bureau. "The delay is not as great as the satellite, but it still is distracting."

The network was not able to solve the delay for reporters on the floor, which resulted in their hearing a mixed minus signal—everything being aired except their own voices.

Technicians at CBS Radio were pleased with their employment of fiber optics services.

"The quality is as good if not better than satellite," said Gary Scherer, a CBS technician. And delay was not a real difficulty. "By the time (the signal) leaves here and gets to New York and back, it's less than a quarter second delay. It's not objectionable at all if you were listening to yourself coming back."

One of the main carriers of fiber optic services for networks at the Democratic convention was IDB Communications, which provided for ABC, CBS, Westwood One, AP, UPI, Voice of America and the BBC. Signals were carried from fiber optic lines to satellites at IDB's New York teleport.

National Public Radio (NPR) debuted its own fiber optics transmission system in Atlanta, which also was utilized by CBS Radio Stations news service, Canadian Broadcasting Corporation, The Christian Science Monitor/Monitoradio and a number of public radio stations.

With the system's T-carrier service, feeds from the convention site were transmitted via a fiber optics circuit to NPR's technical center in Washington, then routed through satellite channels, phone lines or other fiber circuits to respective end users.

Judging by its success at the Democratic convention, fiber optics have woven a communications trail for the future.

Said Westwood One's Weiss, "I wouldn't be surprised if satellites starting going down in popularity for broadcasting. Once fiber is more widely installed, that may be the answer."

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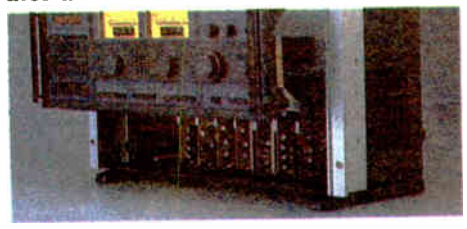

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STUDER REVOX

Circle Reader Service 36 on Page 38

World Radio History

Troubleshooting Intermittents

(continued from page 28)

Some of the larger distributors can provide needed service information or act as an excellent liason with a less responsive manufacturer.

Help from the manufacturer

The larger companies will stay on the phone for hours if necessary to help you get out of the woods . . . but try to do your homework first.

Write down symptoms, readings, control settings, clues . . . and try all the obvious approaches first. This is the mark of the professional. A pro asks for help when stuck but has explored the problem to the best of his or her abilities first.

Remember also that most manufacturers will repair a board or a complete piece of equipment in their own shop. There are situations when this is the best approach.

Much of today's equipment is microprocessor-based, with programs stored in ROM chips. This equipment often contains self-diagnosis programs that can be accessed from the keyboard or internal switches.

The service manual will outline how to accomplish the diagnosis; the operator manuals usually will not.

If there are no on-board diagnostics and the service manual is skimpy it is often necessary to return the equipment to the manufacturer or an authorized service station for repair.

Some manufacturers have "board exhange programs" also. In my opinion this is a last resort. Almost all problems can be repaired in house with factory assistance. But if you have a total meltdown on your hands factory service can look very inviting.

Fast service

If parts are needed and you do not have them readily on hand you can request overnight shipment. A good service department will have the parts in your hands the next day. Airport-to-airport package service is even faster, if you are really in trouble.

Unless you live in a big city, some specialized ICs are impossible to find locally. Even though the price will be higher than from a big distributor, the manufacturer is often the fastest source for these parts.

It is always a good idea to maintain as much in the way of spare parts as possible. This is especially true of specialized ICs. In the long run you will save money by having what you need when you need it. And you can purchase from a large distributor at the lowest possible prices.

Troubleshooting is an art . . . and a science. Few traits in an engineer are admired as much as the ability to diagnose and repair a piece of equipment in the shortest possible time.

Keep records of problems with each service manual so you can refer to them at a later date without trusting your memory. When you find something unique, share it with the other engineers you know.

In this way you can build a "network" that will help you become a better troubleshooter and engineer. It is a skill well worth developing.

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.

FCC Rules for Transmitter Operators

(continued from page 28)

papered with licenses.

The licenses that are required to be posted should be posted by affixing them to the wall or by placing them in a binder or folder that is readily available at the posting location [73.1230(c)].

Chief operator

Every station must designate a chief operator [73.1870(a)]. An acting chief operator is to be designated during times the chief operator is not able to act (such as during vacations or sickness).

The chief operator must hold a commercial radio operator license or permit that is not endorsed to prohibit broadcast operation.

The chief operator of an AM station using a directional antenna or operating with more than 10 kW or a TV station must be an employee (although he or she may be part time) of the station [73.1870(b)(2)]. I think many contract engineers may not be familiar with these requirements.

This rule has a number of other requirements. The chief operator of a lower power non-directional AM, or an FM station may serve on a contract basis.

The designation of chief operator must be in writing. Further, if the chief operator serves on a contract basis, then the agreement between the operator and the station must be in writing and kept in the station files. This contract is to be available to the FCC during an inspection.

The chief operator has the responsibility to insure that various requirements are met. The duties may be delegated but the responsibility may not.

When the chief operator delegates some of the duties to another person, the chief operator must maintain sufficient oversight to insure the duties are completed properly [73.1860(c)].

The chief operator (or the designee) must make inspections, calibrations and repairs of the transmission system, monitors, metering and control systems as often as necessary to insure proper station operation.

He or she must also make the monitor point measurements specified in the station license, equipment performance measurements and any other tests specified in the rules or the station license.

Another duty is a weekly review of the station log, insuring that it has been completed properly and that the station has been operating within the terms of its license and the rules.

On completion of this review the chief operator or designee is to sign and date the log, initiate any required corrective action and advise the station licensee of any problems that appear repetitively.

The chief operator must also make any other entries required in station records by other sections of the rules.

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

New Directions in Digital

(continued from page 30)

ital audio in a well-presented text.

It's a must for all audio engineers interested in complete digital fluency. It makes a welcome and timely addition to the reference shelf but it's worthwhile to digest it like a novel from cover to cover. And it makes excellent summer reading for the digital expert and novice alike.

Another is *Principles of Digital Audio*, by Ken Pohlmann, Howard W. Sams & Co., Inc., Indianapolis, 1985. Softcover, 285 pages. A very good "first" digital book, providing a thorough grounding in both the basics and many specifics of digital audio systems.

At under $20 it's an excellent investment in digital education, and a popular offering in any station's technical library.

Things often seem to be developing in a way that is impossible to keep up with.

Nevertheless, in an attempt to do so, I would appreciate hearing from you about areas you'd like to see covered in these pages or with any facts you'd like to share. Thanks to those who have already done so.

Such digital audio 'town meetings' are an important component to staying current in these volatile times.

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

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007	027	047	067	087
008	028	048	068	088
009	029	049	069	089
010	030	050	070	090
011	031	051	071	091
012	032	052	072	092
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015	035	055	075	095
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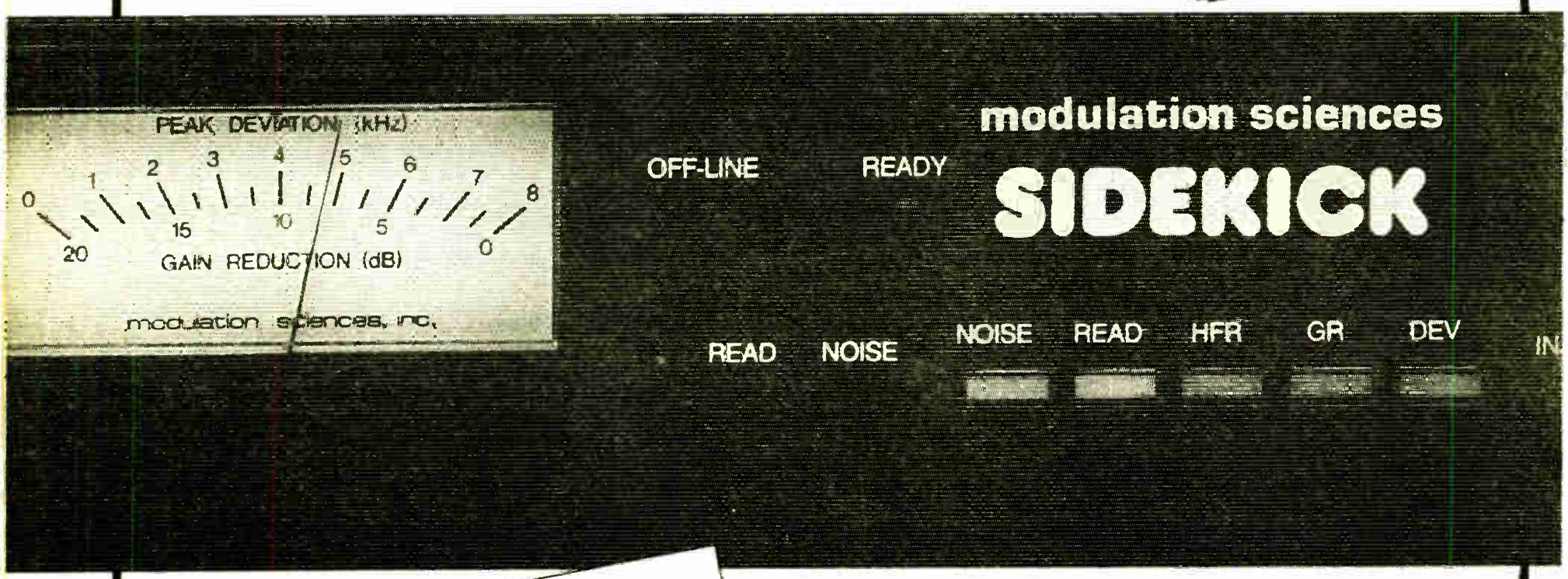

RF IDEAS

E.J. PRYOR, JR. — Broadcast Technologies, Inc.

"I have been operating one SCA on 67khz on my Dallas, TX station for some years. After many years of the normal problems of crosstalk, noise, etc., Modulation Sciences came forward with the 'Sidekick' SCA generator. I have never spoken out for a particular device in this column before, but I found that virtually every problem I had been experiencing, disappeared when I finally got one of these units and installed it at the studio between my stereo generator and composite STL. I found that the crosstalk, main to sub and sub to main, was improved almost 20db and the system noise was markedly improved also. There is no measurable degradation to the stereo performance or loudness whatever. With the new rules allowing stations to increase their total modulation 5% for each 10% of injection, the main channel (mono) level suffers a negligible 0.5db reduction in loudness."

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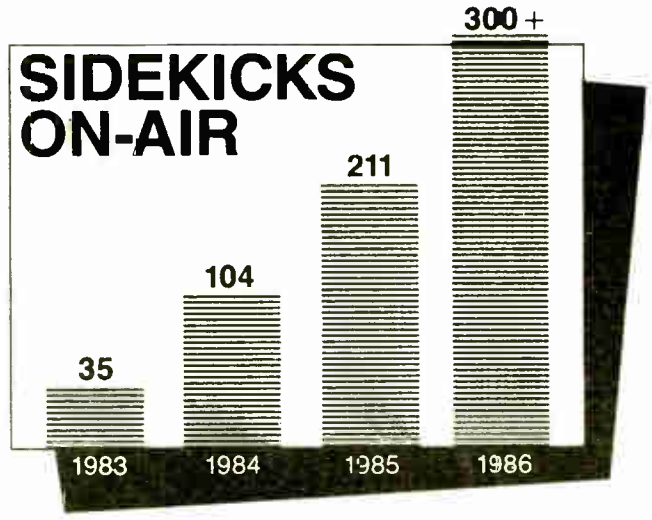

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World Radio History

RadioWorld

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AMPLIFIERS

Want to Sell

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.

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

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

Hill Audio 1000A (2), 2 yrs old, $2500 ea; Crest 3001, $750. B Rappleye, Bob Steele Prod, 4013 Postgate Terr Ste 701, Silver Spring MD 20906. 301-871-0132.

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

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

Want to Buy

RCA amps, BA-1-4 series & up; 82-87 series & up. W Davies, Virgo Prod, 5548 Elmer Ave, N Hollywood CA 91601. 818-761-9831.

ANTENNAS & TOWERS

Want to Sell

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

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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.

Dielectric 50,000D RF control switch, never used, $1500. E Gorman, 11250 Longhill Dr, Pinellas Park FL 34666. 813-546-6996.

Zenith automatic transfer switch, 25 kW. K Dicks, WVVA, Box 1930, Bluefield WV 24701. 304-323-5487.

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

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

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

RCA TFU-24DM UHF TV antenna on chnl 41, $1500. C Haynes, WJMI, POB 31235, Jackson MS 39206. 601-948-1515.

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

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

Want to Buy

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.

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

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

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

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

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

AUDIO PRODUCTION (OTHER)

Want to Sell

Henry Eng Mix Minus Plus (2), $125 ea. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

WANTED:
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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.

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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.

Paper leader tape, 1/2". (3) nearly full rolls; 1/2" Editall splicing block, $30. M Kuehl, Passage Prod, 1418 N Stevens St, Rhinelander WI 54501. 715-362-3016 aft 6 PM CDST.

CRL FM subcarrier gen, new cond, $675. Zetron paging terminal, $975. Mr Mudge, Datacel, 8577 Sandy Crest Dr, Union Lake MI 48085. 313-698-2336.

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

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

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

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

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

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

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

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

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

Harris 9003 automation controller, equip w/2 terminals, 32 sources, monitor panel, all cables, extra disc drives & spare parts. $5000. F 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.

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

IGM Instacart, late mdl, 48 tray, mono, excel cond, fac refurb, never unpacked, $12,000 + ship. M Lucas, WVNO, 2900 Park Ave W, Mansfield OH 44906. 219-529-5900.

Cetec System 7000, w/real time clock, printed log opt, 2 terminals, 2 encode ctrs, 3 R-R, 3 Insta-carts, Audiofile 2A, well maintained, $28,000/BO. B Troy, KSOP, 1285 W 2320 South, Salt Lake City UT 84119. 801-972-1043.

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

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

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

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

Want to Buy

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

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 orth.con 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.

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

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

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Want to Buy

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

Ampro 2514 PB, stereo, 3-tone, new head, $600; ATC CR stereo record amp w/interconnect cable. M Patton, WXOK, 6819 Cezanne, Baton Rouge LA 70809. 504-292-4189.

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BE-303C 3D stereo	995.00
ITC stereo WRA Amp	795.00
ITC mono R/P with tones	1,095.00
Tapecaster 700RP mono	395.00

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

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 mdl, 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. 402-553-0980.

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.

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

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

Spotmaster 3200, 5300, one R/P mono, one triple play only, gd cond, $1000/both. B Huges, KNET, POB 649, Palestine TX 75801. 214-723-2417, aft 7 PM central.

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

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

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

Want to Buy

Criterion 80 or BE R/P machine. R Ramirez, WSOF, POB 1246, Madisonville KY 42431. 502-667-5440.

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, PO Box 1214, Falls Church VA 22041. Attn: Box 1-1

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 good condition, perfer ITC Premium line or Audicord, reasonably priced. S Streitenberger, WFCB, 45 West 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 3D stereo cart machine. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

Cart rewinder. D Wiltala, WLOR, 118 S Union, Traverse City MI 49684. 616-947-3220.

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

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

Single play cart decks (2), mono w/1 kHz cue tone. W-13-BH TV, 1155 Old Portage Rd, St Ignace MI 49781. 906-643-8686.

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

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CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

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.

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, 48847 12 Mile Rd, Novi MI 48050. 313-349-7910.

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.

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.

Marantz/Superscope CD330 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, original 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.

Beriant 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 Kenny, BMA Inc, POB 817, Neosho MO 64850. 417-451-1440.

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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.

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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.

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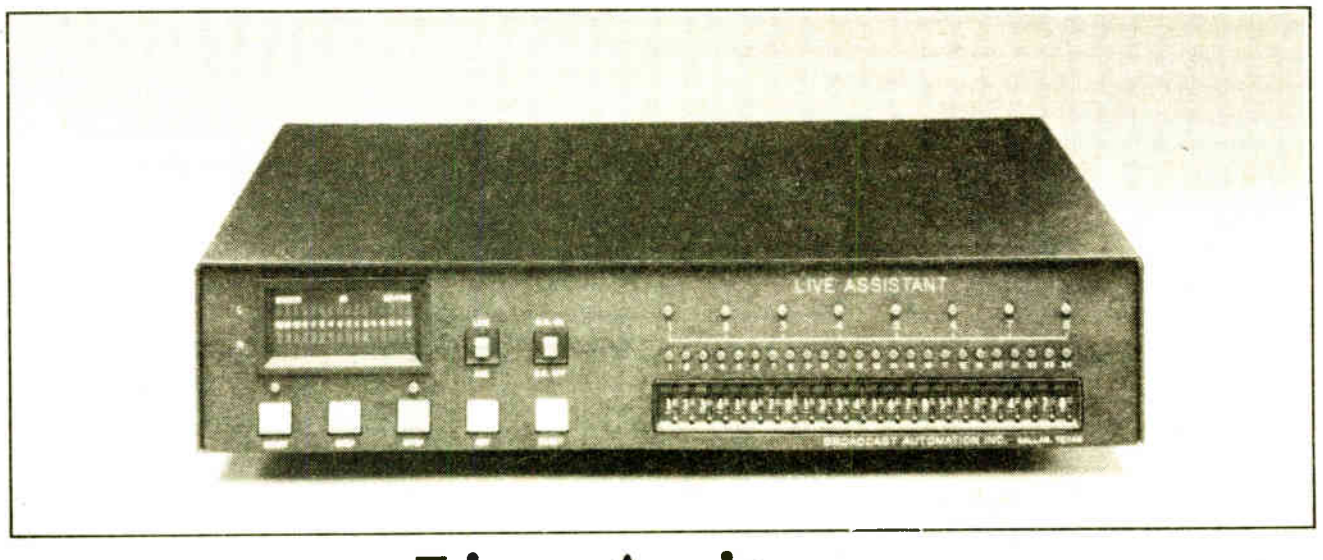

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Nagra III, (9) as is cond, $789 ea. B Cook, Cook Assoc, POB 4390, Wood Land Park CO 80866. 719-594-9464.

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.

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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.

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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.

ITC 750s (4), w/(4) MW Persons tone processors, $2000 (might break up package). L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

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Otari 5050 BII R-R, $1800 J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737.

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

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

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

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

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

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

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

Tandberg TCD-320 cassette deck, excel cond, 3 motors, dual capstans, mic inputs, headphone outputs, output level controls, $350. B Feinberg, Total Tape Publ, 9417 Princess Palm Ave, Tampa FL 33619. 1-800-874-7599.

Ampex AG440B FT, clean, $500; Revox A77, gd cond, $400. B Mountjoy, WHMJ, POB 1240, Elizabethan TN 37644. 615-543-5849.

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

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

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

Want to Buy

Otari MX5050BQII, must be in very gc cond. B Hanson, KCMQ, POB 459, Columbia MO 65205. 314-449-2433.

Workable Walkie-Recordall Model CCB, Miles Reproducer Company, call collect 319-626-6478.

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.

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.

Ampex AG440B elect in gd working cond. R Kaufman, Kaufman Recd, POB 462247, Garland TX 75046. 214-271-7625.

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.

Any parts for Ampex 200, especially amps & 200 head assembly; also Ampex 400 wood console. K Metzger, The Navagators, 1009 Pioneer Ln, Colorado Springs CO 80904. 719-635-1721 (call collect).

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

CONSOLES

Want to Sell

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.

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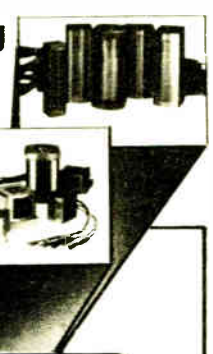
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Neve production/transmission/outside broadcast type consoles (2), excel cond. Dan Alexander Audio, 2944 San Pablo Ave, Berkeley CA 94702. 415-644-2363, TLX: 650 8567 MCI.

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.

Gates Yard console w/power supply, fair cond, $200. L LeBlanc, WKXL, POB 875, Concord NH 03301. 603-225-5521.

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. 214-463-5658.

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. 212-274-0274.

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.

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

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

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

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

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

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

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

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

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

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

Collins 12-2 remote board, needs tubes, $150; IBM Dictabelt w/access, $25; IBM small Dictabelt, $15; Wollensak R-R, $25 ea; Sony shotgun mike, complete w/access, $250; Marti remote xmtr & ant, $250. R Hull, KWMT, 540 A St, Ft Dodge IA 50501. 515-576-7333.

Want to Buy

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.

NOW FORMING
ADM
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Parts for discrete consoles
CALF AUDIO (607) 272-8964
J. Todd Hutchinson

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.

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

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

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

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DISCO & SOUND EQUIP.

Want to Sell

E-V S1202. B Raines, DIR, 32 E 57th, NY NY 10022. 212-371-6850.

EMT 140 stereo reverb w/remote, $1200. T Papa, Santa Monica Sound, 2114 Pico Blvd, Santa Monica CA 90404. 213-450-2119.

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.

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.

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

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

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

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

Want to Buy

dbx DX-40 processor or (2) dbx 150's. B Roberts, 5504 87th St, Lubbock TX 79424. 806-794-6023.

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

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

LIMITERS

Want to Sell

Gates Stay Level w/gd tubes, $30/BO. K Smith, POB 85, Gorham ME 04038. 207-929-6129.

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LIMITERS . . . WTS

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. 707-446-020C.

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.

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

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

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

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

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

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

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

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

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

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.

Orban 8100/ST Optimod split chassis, also old #5 cards. R Dietterich, WAMO, 411 7th Ave, Pittsburgh PA 15219. 412-471-2181.

Orban Optimod 9000A, 8000A. pref gd cond. S Roach, KARY. 509-882-3500.

MICROPHONES

Want to Sell

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.

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.

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.

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.

AKG D19E, BO. P Sibley, 138 E 78th, NY NY 10016. 212-986-2219.

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

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

Want to Buy

Altec yoke for Altec 639 mic. L Beigel, On-Cue Recdg, POB 85042. LA CA 90072. 213-466-3595.

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

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

MISCELLANEOUS

Want to Sell

New FM, Class A radio station seeks, tower, transmitter & studio equuipment, call N. Norris, 313-234-4335.

WANTED
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Teletype ASR33, (3) one working, two for parts, BO. C Edwards, WWJM, 210 S Jackson St, New Lexington OH 43764. 614-342-1988.

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.

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.

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.

1A2 Telephone Equipment: 501 KSU w/o power, $50; Eglin EBK 16 power supply, $50; line cards tested, $8.50 & much more, call Mike 904-377-0918.

Handbook of Radio Publicity & Promotion, new copy, $20/BO; (4) Accustainer 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.

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

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

Want to Buy

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.

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

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

MONITORS

Want to Sell

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.

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.

Belar FMM Series, mod mon set, w/manuals. G Stonebraker, KMYO, POB 1330, Aztec NM 87410. 505-632-3402.

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

MOVIE PROD. EQUIP

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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).

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

Contact 360 receiver & down converter for AC format, $2500. P McQuade, KATO, POB L, Safford AZ 85548. 602-428-1230.

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Spectrum Resources
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Anchorage AK 99524
(907) 347-2630

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.

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ACTION-GRAM

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World Radio History

Broadcast Equipment Exchange

RECEIVERS . . . WTS

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.

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

Want to Buy

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

REMOTE & MICROWAVE EQUIP.

Want to Sell

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.

S-A 7300, for major networks w/book & crystals, excel cond, $7600. T Crockett, Hot Tracks Recdg, POB 10501, Blacksburg VA 24060. 703-953-0222.

Fairchild 360 sat receiver for Transtar adult contemp format, complete system in excel operating cond, $2500. R Reich, WIBZ, POB 686, Sumter SC 29151. 803-773-1859.

Elgin 20721, has 20 listen line couplers, new cond, in boxes, $100 ea. C Ortome, KMPC, 5858 Sunset Blvd, Hollywood CA 90028. 213-460-5651.

Microdyne 1100 SCPC satellite receiver/demod (2), $3000 ea/BO. J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737

Gentner SPH'3 telephone interface (3), $325 J Lackness, KRIA, 3407 NE Pkwy, San Antonio TX 78210. 512-828-3737

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.

Moseley PBR-30 RC system, $800. J Stromquist, WNCB, 2816 Hagberg St, Duluth MN 55811. 218-722-3017.

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.

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

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

S-A 15 kHz dual audio card, will trade for 7.5 kHz audio card. D Grant, WLAV, 50 Louis NW, 3rd Fl Trade Ctr #333. Grand Rapids MI 49503. 616-456-5461.

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

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

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

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

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

Want to Buy

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.

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

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

STATIONS

Ohio, PA., W.VA.
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As little as $25K down
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Want to Sell

NW of San Antonio, TX, 500/250 W AM, assume & small down. 512-691-0716.

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.

FM Class A, AM daytimer, w/3 acres land, 3 bedroom house in combination w/studio & offices, 750 sq ft transmitter building, automated, all equip in first class working order, $350K/negotiable, retiring. JP Robillard, 1803 N First E St, Haynesville LA 71038. 318-624-0105.

FM CP's Wanted
Clients seek CP's any size market. Small, medium, large. Will consider FM upgrades, too!
Don Nahley
1-404-323-1460

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

Want to Buy

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 or best offer. A McCarthy, KUIC, 419 Mason Suite 203, Vacaville CA 95688. 707-446-0200.

Employment

To place ads in this section, use the Action-Gram form. To respond to box numbers, write Radio World, Box 1214, Falls Church VA 22041, Attn: __.

POSITIONS WANTED

Eng mgr seeks position as group tech director, 20+ yrs bdct industry w/previous 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 position in Midwest, 18 yrs exp FM & AM high power directional, FCC general 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 management 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 engineer tired of small stations, looking for full time job with medium-large market, progressive station, 18 years experience, general 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 with company, flexible and hard working, for resume call: L Cordoza, RAI Corp, 485 NW 69th St, Boca Raton FL 33487. 407-994-6982.

Seeking FT radio CE pos. Exper in AM/FM radio, prof audio systems, 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

Radio Engineer for WBBM AM/FM stations. Applicants should have in-depth experience in studio design, 50kw xmtrs, dig & 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.

Broadcast Engineers: growing contract engineering company seeks engineers w/2-10 yrs exper. to work in Mid-Atlantic area. Immediate positions for right persons. Salary, company vehicle & hospitalization provided. Contact John Rodman at 804-875-9430.

Chief Engineer, WBBF-AM/WBEE-FM in Rochester, NY. Acquisition focused company with excellent benefits. Team player with hands on experience required. EOE. Phone Carolyn Merz, 716-232-7550.

Chief Engineer for Northern California 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.

Maint. Eng., 50kW FM, 5kW DA AM. Associate degree EE Technology or equivalent exper required. EOE. Bill Chambers, WHBC, Box 9917, Canton OH 44711.

CE/Production Talent for upgrading South Florida coastal adult contemporary FM. Candidates must be organized, maintenance minded, relate well to people, & enjoy the beach. RF exper required. Salary range 18-23K. Resume to Kyle Magrill, DE, The Daytona Group Inc, 770 W Granada Blvd, #206, Ormond Beach FL 32074.

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World Radio History

RW Broadcast Equipment Exchange

STEREO . . . WTS

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, excel cond, $3500. A Munro, WKTZ, Jacksonville FL 32211. 904-743-2400.

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

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.

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

Want to Buy

Dynair VSX, 12 x 12A or similar routing switcher. D Sis, St Johns Univ, Collegeville MN 56321. 612-363-3378.

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

TAPES, CARTS & REELS

Want to Sell

Ampex reels, (200) w/hub 1 mil 642 tape, erased music syndication tapes, little use. $5/reel + shpg. T Moore, WBCO, 403 E Rensselaer, Bucyrus OH 44820. 419-468-2326.

Want to purchase large quantities of used or new audio tape, mainly 10" tape on reels or hubs, 1.0 & 1.5 mil. Contact Rudy at Burlington Audio Tapes, Inc., 106 Mott St, Oceanside NY 11572. 1-800-331-3191.

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(715) 835-7347

NAB reels, 10.5" metal 1/4", all in gd cond. 1-10, $1.50 ea, 11-100, $1.25 ea, 100 +, $1 ea. Falk Recd Srvs, 7914 Fegenbush Ln, Louisville KY 40228. 502-239-1010.

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.

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.

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.

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.

Want to Buy

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 buy-out on reel or disc. B Fogal, Hold Plus, 5319 SW Westgate Ste 20, Portland OR 97221. 503-292-4871.

TAX DEDUCTIBLE EQUIPMENT

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

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

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

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.

Surplus Electronic Equipment
H-P, Tektronix, and others.
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(602) 458-6656

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 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.

Tek 146 video test signal gen, exel cond, $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.

Want to Buy

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TRANSMITTERS

Want to Sell

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LPB AM1 RC5A 1620 kHz, 5 W output, Stelatron FX20, FM stereo 20 mW out. J Titus, WSAM, 566 Briarcliff Rd, Pittsburgh PA 15221. 412-243-1674.

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.

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Gates 250C1 w/exciter on 1240 kHz, gd working cond, BO. K Chestnut, WSFC, POB 740, Somerset KY 42501. 606-678-5151.

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Parts, large inventory for RCA BTF-20E1, all in gd cond, BO. J Schloss, KICD, 2600 Hiway Blvd, Spencer IA 51301. 712-262-1240.

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.

ITS 1615 ITFS sys, xmtr, antenna & 377' 6" waveguide, $42,500 2 yrs ago, sell for ½ price or trade, avail 10/30/88. B Ellis, KOZK, MPO Box 21, Springfield MO 65801. 417-865-2100.

RCA mod xformer for BTA 5F xmtr, new in orig crate, $600 + shpg; RCA BTA 50F, 50 kW AM in excel cond, compl, in storage ready for use, w/electro-static air filter, solid state rectifs & much more, w/manuals & floor layouts, $18,000 + shpg; RCA BTA 5F, 5 kW AM ready for immed use, excel cond, w/manuals & floor layout, $10,000 + 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

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ACTION-GRAM

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World Radio History

RW Broadcast Equipment Exchange

TRANSMITTERS ... WTS

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.

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 1019, 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.

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Continental 316-S 10 kW, excel cond, avail soon. A Sutton, WMGA, POB 1380, Moultrie GA 31776. 912-985-1130.

Power Pak 40 W field selectable broadband stereo exciter, $2000. J Phillips, All Star Bcctg, 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.

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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

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.

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 Ratlife, 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.

FM xmtr, 20 kW Harris, Continental, BE w/late mdl exciter. D Agnew, 402-488-4275.

Harris BC5H binary div for low AM freq, used in RF exciter of BC5H/BC10H AM. D Williams, KLLV, 14780 Kwy 140, Breen CO 81326. 303-259-5558.

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.

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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.

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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/package. 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 CB-500 16" TTs (2) w/tonearms & preamp, $60 ea; (3) QRK 12" TTs, $50 ea. L LeBlanc, WKXL, POB 875. Concord NH 03301. 603-225-5521.

Gates 16" (2) transcription 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.

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Mint 16" transcription TT, complete w/arm, cartridge(s) & preamp. C Fuller, VOICES, 119 S Constance Ln, Countryside IL 60525. 312-579-9578.

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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.

Telemation TSE-200 SEG, $300; Panasonic 13" color video monitor BT51300N, $175; Panasonic 10" CT-110M color video monitor, $150; American Data vert 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.

Sony BVH 500 portable 1" type C, excel cond, $10,000; Sony TC1000, excel, $2500; Shintron TC 690ET, excel, $2500. D Weber, 57 E 11th, NY NY 10003. 212-995-8822.

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.

3M 6220 image enhancer decoder, excel cond, $350. R Cane, Video Dynamics, 6142 Miramar Pkwy, Miramar FL 33023. 305-962-8111.

Convergence ECS103 editor & TCR100 time code interface & SWI110 switcher interface, gd cond, w/5000 series cards, $1995. A Denke, Am Motion Pictures, 7023 15th Ave NW, Seattle WA 98117. 206-789-1011.

Vital 11410X w/audio follow & RGB chroma keyer, $6000/BO; Duhel Optics w/16mm, 8mm & super 8mm, $4000; BTX audio interlock sys w/8 trk & (2) 2 trk audio machines, $6500. T Judge, TAG Comm, 75 Weaver Rd, W Milford NJ 07480. 201-697-8454.

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Sony 2850, 2860, RM400 edit system, $1800. Bob, RC Video, 2953 First St, Napa CA 94559. 707-252-2396.

IVC 1" VTRs (4), one remote control & 2 service manuals, approx 30 tapes, $500/pkg. J Richardson, Mercy Health Ctr, Mercy Dr, Dubuque IA 52001. 319-589-8708.

Sony VP1000, VP1200, VO1800, 3/4" players & recorder & approx 80 tapes, $600/pkg. J Richardson, Mercy Health Ctr, Mercy Dr, Dubuque IA 52001. 319-589-8708.

Want to Buy

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