



# NRSC Examines RBDS Systems

by John Gatski

**WASHINGTON** Four systems have been submitted to the NRSC for consideration as a U.S. Radio Broadcast Data Service (RBDS) standard, including versions of the European RDS (Radio Data System) and one totally new system.

The NRSC was scheduled to meet March 14 to discuss RBDS

submissions, which were due no later than Feb. 28.

U.S. proponents of an RBDS system believe it holds promise for displaying station call letters, traffic alerts, emergency alerts, text message displays and automatic format selection.

According to NRSC Coordinator Stan Salek, the NRSC will look over the proposals and decide how best to evaluate the

systems for an eventual recommendation.

Two of the submitted proposals—Phoenix Communications and Sage Broadcasting/Delco—are based on the European RDS systems, using a 57 kHz subcarrier. Sage has been heavily promoting the RDS-based systems as a replacement for the current EBS system.

Sage, now in partnership with

Delco, has been working to adapt RDS for the U.S. for more than a year. Much of the U.S. version would be based on the European CENELEC RDS specifications. In its proposal, Sage outlined the program information codes that will enable a receiver to lock onto a format and to provide other information.

Sage has proposed program information code exceptions that

depart from CENELEC. They include codes to ensure that a receiver can select the different frequencies of two stations broadcasting the same programming, codes for stations with three call letter IDs and special codes for nationally-linked stations carrying different call letters like NPR.

Phoenix Communications also promotes use of the European RDS systems, but said its design can provide cheaper encoders (\$1,500-\$1,600 versus \$8,000 to \$12,000 for encoders purchased in England).

The newcomer is Zephyr Enterprises, whose system operates on a 76 kHz subcarrier. "It is similar to proprietary systems now used, such as the Dow Jones information service," Salek said.

Zephyr claims its systems is "superior" to the RDS system by providing in-depth information via scrolling that goes beyond the eight character display planned for U.S. RDS.

For example, "Zephyr's internal memory has the capacity to hold pages of incoming data, which is saved until the user chooses to access it," the proposal stated.

The company said that Zephyr transmission equipment is "inexpensive," requiring only the software, SCA generator and IBM-compatible computer.

Cue Network Corporation, which currently services several Canadian cities with a paging network, proposed a modified RBDS system using the MSB paging technology, called MMBS. It is similar to Swedish Telecom Radio systems, according to Cue Network, but allows greater compatibility and capacity than the European RDS system.

Although RDS encourages data and paging service, it "is less efficient than would be desired for these applications," Cue Network said in its proposal.

Salek said that a U.S. standard could eventually include elements from all the proposals.

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# Spectrum Auctioning Debated

by John Gatski

**WASHINGTON** Spectrum reallocation and possible implementation of a new FCC "user" fee dominated much of the panel discussions during the NAB's annual leadership conference.

The March 2-5 conference included a debate on a variety of broadcast issues by NAB officials, FCC staff and congressional staff, as well as key note addresses by FCC Commissioner Andrew Barrett and Sen. Daniel Inouye (D-Hawaii), Senate Com-

munications Subcommittee chairman.

Other issues discussed included the expanded AM band and performers' royalties, the decline of FCC application backlogs, and the FCC/FAA tower jurisdiction dispute.

Spectrum reallocation was a key subject because of its potential for use by new technologies, such as digital audio broadcasting. Two versions of a congressional bill have been introduced in the House and Senate that would free up about 200 MHz of government spectrum.

NAB Government Relations Executive VP Jim May said a potential snag in supporting the bills comes from a Bush administration proposal for a spectrum auction that may or may not exempt broadcasters.

"It is going to be a long-term debate in Congress," May said.

The auction proposal appears to exempt licensed broadcasters, but the language for new licensees is not as clear, according to the NAB.

Sen. Inouye said he was opposed to spectrum auctions, a consensus Senate Commerce Committee Minority Counsel

Gina Keeny echoed earlier in a congressional staff panel. "I don't see a chance for auctions on the committee," she said.

On the House side, Telecommunications/Finance Subcommittee Senior Counsel Larry Irving said House support for spectrum auctions also is unlikely.

Besides auctions, the NAB signaled its opposition to a new FCC "user fee" that has been backed by the administration. The fee would hit common carrier users the hardest, but broadcasters would end up chipping in an estimated \$11.2 million annually.

(continued on page 10)

## Translators Unfrozen

by Charles Taylor

**WASHINGTON** New rules tightening the operation and ownership of commercial FM translators went into effect March 1, ending three years of uncertainty regarding the signal extending technology.

The action, approved by the FCC in November, reflects a comprehensive reexamination of the FM translator service, commonly used to bring a station's signal into weak areas of its one millivolt per meter (1 mV/m) contour.

The long-awaited rulemaking followed a March 1988 freeze on new commercial FM translator applications. Since then, the Commission has accepted round after round of comments from various groups either opposing a tightening of the rules or claiming that the technology creates a low-power FM service.

The freeze will be lifted May 1, 60 days after the effective date of the new rules. After May 1, new applicants must conform to the amended rules. Applications that were deferred pending the outcome of the translator proceeding must amend their filing to meet the new regulations by July 1.

Until May 1, only new non-commercial

educational applications or major changes to existing or non-commercial facilities will be accepted for filing.

Among the primary translator rule changes is a move to prevent a commercial station whose signal is carried via a translator from helping an independent owner with operating costs. The primary station already was forbidden to own the translator or to help pay for its construction, but it had been allowed to supplement costs of operation.

The primary station still is allowed to operate on any of 80 non-reserved commercial channels with the 20 reserved non-commercial educational channels available for non-commercial educational FM translator use.

As well, the maximum effective radiated power standard has been reduced from a proposed 1 kW to 250 W. The Commission also established power and antenna height combinations for translators operating beyond a primary station's coverage contour, yielding new coverage contour distances of seven kilometers for areas east of the Mississippi River and Southern California and 13 kilometers elsewhere.

For information, contact the FCC's James Coltharp at 202-632-6302.

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# Screech! Crash! It's Only FM

by Judith Gross

**FALLS CHURCH, Va.** Where did they come up with this one?

OK, so the FCC has to try to coordinate a spectrum request to take to WARC, now less than a year away.

Trying to satisfy the demands of government broadcasters like the VOA, NASA, all the proponents of all the new



technologies—cellular phone folks, etc.—and of course, existing broadcasters, isn't exactly a walk in the park, know what I mean?

We got the DAB activists fighting among themselves and with the HDTV folks. Throw in the mobile satellite guys and it's a real mess.

So the Commission tried to give everybody the greatest number of alternatives with its first two Notices of Inquiry. You remember. There was some UHF spectrum, the now infamous L-band, and a slice up around 2100 MHz, the microwave band.

The UHF spectrum was the source of a lot of haggling: "It's mine." "No, it's mine!" and a lot of M.C. Hammer-like yelling: "You can't touch this." The HDTV people have staked that one out pretty tightly.

L-band is still under debate. It seems to fit the needs of satellite proponents all right, but terrestrial broadcasters, namely stations in the U.S., have mucho doubts about the ability of a signal to penetrate buildings, about the power requirements and all that way up there.

So there are a bunch of tests planned and the verdict is out with a big dollop of skepticism for good measure and

arguments raging every step of the way.

The microwave band? You've got to be kidding. If you thought the propagation and power problems were rife at L-band, just imagine putting it up even higher.

Well, the esteemed Commissioners are literally reaching for the stars on this one. They put out a call for comments—no, not a third NOI, but a supplement to the second NOI, which offers a fourth place to put DAB. How about 2360-2410 MHz?

Excuse me?

I asked the OET's Tom Stanley where the current concerns of terrestrial broadcasters are being taken into consideration on this one, and he said, "That's why we're suggesting this. We want to hear from those broadcasters."

So let 'em hear from you. You think it's a good place to put a DAB service? I've heard a lot of folks who don't. Can't wait to see what the consensus is, and I won't have to wait long.

The Commish put a short comment track on this one. April 12 for comments, April 26 for replies. They have to have the WARC position sewn up soon, you see. Expect a vote from the M-Street Five (sounds like a radical political organization, doesn't it?) about mid-June.

Oh yeah, and I wish somebody would tell the security folks at the FCC and also at the NAB that the war is over and the risk of terrorist attacks is pretty much a washout, too.

I mean, I know that international terrorists would just love to get at the Commission dockets room (wouldn't we all?) but all that signing in, signing out, "Where's your picture ID?" "Is that a computer, ma'am?" (no, it's my jet propulsion pack, I hate Washington traffic jams) is a bit too much.

All, right, it's a bit better at the NAB, where I understand they actually did have a few bomb threats, including one during a Radio Operators Caucus meeting ("when I say I don't want DAB, I mean it"). But, really.

And I understand the weather was

chilly but the food was good in Rennes, France, where the technical advisory group of the NAB's DAB Task Force traveled for a firsthand look—or listen—at Eureka.

Everybody knows it's impossible to get a bad meal anywhere in France. That goes double for the wines. So how come you never let reporters go along? I even like escargot, honest.

Anyway I hear the nine engineers had a good time dreaming up new test situations to hear how well Eureka 147

be heard even in the structure, which was an open-type of garage and not completely closed in.

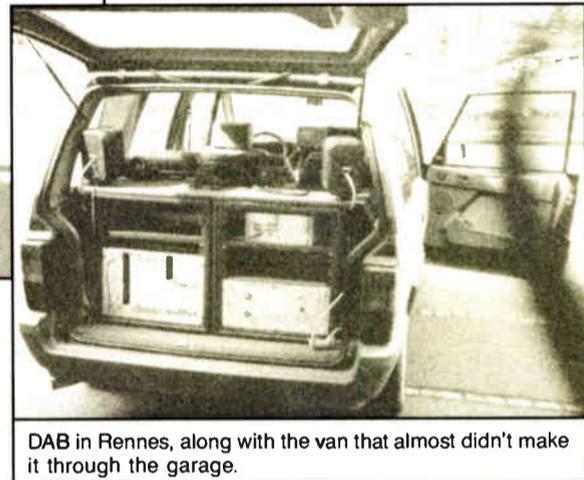
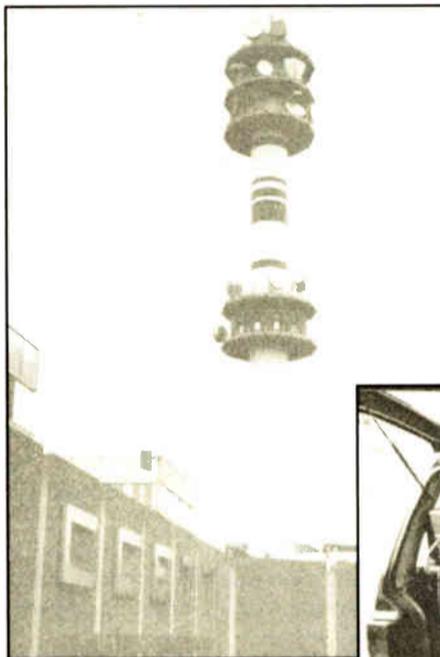
The signal was there or it wasn't, but they said it sounded good when it was there.

Unfortunately, not all of the nine got to hear and see everything they wanted to about Eureka. There was a clash of systems, apparently.

Gannett is currently working on an in-band DAB system with Stanford Research Institute, but Gannett VP of Engineering Paul Donahue did travel with the Rennes group.

The Eureka folks, however, wanted each engineer to sign a non-disclosure agreement. They also pressed Paul to give them the skinny on the Gannett-SRI system. He couldn't do either. So unfortunately, they excluded him from some of the demos and discussions.

The engineers generally gave Eureka good grades for the Rennes performance. But as a letter to the DAB Task Force from advisory group chairman



DAB in Rennes, along with the van that almost didn't make it through the garage.

DAB performs. The acid test was the parking garage caper. I can only imagine the exchange.

"But, monsieurs, you actually want to listen to ze radio in ze parking garage?"

"Oui." In they went, only they almost demolished the vehicle's FM antenna because the demo van wasn't built for the low clearance. Oh well, who needs FM when you've got DAB, right?

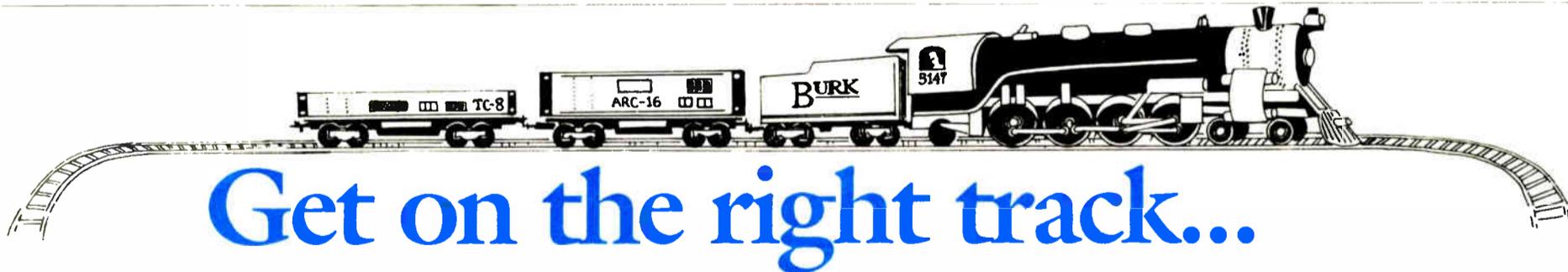
All went well, however. The antenna came out none the worse for the wear and the engineers said the signal could

Don Wilkinson says, it still has to be tested at L-band.

And as Paul says, "until it's tested where we want to put it, it's all speculation." Amen.

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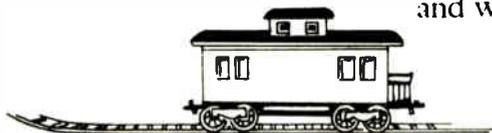
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"Thumbs up" for pirates

Dear RW,

As a strong supporter of the Pirate Radio movement, I am quite pleased at RW's coverage of pirate news. Great articles like "Pirate Evades FCC's Clutches" (RW, Feb. 6, 1991) are certainly welcome, and thanks to the way the media has exposed the pirate radio scene, the pirate operators suddenly become heroes, rather than the criminals the FCC makes them out to be.

The FCC's current licensing policies make it so that only the rich and powerful have legit access to our country's airwaves. I am not, nor have I ever been, a pirate operator, but I do entirely encourage and condone this type of activity.

If Chairman Sikes is hoping for a decline in pirate activity, look—there is very little, if any, negative publicity about the current pirate scene, and your "pirate-busting" techniques are just another form of bureaucracy that clearly defeats the purpose of our Constitution's First Amendment.

Many folks in our nation are underrepresented in the media, and the FCC is only helping to keep such people out of broadcasting. What is needed at this time is some type of low-power AM service, other than the 100 mW service currently

being permitted. It is to my knowledge that the FCC has rejected applications for new MW stations recently. If that is true, allowing low-power, restricted range stations to operate on unused MW frequencies is quite possible, and still would not cause interference to licensed broadcasters. A couple watts of ERP can provide a radius of several miles, at a cost of several hundred dollars.

Until the FCC can institute such a service, I am "thumbs up" to the pirates who broadcast in defiance of the powers that be.

Sam Murdock  
Radio Activist  
The Midwest, U.S.A.

DAB: U.S.'s turn

Dear RW,

I fail to see the benefit of supporting the Eureka 147 DAB system, especially with its hocus-pocus data compression scheme. I beg some reconsideration in light of spectrum-compatible systems developed here in the good ol' US of A which do not resort to such unnecessary schemes, or at least to the extent the Eureka system does. We could do to the Europeans in DAB what they did to us in television. Early systems tend to be inferior, anyhow.

For instance, Britain had one of the first operational TV systems. It had only 405 lines and was soon outclassed by our 525, which itself was bested by a 625 line system. Similarly, with color, our NTSC (cynically dubbed "Never Twice the Same Color") system implemented in 1954 was surpassed by the German PAL system which was not on line until 1965.

Now it's our turn. Let the Europeans have their inferior system. Let's not let this "me too" attitude turn us into a bunch of lemmings. Let's have DAB even if it means not having it next week. Theirs may be digital, but to us golden-ears (or, in my case, gold-plated) it isn't CD quality if it can't produce a CD wave form.

By the way, Carver's use of tube amps in CD players is for improved sonic performance, not for nostalgic tube-amp boominess (JG's *Earwaves*)—largely a fault of the speaker systems! Nor is Carver the first. California Audio Labs has had one for years.

Scott Todd  
Skylight Satellite Network  
Roseville, Minn.

Another worthy cause

Dear RW,

I agree with Paul Courson (*Readers' Forum*, Feb. 20, 1991) that amateur radio users would benefit from receiving 1960s and '70s radio equipment being discarded by commercial stations undergoing studio upgrades. RW itself in the editor's note following the letter deemed Courson's effort to distribute such used equipment as a "worthy pursuit."

However, I hope RW would also agree that an even more desperate need for, and worthy use of, such old equipment exists at college and high school radio stations. Many of these stations are treated as training facilities by their host schools, often

Plans to test the Eureka 147 DAB transmission system in the L-band are a logical next step in the effort to establish digital audio broadcasting in the U.S. Whether done by the NAB's DAB Task Force, in conjunction with Strother Communications, or by Canadian broadcasters, the tests are both necessary and appropriate.

The recent demonstration of Eureka 147 in Rennes, France to the task force's technical advisory group—while perhaps impressive in itself—did nothing to disprove opponents' claims about the unsuitability of the L-band for digital broadcasting. Power requirements for Eureka and the system's permeability of office buildings are unknown at the 1500 MHz frequency suggested for the DAB scheme.

Even the NAB, which now suggests that its earlier predictions of power requirements for Eureka may have been overestimated, understands the need to test the system—if only to quiet its detractors. The tests, along with the Rennes demonstration, constitute the technical evaluation of Eureka that the association promised it would undertake.

L-Band Testing Logical

Such evaluation is more important to the fledgling digital audio broadcasting technology now than ever before. As people become more comfortable with the concept of DAB, more inventive and entrepreneurial DAB ventures are being proposed. It seems as though a new DAB

scheme is unveiled every two weeks.

Many of these new systems do have benefits. Some, like the Gannett system, are in-band, utilizing existing FM spectrum and thereby sidestepping the unknown factor of the L-band. But as the NAB points out, these in-band systems leave open an important question: What will the industry do to assure that an equivalent technology is made available to AM broadcasters as well?

For the NAB, at least, the answer is becoming clear—choose Eureka. Such action, however, must not be entered into hurriedly. It must be done quickly enough not to bog down the development of DAB technology, while rationally examining the system's weaknesses as well as its strengths.

It is correct for the NAB to actively evaluate DAB. Until the system it endorses can be tested at the frequency proposed for it, there will be no consensus of opinion from broadcasters, and DAB implementation will be delayed by an ever-increasing number of alternate systems. For better or worse, L-band testing will decide the fate of Eureka 147 in the United States.

—RW

receiving no formal budget at all. Even when they do, the money barely covers emergency repairs and basic office supplies. Given this, most college stations are sorely lacking in equipment. Even the most basic studio pieces are old and almost beyond repair.

This is where commercial stations' old equipment would be most appreciated and make a real difference—in the lives of the students training to become the next generation of radio industry professionals. In addition to the real service such donations mean to these stations, the donor could also reap significant benefits in public relations and tax deduction/write-offs.

I hope RW will endorse the donation of such equipment to student stations at least as strongly as it did to amateur radio hobbyists.

Glenn Gutmacher, Publications Dir.  
National Association of  
College Broadcasters  
Providence, R.I.

*Editor's note: Mr. Gutmacher is correct. Many college and high school radio stations are getting by with equipment that might not be used even as back-up gear at commercial facilities. The education of our next generation of radio professionals could indeed be enhanced by the charitable contribution of equipment that might otherwise be cast off.*

*Those interested in learning more about how tax-deductible equipment donations can be made to college and high school stations can call Glenn Gutmacher at the NACB: 401-863-2225.*

More on off-air monitoring

Dear RW,

For the most part, Mr. Vernon's article "The Inside Track on Off-Air Monitoring" (RW, Feb. 20, 1991) was correct, but there are some areas that need clarification or correction.

First, I would like to point out that one cannot always go by the power ratings of the output devices in an amplifier to determine the power output of that amplifier. This is because the power supply in the unit is the other determining factor for output power. For example, 2N3055 power transistors are spec'd at 115 W, but if the power supply and heat sinking aren't designed for such a power level, the amplifier won't put out that much.

A better way to determine output power is to read the specification plate or check the owner's manual. Most commercial grade amplifiers will have a realistic power rating.

Secondly, while the sum of the power taps on the speaker matching transformers should never exceed the output rating of the amplifier, they don't have to equal it. In fact, when I design a system, I prefer the speaker load to be about 50 percent of the amplifier power rating. This allows the amplifier to run cooler and last longer and also gives some room for expansion of the system.

Also, for volume control applications, a step attenuator autotransformer such as the Soundolier AT-10 is a wise choice. This unit goes in the primary of the transformer and allows smooth control and good matching back to the line (it effectively adjusts the power tap to the transformer(s) it is connected to). If you wish to use a pot in the secondary of the transformer, a better choice is a 50 ohm unit rather than a 10 ohm—it will give a wider range of control.

There are other factors in the design of a constant voltage sound distribution system involving speaker sensitivity, insertion loss of the transformer, etc., but the preceding information is enough to do a small monitor system for the studio or background music for a small store.

Randy L. Aldous  
Brainerd, Minn.



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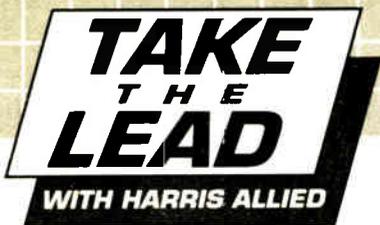
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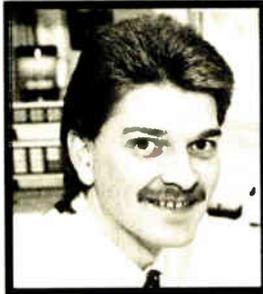
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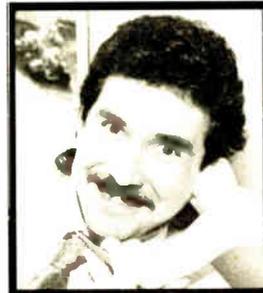
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# QSound Mixing Affects Mono

(continued from page 1)

"It totally flipped out of phase," Reeves said. "All of a sudden the bass disappeared. It could have twisted my head around because I was listening in stereo. Then it came back again."

The incident prompted Reeves to check out the QSound material. He said he found severe mono compatibility problems with both the Wilson Phillips and Madonna releases.

All QSound material is now screened before airing on WHITZ, Reeves said.

Problems with early QSound releases also surfaced at the BBC in England. "We briefly assessed QSound recordings. The mono compatibility is causing a problem," BBC Engineer David Kirby said.

Following its QSound assessment, the BBC later issued a statement saying Q-Sound material will be evaluated on a case-by-case basis before airing.

NAB Science and Technology Staff Engineer Stan Salek said several broadcasters had called the association to complain or seek information about QSound. "From the stations I have talked with and the BBC, they feel the mono version of QSound is unnatural compared to the standard stereo version," Salek said. "The left minus right content is apparently enhanced beyond what is normal."

"When you enhance the stereo it's kind of a tricky thing, because in our current FM stereo multiplex system the enhanced stereo that increases the left minus right content can contribute to added multipath," Salek said.

### No midrange

Jeff Lockridge, a broadcast engineer with Audio Concepts and Engineering, Richmond, Va., said he analyzed a demo QSound disc of Madonna's recordings for mono compatibility. "The whole midrange just disappeared."

Tom McGinley, director of engineering for Cook Inlet Partners, Greenbelt, Md., said he also has evaluated the QSound

demo CD. "We confirmed the problems about mono compatibility. The vocals sound off-mic—sort of washed out. There's a loss of high frequency detail. There's a hollow flavor to things."

QSound company officials in Hollywood and Calgary said they were shocked with news of the broadcasters' complaints. Following inquiries by RW, QSound officials began discussions with complaining broadcasters.

QSound officials and engineers cited several possible reasons for the problem. Though QSound had been tested favorably for mono compatibility, the mixing engineers and producers who use the technology are ultimately responsible for whether a mix is mono compatible, they said.

Any stereo mix—with or without QSound—can be incompatible with mono, according to QSound and other recording engineers.

Among many recording engineers, however, the mono mix is of lowest priority in a modern recording session. In fact, some engineers and record producers, who asked not be named, told RW there is considerable disdain for radio broadcasters among mixing engineers.

Excessive processing and compression as well as poor sound quality from many stations are to blame for that attitude, they said.

### Mono is low priority

"Some engineers throughout the world just don't want to deal with mono," QSound inventor Dan Lowe said. "They just wish mono would go away."

Apparently, the initial QSound releases did not undergo serious analysis for mono compatibility, according to one mixing engineer. "I decided this is a QSound mix and we're doing this specifically for QSound," said Francis Buckley, mixing engineer on the Wilson Phillips release. "I wasn't having any problem with it in stereo but I was noticing in mono there were

some things that would disappear."

Buckley said he received a call from the mastering house with complaints the recording was out of phase. "I could see how there could be a mono problem," he said.

Engineers using QSound defended the new technology. QSound consultant Bob Clearmountain, an engineer for such artists as Bruce Springsteen, Paul McCartney and David Bowie, called the 3-D process "a tremendous addition to the tools we have to make records exciting."

Clearmountain, who has just completed QSound recordings for Guns 'n' Roses and Janet Jackson, noted that "because of the way it works there is a potential problem when it comes to mono. But the technology is absolutely mono compatible. It really comes down to the mixer."

### Check mono

"It's a bit trickier to mix in QSound than normal stereo, but it is not a problem. You always check in mono. That's part of the job of mixing records. It's not the fault of the system, it's the fault of the mixer and producer," Clearmountain said.

Ray Bardani, engineer for six Luther Vandross albums, is mixing a new Vandross album with QSound. "I feel very, very comfortable with it," he said. "QSound has no more of a problem with mono compatibility than normal stereo."

The untroubled reception of the new Sting album is evidence QSound can work successfully in the broadcast environment, according to QSound proponents.

Since the initial record releases, QSound has issued new software designed to make mono compatibility with the process easier to achieve. The company is also planning to include a warning signal in future software which would alert an engineer to a potential mono compatibility problem.

Lowe vowed to work with broadcasters and the mixing engineers to assure mono

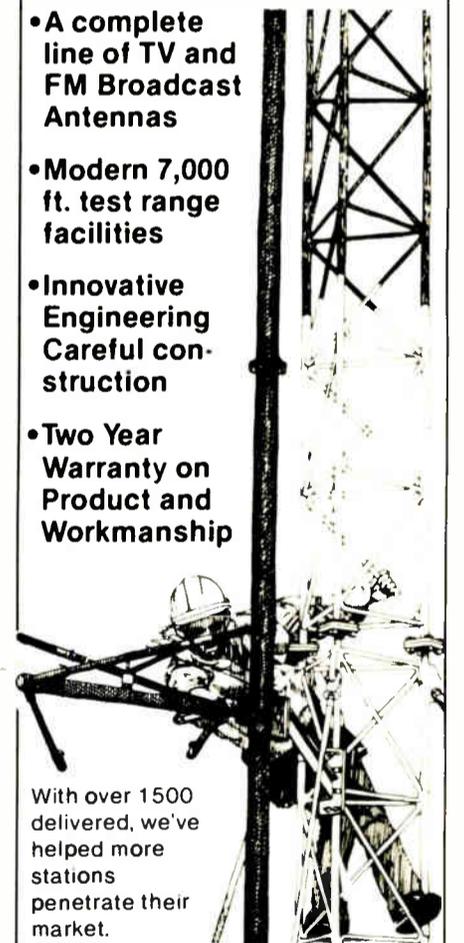
compatibility. "We will absolutely satisfy the broadcasters' needs," he said. Lowe also vowed to offer more guidance to the mixers who use the technology but noted the company is at the mercy of engineers who choose to misuse it.

"I don't think you can have 'QSound police,'" he said. "I think we share the blame, if there is blame to be laid, with the engineers. We wanted to give them new creative tools. I think in some cases they may have gotten over-excited or carried away with the potential of the system. It always becomes a trade-off scenario for mixing engineers."



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# FCC Eyes Microwave Spectrum

by Judith Gross

**WASHINGTON** With less than a year remaining before the World Administrative Radio Conference (WARC), the FCC has reached even higher in the frequency spectrum to consider a place

for a DAB service.

During its March meeting, the Commission issued a supplemental notice to its second WARC NOI, which was completed at the beginning of this year. The second NOI evaluated three different spectrum slices in the UHF-TV, L-Band (1500 MHz)

and the higher microwave frequencies.

Calling this area of spectrum planning "the most controversial," FCC Chief Engineer Thomas Stanley introduced the supplemental NOI, which proposes a fourth DAB spectrum option at 2360-2410 MHz.

The 70 MHz proposed in the supplemental NOI would accommodate all recent estimates of the amount of spectrum needed for the major DAB systems being proposed. But comments to the FCC's second NOI on WARC generally ruled out the higher frequencies because of higher power requirements, safety issues and other technical difficulties as frequencies increase.

In approving the supplemental NOI, Commissioner James Quello noted international support for placing a DAB service in L-band frequencies. Stanley replied that domestic discussions on DAB seem to have been led by international interests.

Stanley also mentioned in-band DAB systems under development. "I don't think that topic has gotten a full hearing," he said.

Later, Stanley conceded that the

higher band proposed in the supplemental NOI hasn't been a part of recent discussions about implementing a terrestrial service for U.S. broadcasters. But he said it "behooves domestic broadcasters to look at what the rest of the world is doing."

He also said that, if industry engineers are concerned about the technical performance of DAB systems at the higher frequencies, "We're looking for those concerns to be articulated in this supplemental NOI. The challenge is to the radio community. We want to hear from them."

Commission Chairman Al Sikes and Commissioner Sherrie Marshall both noted that since the FCC began its NOI process on WARC the issue has gotten more complex. "This is the world's most complicated zoning process," Sikes remarked.

Marshall urged those filing comments to "narrow the issues, instead of identifying new problems to solve."

Because WARC policy and the FCC's recommendations to the U.S. State Department need to be completed this summer, the supplemental notice will have a 30-day comment period which ends on April 12.

Reply comments are due two weeks later, and the Commission has tentative plans to vote on a WARC position at its mid-June meeting.

## DAB Group Impressed

by Judith Gross

**WASHINGTON** Eureka 147 "met or exceeded" the expectations of the NAB's DAB technical advisory group, according to eight of the nine members of the group who recently traveled to Rennes, France for an on-air listen.

But the group cautioned that tests of Eureka at L-band still need to be done before technical concerns about the system in the U.S. are satisfied.

In a letter to the DAB Task Force, the advisory group said that Eureka 147 does what its developers claim. Specifically, they said the system "provided CD quality sound"; was not prone to multipath; and provided coverage to the city at "considerably lower power than comparable analog systems."

### Technical set-up

The system set up in Rennes used one main transmitter and two gap fillers, all operating within a 3.5 MHz slice of bandwidth centered at 794 MHz (UHF TV channel 68 in the U.S.). The 459-foot transmitting antenna had 12 dB of gain. With 1 W of power the ERP was 16 W per program.

One gap filler had an antenna input power of 1 mW per program and the other had an input power of 60 mW per program, each into a 9 dB antenna. The distance covered by the signal was about 15.5 miles.

Engineers who made the journey Rennes noted that even traveling at high

(continued on page 10)

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## L-Band Tests Readied

(continued from page 1)

a test for approval by the task force's technical advisory group by the end of April.

Task Force Chairman Alan Box said he believes L-band tests of Eureka could be completed by the end of the year. In a DAB press briefing in early March, NAB Senior VP of Science and Technology Michael Rau said he anticipated testing to begin in the third quarter of this year. The task force has not yet decided who will perform the tests.

One possibility would be working

with Strother Communications. In mid-March, Strother filed another application for experimental test authority with the FCC, asking for a slice of spectrum from 1500-1506 MHz in Washington D.C. to test DAB systems.

Strother's engineering consultant, Steve Crowley of duTreil, Lundin & Rackley, said informal discussions with the FCC and the NTIA show a willingness to find spectrum for L-band tests.

Crowley also said that Strother was interested in testing Stanford Telecom's system (developed as part of Satellite CD Radio's plan) for terrestrial implementation at 1500 MHz as well as the Eureka system.

### North of the border

Meanwhile, Canadian broadcasters are planning to perform a series of L-band tests this summer, according to Steve Edwards of Rogers Broadcasting.

Edwards said the tests will be done from May to September, probably in Ottawa. The tests are to look at propagation, building penetration and fading characteristics in different bandwidth slices.

Edwards said the tests would consider both mobile and stationary listening environments, but—at least initially—would not be able to use Eureka 147 equipment.

"Currently, there is no Eureka equipment that can transmit at 1500 MHz; it will take awhile for Eureka engineers to reconfigure the system so we can test it there," Edwards noted. He said the first tests at L-band would probably be done with a constant carrier, with Eureka tests to come later.

Canada has already drafted its initial spectrum request for DAB to take to WARC next year. Canadian planners have asked for 74 MHz of spectrum at L-band to implement both terrestrial and satellite DAB.

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# FCC Enforces Tower Regulations

by Arthur Cole

**WASHINGTON** The unexpectedly high number of tower safety violations discovered in a two-day inspection sweep last November has given FCC officials new resolve to continue stepped-up enforcement.

Of 1,000 broadcast towers inspected, about 160 were discovered to have safety hazards that posed significant danger to aircraft, according to Dan Emrick, chief of investigations and inspection at the FCC.

"I think the number of violations that turned up and the nature of those violations demonstrates that there is a need for further inspections," he said. "It is clear that a significant number of licen-

sees are not maintaining adequate safety standards."

The violations racked up about \$350,000 in fines from the FCC. While most licensees were fined between \$500 and \$2,000, many towers serve multiple licensees, resulting in numerous fines going out for a single violation.

"We are looking for anything that makes the tower hard to spot at a distance," he said. "There is an ever-increasing number of structures going up and air traffic has increased as well."

The crackdown was partly in response to a 1989 North Carolina accident involving a medical helicopter that crashed into a cellular phone tower under construction. The crash killed two people. A battery powering the tower signal beacon

had failed, leaving the tower completely dark.

Under FCC regulations, towers must be inspected by the licensees every 24 hours, and all violations that threaten air traffic must be corrected or brought to the attention of the FAA within 30 minutes of their discovery.

During the November crackdown, fines were issued only if the corrections did not take place or the FAA was not notified.

"These violations were serious enough that no warnings were given in which the violators had several weeks to make corrections," Emrick said. "They had to be corrected right away."

While Emrick would not reveal where or when the next round of inspections will take place, he warned that inspections are always underway.

"Often, it's a matter of an inspector driving by on the way to another appointment, checking to see if a tower is painted," he said. "We have always had an ongoing inspection program. But it seems that lately, compliance has not been so good."

# Slow Change for AM

by Alan Carter

**WASHINGTON** Don't expect the FCC to do a quick turnaround on the new AM rules.

"It's going to take a lot of study and analysis," said Mass Media Bureau Assistant Engineering Chief William Hassinger. "You have to make sure all the pieces fit."

Hassinger would not predict a timetable for the staff to issue a report and order on Docket 87-267, the FCC's technical review of AM, to the commissioners. Sources indicated the docket would not be finalized before the NAB convention in April as some had hoped, but said that it may occur by September.

Hassinger said the project is more difficult than people may realize partly because of its scope—which includes a sweeping revision of AM rules—and the lack of a clear consensus on the best approach.

"I don't know if we have agreement on anything except the basic notion of 'let's improve AM,'" Hassinger said. "People are all over the ball field. Everybody is saying, 'Do it my way.'"

There are calls for less interference, more power and changing ratios, just

to name a few, Hassinger noted.

"You just don't pick a number. You have to defend it," Hassinger said. "You have to be sure of your facts. When you are finished you have to make sure all the pieces support each other."

Broadcasters and consultants are monitoring the progress of the report and order.

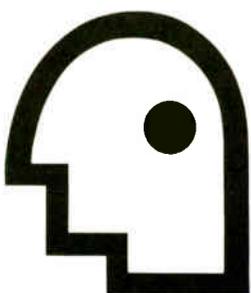
Consultant Karl Lahm said he hoped the Commission would note the criticism recorded in the comments. "The rules should be restrictive in a manner that results in real gains. The final decision should not hurt existing stations."

Group W Engineering Director Glynn Walden said the headlines of digital audio broadcasting (DAB) should not take precedence over AM. "I'm not so sure that as a resource we want to give up AM," he said. "Don't forget about AM just because DAB is around the corner."

Art Suberbielle, owner of KANE-AM in New Iberia, La., and chairman of the NAB AM Improvement Committee, said he is encouraged with the FCC's commitment to AM.

"We are talking about a program that will modernize half the broadcasting industry," he said.

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# DAB Group Evaluates Eureka

(continued from page 8)

speeds in a car, the Eureka system performed well. NAB Executive VP of Operations John Abel said a speed simulator was able to reach nearly 180 mph without a break-up of signal.

Bert Goldman from Shamrock Broadcasting and Milford Smith from Greater Media participated in the trip and noted that they asked Eureka engineers to drive through a parking garage to listen to the Eureka signal. They said that even in that structure, the signal could be heard part of the time.

The advisory group letter also men-

tioned the possibility that the spectrum study just completed for the NAB might have incorrectly calculated Eureka's power requirements.

### Spectrum study faulty?

The letter noted that Eureka makes use of signal echoes to recover and enhance the received signal. In areas where the signal was strong enough for the echoes to be received, it produced a strong signal, which means it can work with lower than estimated power levels.

The spectrum study used traditional thinking about multipath fading to de-

termine when signal strength would be insufficient, the letter added.

In addition, the engineers said that they learned that it might be possible to cluster stations of different classes together on one antenna, by using different power levels.

Eureka has been criticized by those who feel that power requirements at higher frequencies will be too large and from those who worry about stations of different classes having the same power and/or coverage.

### Differing view

Technical Advisory Group Chairman Don Wilkinson of Fisher Broadcasting said that Paul Donahue of Gannett would be offering a dissenting opinion to the views expressed in the letter.

Gannett is developing its own in-band DAB system and Wilkinson noted that Donahue was the only one of the nine who traveled to Rennes who would not sign a non-disclosure agreement for

Eureka. He was therefore excluded from some of the Eureka demonstrations and discussions in Rennes.

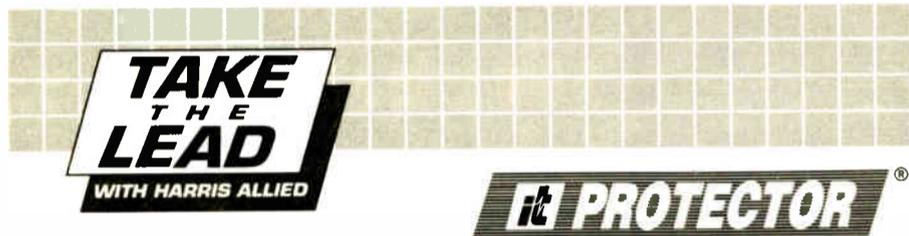
Donahue said that Eureka engineers not only requested a non-disclosure agreement from each member of the group but also wanted him to reveal technical details about the Gannett-Stanford Research system, called USA Digital, which he said he could not do.

Donahue said he is not really a "dissenter" to the technical group's opinion of Eureka. His concerns, he emphasized, are about Eureka's performance at the 1500 MHz, the spectrum that the NAB spectrum study targeted for it.

"It works. We know it works. The question isn't whether it works, but where? Where (in the spectrum) are we going to put it? We should test it where we're going to put it," Donahue said.

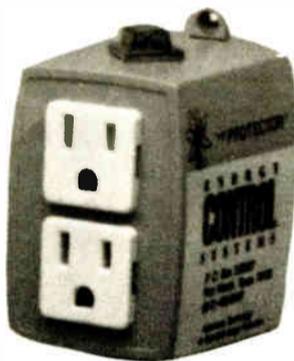
The technical group's letter also noted that further testing at L-band is mandatory.

The DAB Task Force has already decided to perform a test of Eureka 147 at 1500 MHz. The Task Force was set to discuss the advisory group's letter about the Rennes trip at its April 2 meeting.



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World Radio History

# Auctioning Debated

(continued from page 3)

The annual radio broadcaster fees would range from \$100 to \$500 depending on class, according to the proposal.

May said the fee is actually a tax because it is not based on any FCC-provided service, other than the broadcasters being a license holder.

NAB General Counsel Jeff Baumann said the proposed user fee "is nothing more than a spectrum tax," a proposal that has been brought up, but dropped several times over the past few years.

During an FCC update panel, Mass Media Bureau Deputy Chief Rod Porter said the U.S. is now working with the Canadians to approve an interim agreement allowing expanded AM band broadcasting without an official treaty.

Porter noted that the U.S. and Mexico are "very close" to a treaty that will

allow expanded band broadcasting and Class A FM power increases from 3 kW to 6 kW.

The FCC/FAA dispute also was briefly addressed during several panel discussions.

FCC Audio Service Division Chief Larry Eads said officials from both agencies have been meeting to resolve the jurisdictional conflict, which stems from a recent FAA rule proposal that would give it increased authority over broadcast tower placement.

"I hope we can reach a resolution as soon as possible," Eads said.

The NAB's Baumann called FAA attempts to increase control over broadcast towers "unfair" and the broadcaster association continues to oppose them.

NAB Deputy General Counsel Barry Umansky said the NAB is working on a "preemptive" plan to reverse the trend toward more FAA control.

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World Radio History

# AM Suffers in Today's World

by John Gatski

**WASHINGTON** During the Persian Gulf War, a lot of people stayed tuned to their radios for the latest news. I was no different. On one particular day, however, I decided to switch from my normal NPR FM station to a local AM news station to get an update.

I reached for the vintage mid-1970s

the surge protector switch, expecting the radio to stop shrieking at me. But that wasn't it.

"What else could it be?" I wondered. The lights, the clock or perhaps the phone. Yeah. That must be it. The stupid phone. Unplugging it from the wall finally brought to me a clear AM signal.

Weary from the effort, I mumbled that maybe putting AMs on digital audio frequencies is a good idea.

Why should it be this way? Once upon a time, AM was king of the hill, cream of the crop, the Big Daddy of radio—but no more. It has been reduced to an

interference-plagued, narrow bandwidth medium that appears to have been left for dead.

Oh sure, there are success stories. But you can't buck the general trend that fewer people are listening to it for the very reason I almost threw my portable in the trash can.

In looking at AM's ills, I agree with folks who filed comments on the FCC's recent proposed AM rulemaking. They said a lot of AM's problems are due to the design of the radios and electronic products that cause interference—not just bandcrowding.

No matter what happens with DAB and FM, AM could still be viable if in-

terference is reduced. I believe people will still listen to AM, even with its limited frequency response—if they can hear it.

To achieve that end, I applaud efforts to get better radios and to come up with ways to lessen AM interference emissions from appliances.

The National Radio Systems Committee's (NRSC) recommended AM receiver voluntary standard is a great idea if the manufacturers will go with it.

This doesn't fix all the interference problems, but it gets the industry into the mindset of making better AM radios.

The NRSC also has suggested options such as wide/narrow bandwidth switches, noise blanking and external antenna connections. You remember external AM antenna connections? They used to be on the back of receivers. I have an early 1970s Sansui that has one. But you won't find the connection on many receivers today. Just those internal or sometimes external ferrite rods that you can't move far enough away from the interference.

There seems to be hope for AM receivers with better specs, based on recently published audio tests. Some receivers tested show more thought about AM sound quality than in the recent past. On some models, bandwidths are being extended and wide/narrow bandwidth switches have been added to cut down on nighttime interference.

Unless folks read equipment reviews, however, they are not finding out about these receivers because the companies don't promote the improvements. That's where the NRSC's push to get voluntary compliance comes in. People won't have to read reviews to find a receiver with a good AM section. With luck, the companies will engineer them into all their receivers.

In directly addressing interference, kudos go to the IEEE for its effort to come up with standards for such items as fluorescent lights and other household appliances. This can go a long way in eliminating that frustrating electrical whine and static on a receiver.

According to the NAB's Science and Technology department, new noise blanking technology holds some promise of helping to reduce interference. Noise blanking, however, can only go so far and interference from such sources as lightning cannot be totally eliminated.

One industry analyst told me that if AM becomes listenable again, maybe DAB will be the old band's salvation. Many AMs will want to jump on the "we now have parity with FM" DAB bandwagon. This would free up the band for the smaller AMs who don't want to move and the clear channels who like the nighttime ability to beam their non-satellite assisted signal halfway across the country.

And, of course, I could sit in my office and listen to the news without shutting off the phone, the computer, the pencil sharpener, the heater, water cooler ...

## CUE and REVIEW

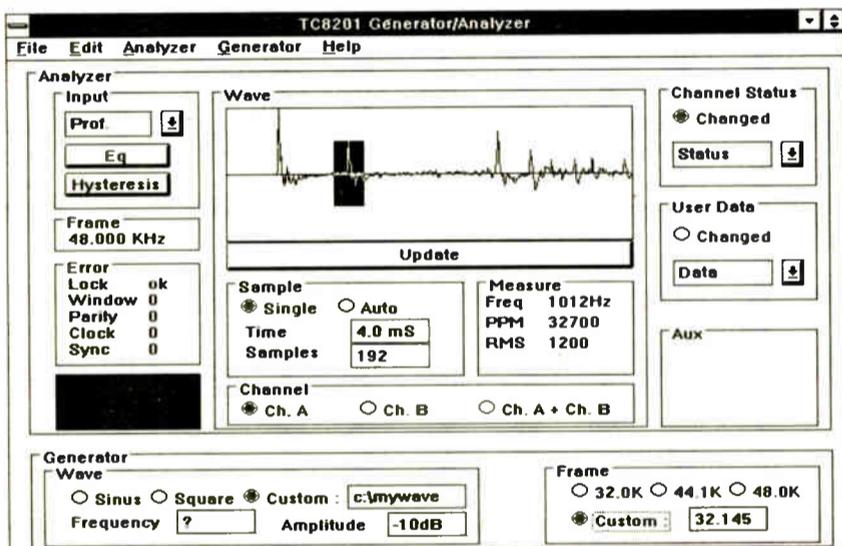


AM/FM/TV portable radio I keep in my office. The station should be easy to tune in, I said to myself, knowing that AM reception usually is pretty good when the receiver is perched next to a large window and the high-powered transmitter is just a few air miles from the office.

Boy, was I wrong.

As I moved the frequency selector switch from FM to AM, I immediately heard this screechy static and other indescribable noises associated with RF interference.

Being the investigative type, I decided to temporarily shut off the computer, often a source of interference, to see if that was the problem. I clicked off



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|   |         |                         |  |
|---|---------|-------------------------|--|
| KSOP FM   | 2:35 PM | ULTIMATE DIGITAL STUDIO | Tuesday 6/23/1991  |
| ON THE AIR 0:01                                 |         | CD JUKEBOX #2           | <div style="font-size: 48px; text-align: center;">12</div> <div style="display: flex; flex-direction: column; gap: 10px;"> <div>F1 Help</div> <div>F2 Manual/Auto</div> <div>F3 Cue Cards</div> <div>F4 Edit Events</div> </div> |
| Rhinestone Cowboy                               |         | Disc: 3 Cut: 12         |  |
| Glen Campbell                                   |         | Album: 106              |  |
| Time: 3:13 Intro: 12 End: C                     |         | Sked at: 2:32P          | Sked on: 6/23  |
| READY TO AIR                                    |         | TM D. Com. Sys.         |  |
| --STOP SET--                                    |         | Disc: Cut: 15           |  |
| Pepsi Cola                                      |         | Album:                  |  |
| Time: 0:30 Intro: End:C                         |         | Sked at: 2:36P          | Sked on: 6/23  |
| NEXT TO FOLLOW                                  |         | TM D. Com. Sys.         |  |
| KSOP FM   |         | Disc: Cut:              |  |
| JINGLE  |         | Album:                  |  |
| Time: 0:07 Intro: End:C                         |         | Sked at: 2:37P          | Sked on: 6/23  |
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## Help Key

Anything you need to know is as close as Function Key 1. It's a "Help" Key that shows all the things the Ultimate Digital Studio™ does.

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Other creative fields like song writing and music are ahead of radio in use of computers and synthesizers. Recording studios find automated mixing consoles essential. Graphic designers, architects, draftsmen and ad layout artists have nearly all made the move to computer assisted design and typesetting.

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- "On Air" light controler, followed by automatic (or manual) microphone turn on and off for live announcer,
- View five songs forward or back for on-air teasers at the touch of a button, or scroll entire schedule,
- Edit coming events: Change, Delete, Insert, Find, Locate, Swap, or Modify Time, Intro or End,
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- 30 Day Warranty on Labor, 1 Year Parts Warranty and Toll-Free Technical Support from TM Century.

## Computer Requirements

- IBM AT (or compatible 8086/286/386/486) with at least 3 open PC or AT slots (no PS/2s or MCA units),
- 10 MHz (or faster) clock speed with 640K (to 1024K) RAM,
- 20 megabyte (or larger) Hard Drive,
- Floppy diskette drive (3 1/2" 720K preferred),
- Color Display for live assist (mono OK but not as pretty),
- Parallel Interface and Printer (9 or 24 pin dot matrix),
- Serial Port for downloading scripts, music lists, traffic logs.

## Required Accessories

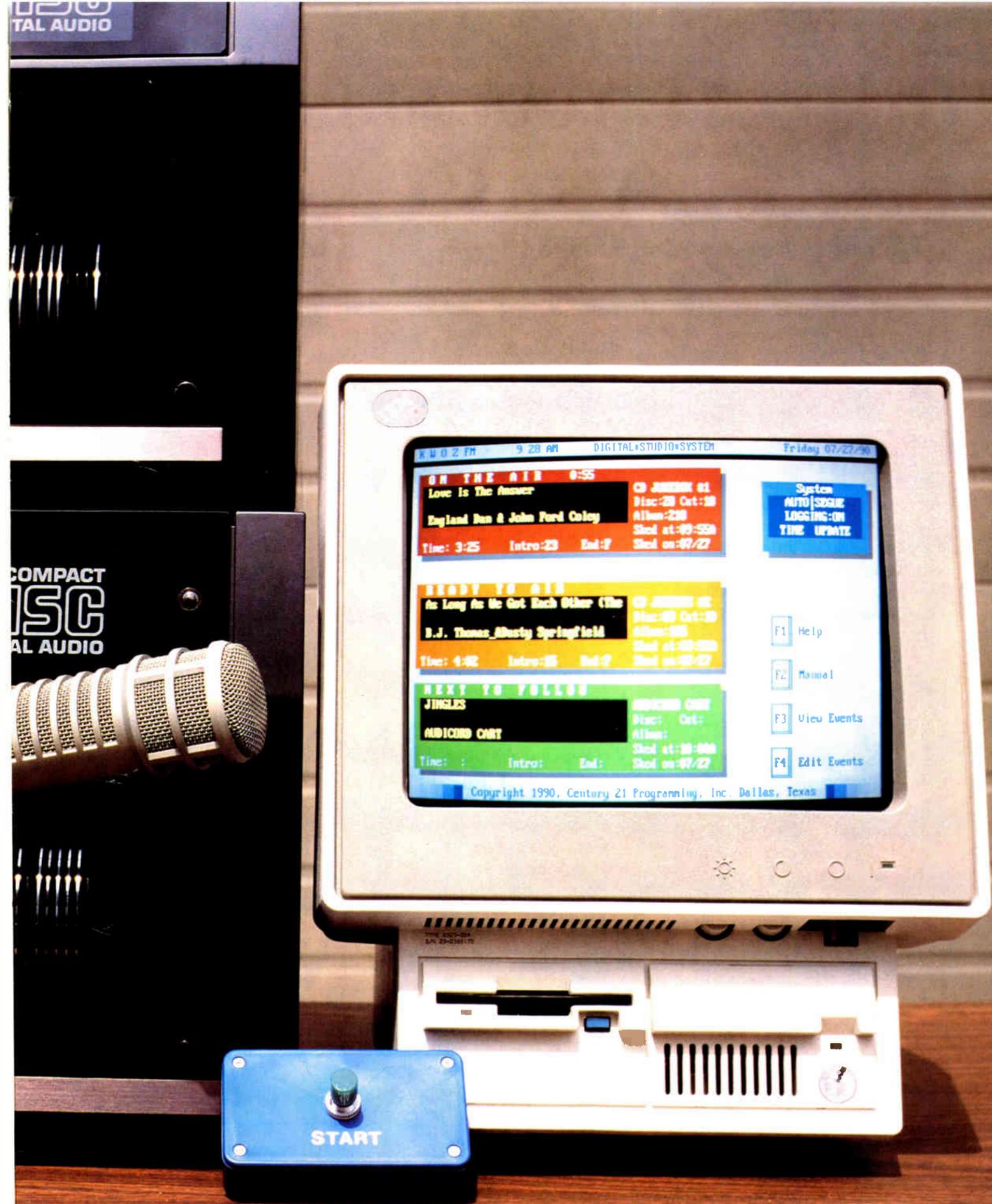
- Microphone with preamp (or console) with line-level output.
- Separate IBM-compatible computer(s) for entering scripts, scheduling music and commercials,

## Recommended Accessories

- PowerPlay Music Schedule Software,
- Station Master or other Traffic and Billing Software,
- Laptop Computer with Modem and Ultimate Digital Studio™ Remote Broadcast Software,
- TM Century GoldDisc™ and/or HitDisc™ Compact Disc Music Libraries ("record store" CDs also play).

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# A Handle on Far-Out Remotes

by Bruce Bartlett and Jenny Bartlett

**ELKHART, Ind.** What are some effective ways to handle remote broadcasts? At a recent Audio Engineering Society workshop, Michael Callaghan spoke with authority on the subject.

Michael Callaghan is CE of KIIS-FM, an SBE-certified AM/FM broadcast engineer and a teacher in the California Community College district. He developed and taught the SBE certification course and is an occasional writer for a number of technical publications, including *RW*. Callaghan's comments are paraphrased below.

## LINE OUT

Broadcast remotes are less common these days because they cost so much. Early remotes were of musical shows, such as a live band playing in a hotel. Today, we take the DJs on the road and they do their programs from a remote location.

One type of remote is the drop-in. During the regular program, an announcer calls in on a telephone and says, "Here I am at . . ." and we put them on the air. Since the standard telephone signal is not high-quality audio, we try to avoid doing drop-ins.

Another type is the voice-only remote. The DJ in the field does intros, outros and comments at the remote mixer and sends the audio through a high-fidelity phone line. All the music is played at the radio station.

Still another type of remote is called voice-plus-bits. The DJ takes a cart and a cassette recorder to play stereo material along with his or her voice. The remote program is sent to the studio. Backhaul channels send the radio program back to the remote if it is out of the broadcast range.

In a mix-minus remote, all of the program is sent to the DJ except his voice; the DJ can hear the program but not himself. This is necessary because of transmission delays. The remote site is equipped with a console with cart spots and microphones. The crowd at the remote listens to a P.A. system playing the DJ's console audio and the station's music.

A communication line from the station (containing comments from station engineers) goes to the DJ's headphones. In the studio, the audition channel (containing music) feeds to the program channel. The DJ listens only to the audition channel (as shown in Figure 1).

Four methods are used to get remote audio to the studio: a dial-up telephone; a leased loop (for example, you ask for an 8 kHz loop from 8 a.m. to noon, ready for testing Friday morning); microwave (which is relatively inexpensive); and satellite (which is good for distant broadcasts. Satellite can provide a 60 dB S/N ratio with companding, but it has a delay).

A satellite remote link is expensive. It may cost \$17,000 for a feed from Disney World, or \$26,000 for a feed from London.

To broadcast from cars or boats, cellular phones are often used. Unfortunately, they are less reliable than hard wires.

A 5 kHz bandwidth for sports announcing on AM radio is adequate and

inexpensive. For FM, an 8 kHz or 15 kHz line can be used. A non-equalized line is a last resort. It helps to add companding noise reduction to the phone line: compress 2:1 on the sending end and expand 1:2 on the receiving end.

A stereo remote is expensive. Phase matching of the two channels requires similar telco routing of the two remote lines; otherwise you get interchannel delay. Phasing each end can cost as much as \$300. Telephone stereo pairs may take two days to set up. In a stereo pair, you may be given both terrestrial and satellite channels. If this happens, hang up and try again.

To check the line, put tones, a frequency sweep or pink noise at the sending end. Check polarity with a 100 Hz tone or a pulse generator.

The phone company might take lines on which they hear no signal. To prevent the phone company from using your line, keep audio on it. You can use Morse Code or a cart machine continuously playing a message stating your location. Alternately, DAK sells solid state devices that play several seconds of a digital

on the sending end. We rotate the antennas until we hear the highest pitch; then both the sending and receiving antennas are aimed at each other.

Thanks for the ideas, Mr. Callaghan. Here are a few more suggestions to enhance the sound of your remotes, or to help them go easier.

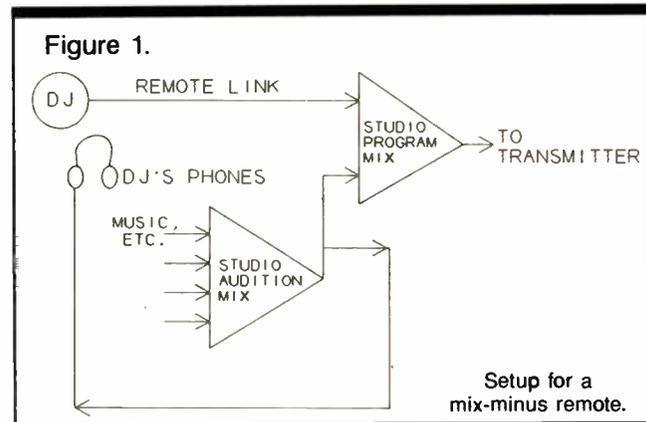
Preparation is vital for remotes. Write a check-off list with such items as a tool kit, flashlight, digital clock, station banner, dial telephone and FAX machine (say, to get sports from the news service).

Since phone-line audio quality often is marginal, you need to compensate. When driving a phone line, you might want to compress the program to keep the signal-to-noise ratio high. Consider boosting the highs a little to make up for phone-line losses. You can do this by ear: Match your locally monitored audio (pre-EQ) with the station's broadcast audio (post-EQ). For a bit more headroom, you could send your audio at, say, -2 VU, rather than 0 VU.

To prevent ground loops when you feed telco lines, you might insert a 1:1 audio isolation transformer between your mixer and the phone line. In fact, you may want to construct a telco interface box, say, with transformers, +18 dBm output, termination switches, polarity switches, binding posts and XLRs.

Here's a neat way to handle microphone cables on location. Roll them onto a cable drum, connecting the end of one cable to the end of the next. When you get to the remote, unwind and unplug the cables as needed. It's less tangled than wrapping them around your arm and it's easier on the cables. Set-up goes faster if you pack cables with their associated equipment, rather than in a separate case.

Be sure to carry a tool box of connection adapters: XLR to phone, XLR to phono, XLR to alligator clips and so on. Include a polarity reverser, 20 dB mic pad, +4 dBm/-10 dBV pad, high-pass



recording; these can also be used.

For microwave links, KIIS uses parabolic antennas with remote antenna rotors. The Street program for IBM-compatible computers has proven useful in aiming the antennas; it gives the distance and direction from your geographic location to another.

At the microwave receiving end is a variable-frequency oscillator (VFO) controlled by the signal strength. We run its tone through the phone lines and listen

filter and any other goodies you can think up. You'll be relieved to find one of these when Murphy's Law kicks in.

Take redundant equipment so you always have a backup. For example, you might carry a small mixer to use if your main console fails. Take plenty of spare cables.

Finally, check all your equipment and cables before and after the remote. Label any piece that needs repair and fix it promptly.

More on remotes next time.

■ ■ ■

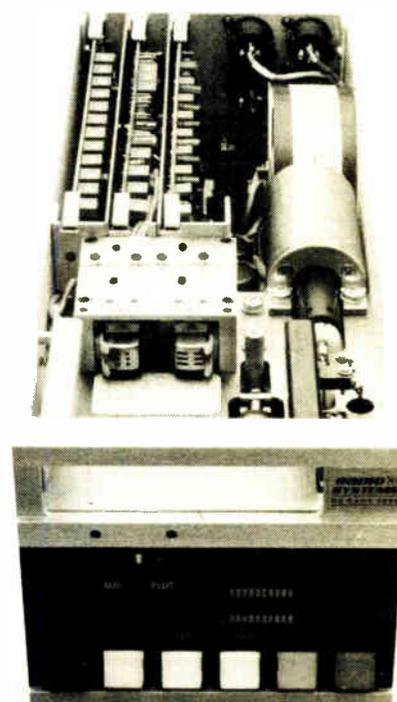
Bruce Bartlett is a microphone design engineer and technical writer for Crown International. He also is author of the recently published book "Stereo Microphone Techniques," available from Focal Press. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.

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# Trouble Rains Down on KBRC

by Dee McVicker

**MOUNT VERNON, Wash.** Trouble began raining down on KBRC-AM in November. It started out as a slow trickle, then came pouring down furiously the day before Thanksgiving. The Mount Vernon, Wash., station was in the path of the largest flood to hit the area in more than 40 years.

"The water just kept coming," reported KBRC GM Rene Morris, whose station was located in a flood relief valley for Skagit River. With the area's water table full and hundreds left homeless, Skagit River continued to swell as the rains continued to fall. KBRC-AM, the only station on the air for miles around, was on emergency alert.

Fortunately, the station's towers, located on a slight incline, were temporarily out of harm's way. But the station's studio was not. As KBRC's announcers fired off on-air emergency tones for community evacuations, they also watched out the window for what would soon arrive on the studio doorstep: water, and lots of it.

Water reached the studio in a gush the day before Thanksgiving. "The water all of a sudden—within an hour—was right there at the front door," Morris related.

The station had to act fast. "We put a plea on the airwaves," said Morris, who, despite the threatening flood, was determined not to evacuate the station. As the

emergency broadcast station for the area, she maintained, the community needed the AM's broadcast service now more than ever.

## OFFBEAT RADIO

Pleading on the air for manpower and sandbags, KBRC found temporary relief in a surprising number of listeners. Said Morris, "We needed people to come with sandbags and we needed manpower to build a dike around the station." Within 10 minutes, listeners started coming to the rescue of the water-logged station. More than 200 eventually showed up to help.

"The water was at that point a little over your knees, and listeners were still coming," related Morris. "It was incredible." Within hours, listeners and station staff alike had built up a dike around the studio. Local businesses also brought to the station's rescue several pumps, which were badly needed to keep dry KBRC's power generator—by that point, the only reliable source of electricity for the station. These efforts kept the flood at bay while KBRC continued to sound emergency alerts.

And still the sky kept pouring rain. With water climbing steadily and no relief in sight, station staff discarded knee-

high boots for hip waders.

Then, on Nov. 30, Morris made the decision to evacuate the studios. Water was now coming in through the studio floor, and it would be a matter of hours before the flood swept through the building, causing major wreckage. "We needed to get everything out of the building right away," she recalled.

Still concerned for the safety of the community and not wanting to leave loyal listeners without emergency information, Morris also made another decision: to broadcast from the station's mobile boom box at the still-dry tower site. Acting quickly, the staff set up the remote van for broadcast and moved all studio equipment to higher ground.

Also acting quickly, the community brought in phone service and electrical service to the portable studio. Within 24 hours, the station would be back on the air, signaling its return with the Beatles song, "Here Comes the Sun."

Realizing this was only a temporary arrangement, Morris went in search of a new facility to set up shop. She found it in what used to be an Italian restaurant—a facility complete with ovens and tables. With the rain still falling, and water still rising, the facility needed to be outfitted for radio quickly.

"I started sketching things on paper and gave it to the landlord, who is also a contractor," recalled Morris. "And I said, 'OK, can you do this? And do it fast?'"

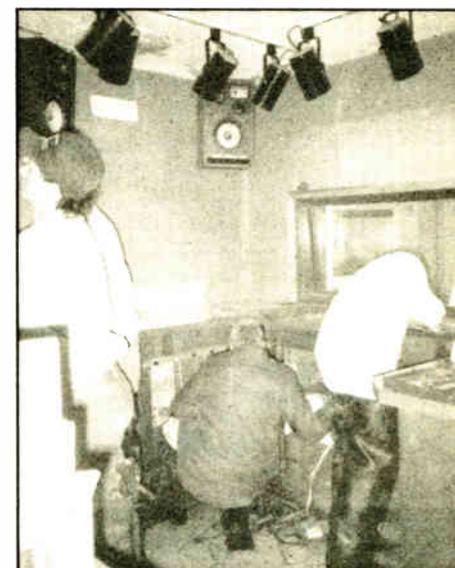
With the same community spirit that helped sandbag the station against the flood and helped bring electricity and phone service to the portable studio, the contractor began large-scale renovation of the facility. Within just three weeks, the new studios would be ready.

Meanwhile, the tower site and temporary studio were coming perilously close to flooding. Said Morris, "The water was cresting high out near the towers, and there was nothing we could do.

There just wasn't any place to put the water." The towers, she commented, looked like they were on "an island in the middle of the ocean."

Reaching the towers' isolators, and within eight inches of touching tower metal, the flooding rains finally subsided. Skagit River had at last leveled off, leaving KBRC's studio building a wreck.

In the final assessment of damage,



As floodwaters subside, KBRC engineers and staff members work their way through a now-sopping control room.

said Morris, "The building is starting to settle, to crack. Of course all the electrical is ruined and the ceiling is falling in. It would probably cost us more to fix it up than to build a new facility on that site." Surprisingly, noted Morris, the building, constructed in 1946, had never before experienced a flood.

Although a new building may be constructed on the site in the future, for now Morris expects the station to stay dry at its new facility—on Riverside Drive.

Morris was quick to point out the irony of KBRC's new address, and joked that if trouble rains down on the station in the future, she'll be ready for it.

♦ ♦ ♦

Dee McVicker is a free-lance writer and regular contributor to RW. To inquire about her writing service, call 602-899-8916.

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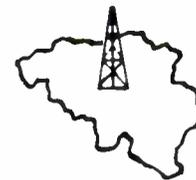
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# Dateline: Radio Belgium



## Patchy European FM Coverage Reveals Flaws Of Complicated Spectrum Management System

by Lex Felker

**BRUSSELS** As I write this, I'm on a train traveling from Brussels to Amsterdam where I'm scheduled to give a speech updating HDTV developments in the U.S. to a group of European executives and government officials.

But my mind is on radio. I've just spent the weekend visiting with friends and listening to radio broadcasts in Belgium. Although I'm far from an expert on the subject, I've heard enough to know that there is a big difference between the U.S. and Europe when it comes to broadcast radio.

My first serious radio listening was with a decent FM receiver and antenna system at my friends' home. I was somewhat surprised by how many monophonic stations I found and by the fact that some stations seemed to be operating on non-uniform channel spacings. I attributed this latter effect to Europe's complicated spectrum management problem.

### Choice of stations

Despite these idiosyncracies, however, I found I was able to tune in a sizeable number of stations. From this ex-

perience, I inferred that, like Americans, Europeans benefit from much choice in the audio medium.

But my opinion changed after my first serious radio listening in a car. My friends, anxious to show off their new hometown, conducted a driving tour of Brussels, and the first thing I did when I got in the car was to turn the radio on.

## FELKER'S FORUM

One of the Saturday countdown programs was playing, and I got a kick out of listening to some programming from home. But my enjoyment was short-lived; we had only traveled a few miles when reception began to fade and my friend tuned in another station. In response to my inquiry, he explained that coverage of all the local FM stations was pretty irregular.

Immediately, I suspected a listener hardware problem, but no—the effect was the same on my friends' other car and was the topic of some discussion among the American expatriate community in the Belgian capital. Nor was the

effect due to terrain shielding or heavy multipath: The area is relatively flat and its small business district has no skyscrapers of any note.

No, the limited coverage is apparently due to regulatory constraints. The European authorities, presumably in an effort to contain interfering signals to within their country's borders, have authorized only relatively small FM facilities. The approach helps control interference, but it sure hurts reception.

### AM still important

This patchy FM coverage benefits stations on the AM band, of course, where channels are spaced 9 kHz, not 10 kHz (although the U.S. nearly adopted this scheme close to a decade ago). Reception in the car was very good for the few AM stations I tuned in and coverage seemed more uniform than is the case in the U.S.

Long-wave broadcasting is also significant, apparently. I was surprised at the very good reception I had of BBC broadcasts on 200 kHz, and I gather these stations enjoy a significant following.

After spending a few days experiencing European radio broadcasting, I can understand why many believe digital satellite radio broadcasting could be a big hit with listeners. Don't get me wrong—some of the medium- and long-wave sta-

tions do a good job. But the constraints on facility size are preventing many FM stations from achieving their potential. And without a realignment of the entire allocation, the situation may not improve significantly.

The initiation of a satellite-based service could provide an opportunity for just such a realignment. The job of efficiently and fairly managing spectrum when all transmitters are co-located 23,000 miles above the earth is a trivial technical exercise. Once the political decisions regarding the number of signals per country are made, spectrum managers would not be called on to sacrifice each signal's coverage to control interference in neighboring countries.

Consequently, high quality audio, broadcast over a wide coverage area, could become a reality in Europe. The number of different broadcast allocations each country receives will depend significantly on the outcome of WARC-92. But regardless of this result, the differences in radio broadcasting between the U.S. and Europe stand to diminish significantly. When that happens, maybe I can convince my editor of the merits in another trip to the continent.

■ ■ ■

*Lex Felker is a technology/engineering consultant with the Washington, D.C. law firm of Wiley, Rein & Fielding and a former chief of the FCC's Mass Media Bureau.*

# EXPERIENCE COUNTS . . .

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WBLX 27.5 kW  
WGCX 27.5 kW  
WJLQ 27.5 kW

### TELETOWER PROJECT Houston, Texas 2 OF 2 STATIONS

KLTR 27.5 kW / 21.5 kW (Aux)  
KMJQ 50 kW

### BRODIE LANE TOWER SITE Austin, Texas 2 OF 2 STATIONS

KHFI 35 kW  
KPEZ 21.5 kW

### SUMMIT TOWER PROJECT Atlanta, Georgia 2 OF 3 STATIONS / 4 OF 5 TRANSMITTERS

WSTR 35 kW (2)  
WVEE 40 kW

### LOADSTAR TOWER PROJECT Ft. Lauderdale, Florida 2 OF 2 STATIONS

WJQY 40 kW  
WKQS 50 kW

### LOADSTAR TOWER PROJECT New Orleans, Louisiana 4 OF 4 STATIONS

WEZB 35 kW  
WLNG 35 kW  
WMXZ 35 kW  
WQUE 35 kW

### GANNETT TOWER PROJECT Miami, Florida 8 OF 10 STATIONS

WEDR 50 kW  
WHQT 25 kW  
WLVE 25 kW (2)  
WPOW 25 kW  
WQBA 21.5 kW  
WSHE 25 kW  
WTMI 25 kW (2)  
WZTA 25 kW (2)

### MILLER TOWER SITE Dallas, Texas 6 OF 6 STATIONS

KKDA 40 kW  
KLTY 40 kW  
KLUV 40 kW  
KOAI 45 kW  
KZPS 40 kW  
WRR 40 kW

### LOADSTAR TOWER PROJECT Orlando, Florida 3 OF 3 STATIONS

WJHM 25 kW  
WJYO 55 kW  
WOCL 55 kW

### LOADSTAR TOWER PROJECT Jacksonville, Florida 3 OF 4 STATIONS

WAIV 40 kW  
WFYV 27.5 kW  
WQIK 35 kW

### OLDSMAR TOWER PROJECT Tampa, Florida 2 OF 2 STATIONS

WKRL 40 kW  
WUSA 40 kW

### SHOREVIEW TOWER PROJECT Minneapolis, Minnesota 6 OF 8 STATIONS

KDWB 25 kW  
KEEY 25 kW  
KLXK 25 kW  
KQRS 25 kW  
WLQL 25 kW  
WLTE 25 kW (2)

### SENIOR ROADS TOWER GROUP Houston, Texas 7 OF 12 TRANSMITTERS

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KIKK 27.5 kW (2)  
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KLOL 27.5 kW

### MONTGOMERY TOWER PARTNERS Montgomery, Alabama 4 OF 4 STATIONS

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### BITLOW TOWER PROJECT Orlando, Florida 3 OF 3 STATIONS

WHTQ 50 kW  
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### WEST TIGER MOUNTAIN TOWER SITE Seattle, Washington 6 OF 9 TRANSMITTERS

KBSG 50 kW  
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# A Guide to Making the Grade

## Reference Aid Offers Info to Pass FCC Tests

### "Electronic Communications"

John J. Dulin, Victor F. Veley,  
John Gilbert  
TAB Books, Blue Ridge Summit, Pa.  
690 pages, \$24.95

by Ed Montgomery

**ANNANDALE, Va.** Back in the days when the FCC required everyone to have a First Class license to work in broadcasting facilities, there were numerous books

and home-study programs available to prepare one to pass the three exams that led to the prized "First Phone."

Almost any science or technical magazine had an ad in it declaring the bright future one had with the license. However, since the Commission waived the requirement of a license to operate or maintain broadcast facilities within the United States, the demand for communications training material has diminished.

The General Class license is still available from the FCC and is still required when working in international communications. It is an updated version of

what the Second Class license once was. In my opinion, that was the most difficult of all the radio-telephone exams administered. Today's General Class is quite a rigorous exam that requires an extensive knowledge of communication electronics.

## BOOK REVIEW

"Electronic Communications" is an overview of all the information necessary to pass the FCC exam and the entry level Certified Electronic Technician (CET) exam. Each chapter gives a concise overview of how a particular electronics device, circuit, or system operates. Illustrations are large and understandable. All areas of electronics are covered with enough information to prepare an individual for the examinations.

### Reference resource

However, one must remember—and the authors point out in the preface—that "Electronic Communications" is an introductory or reference book. You will not become an electrical engineer from reading this text. A competent broadcast technician still needs the equivalent of a minimum of two years of community college level electronics to succeed in today's communication world. There is no way one book could give out all of the theory necessary to understand how devices and systems operate.

After a few years out of school, individuals can become a bit hazy in some areas of electronics that they are not working with on a daily basis. It is important to have a source one can turn to that can give more information about how a circuit or system operates than the manufacturer's manual contains. This book can be of great assistance in this arena.

However, not all types of transmitter systems are covered; this is something the authors might want to update in a future edition. Both audio and visual communications systems are included. Unfortunately, Charge-Coupled Devices (CCD) television cameras are not included. Older camera systems, such as the image-orthicon, are explained but few of these units are in operation anywhere.

### Some omissions

Magnetic recording systems, audio and video are likewise not included. Cathode ray tubes are included, but Liquid Crystal Displays (LCD) are not. AM stereo systems are missing. There is no mention of LASER disc technology for audio or video.

Of course, this information may be missing because it is not required to pass an examination. Still, none of these systems is exactly new to the world of broadcasting. If this book is going to be successful as a resource manual, it needs

## ELECTRONIC COMMUNICATIONS



Courtesy: material used to passing the General Radio-Telephone and L.P. exams.

to be updated to include the state-of-the-art systems used in broadcasting.

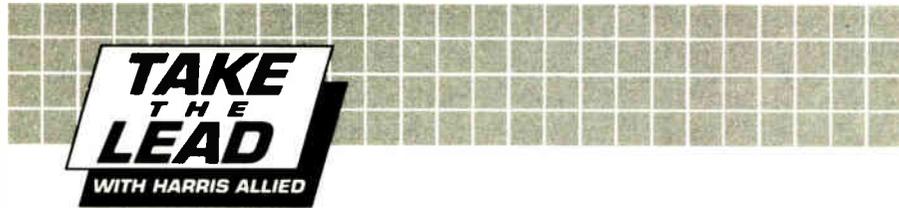
"Electronic Communications" does not, and should not, include fundamentals of DC and AC circuitry. Nonetheless, it is a good study guide for the individual pursuing the communications license and a useful reference guide for the technician.

One may also find "Electronic Communications" to be of great assistance when trying to explain a technical system in layman's terms. The illustrations can be of great value when attempting to make a technical point clear to the general manager, program director or sales department.

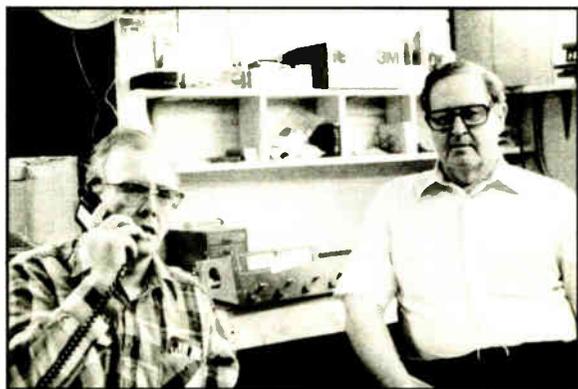
For more information, contact TAB Books at 717-794-2191.

■ ■ ■

Ed Montgomery currently is an electronics teacher in the Fairfax County school system. He has taught broadcast engineering at Northern Virginia Community College and worked as broadcast engineer for several radio stations. He can be reached at 703-971-6881.



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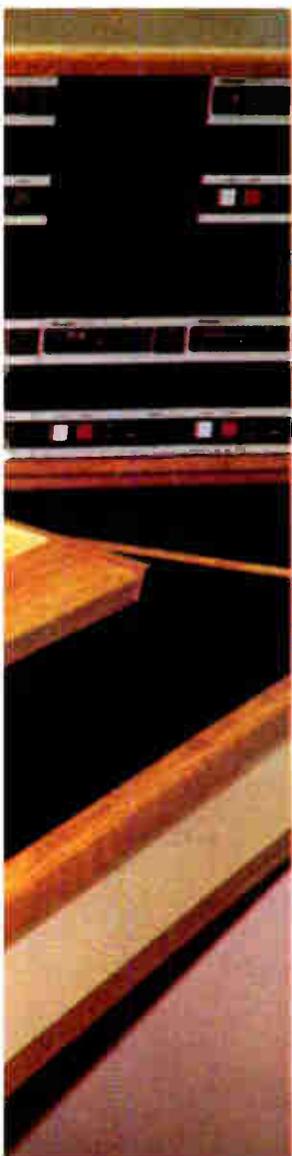


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World Radio History

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# The Advantages of Digital Transports

## Save Money and Time With These DAT Tools

by Mel Lambert

### Part II of II

**STUDIO CITY, Calif.** As I discussed in last month's column, the new generation of remote-controllable DAT transports can provide a degree of cost-effective record and playback flexibility unrivaled by other storage media.

The inclusion of bidirectional serial ports enables both programmable control of all transport and system functions, as well as accessing information from the DAT machine. Such data can be used to verify, for example, that the issued command had been received and acted upon; or to determine the current program number and absolute time location.

Bidirectional serial ports provide two complementary forms of remote control. First, they offer system commands from a computer-based automation system or central remote controller that instruct the DAT machine to perform a designated transport mode.

These include play, pause, rewind or stop, or implement a system function, such as a "go-to-PNO #12," a command that would cause the DAT machine to perform a high-speed search at 250 or even 400 times normal playback speed to the designated program number within about 30 seconds (usually less). The unit then would enter play or play-pause mode.

### Interrogation commands

The second form of remote control involves interrogation commands that

cause the deck to output a variety of status data, including its current transport mode, program number and absolute time locations, digital replay levels, interpolated error rates and so on.

Such information would allow the controlling software to monitor that the selected machine in a pre-programmed sequence actually entered playback mode, for example, and also check that the correct levels are being output.

## DIGITAL DOMAIN

Once a chosen location has been reached and the DAT machine is cued in pause-play mode, it should output audio within a reasonably short time of receiving a play instruction. The start-up time of a typical DAT machine is between 400 and 750 msec—fast enough, I think most of us would agree, for replaying music, jingles and commercials.

### Tighter cueing

If tighter cueing is necessary, however, the remote controller or automation system can be programmed to initiate playback slightly ahead of the designated time, so that the DAT machine is outputting audio at the correct moment. (Most CD players have an average start-up time of between 100 and 250 msec; NAB cartridges, dependent on a number of mechanical factors, offer start times of between 150 and 500 msec.)

Of the various interface schemes currently being used to control reel-to-reel tape machines, DAT players, automation systems and so on, two command protocols have made more than a modest impact: ES-Bus and P2.

Developed jointly by the EBU (European Broadcasting Union) and SMPTE (Society of Motion Picture and Television Engineers), ES-Bus provides integrated control between multiple audio/video machines, controllers, synchronizers and editors connected on a serial network.

P2, on the other hand, is intended for simpler point-to-point or single-controller systems, and utilizes the same connector and electrical interface, as well as similar bidirectional command sequences.

In a typical broadcast application, a master controller might be attached to two dozen or more serially-equipped DAT machines loaded with first-generation tape copies of the station's music, commercials, jingles, IDs and other cuts needed during the upcoming programming cycle.

The controlling software would initiate start/stop sequences, according to the system requirements, and also handle cueing of the currently off-line machines to their required location(s)—either as program numbers, to designate the start of a specified cut, or within  $\pm 1$  DAT frames (3.33 msec),

(continued on page 26)

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# WORKBENCH

## Singing the "Ma Bell Blues"

by John Bisset

**FAIRFAX, Va.** The alarm circuits described in previous installments of *Workbench* prompted a reply by Les Jamison of WANN. Les rigged up two consumer cassette recorders to begin recording when either an EBS message or test or weather alert comes through.

The remote mic contacts of the cassette recorders are used and wired into either the TFT (or equivalent) EBS decoder relay or the Gorman-Redlich Weather Receiver. The beauty of the system, aside from its simplicity, is that there now is no excuse for not getting the EBS message or weather alert correct. Les can be reached at 301-269-0700.

\*\*\*

As we consider possible cases of Spring Fever, let us not ignore the Ma Bell Blues. Tony Gervasi, CE at WNOK, writes to tell us about his most recent experience with Ma.

His homemade listen line box worked great—for a while. Then one day, when someone would call, the listen line would answer, but never disconnect. Thinking the "box" had a problem and never suspecting Mommy Dearest, Tony continued testing for what he thought was his problem.

Four days later, he got a notice from Southern Bell saying it was going to be changing out its central office equipment from "old relay logic" to digital switching. The date given for the change was the day the listen lines started acting up.

Playing this hunch, Tony finally got an answer from the company that recently had installed his new phone system. The rep said that unless "Far End Disconnect Supervision" was pro-

grammed into the switching network, the equipment would not work. Sure enough, a call to Southern Bell made everyone happy—including the GM.

Want to discuss your telco nightmares? Fax them to me: 703-998-2966.

mitter. Compare the numbers to what's available in your Grainger catalog, and you'll be all set when a failure occurs.

If you're having trouble finding a replacement, you can contact your local Grainger office.

Faced with an off-hours emergency, use the toll-free emergency number—800-CALL-WWG (800-225-5994). If you don't have a Grainger catalog, contact your local branch location, or circle Reader Service Number 78.

Once you've purchased your spare motor, take the few minutes necessary to wire it up for your particular use. One solution is to go a step further and dress the ends of the wires with heavy-duty crimp/solder quick disconnects (available from Radio Shack or an electric

supply store). Tape the mating connector to the motor. When the time for installation comes, hookup is greatly simplified.

If you really want to reduce your downtime, break the wires going to the existing blower motor and install the quick disconnects. Now when the motor needs changing, you simply unplug the old motor and plug in the replacement.

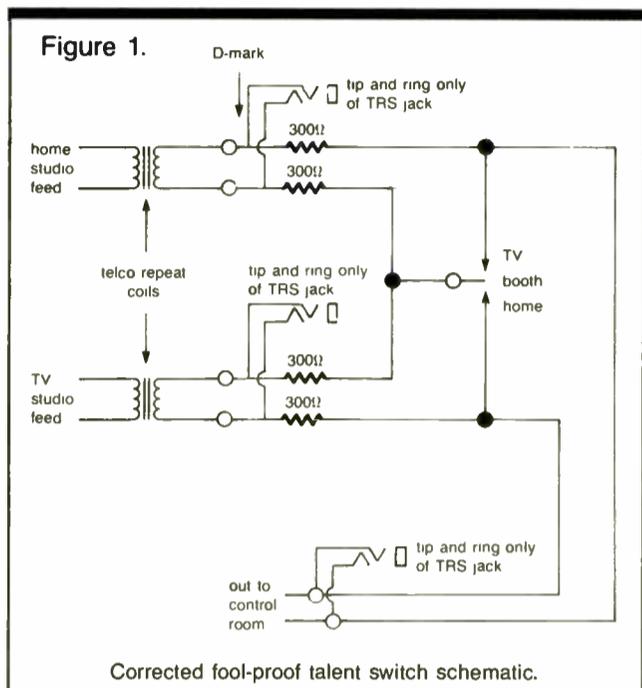
A final note: Some last minute production snafus made for an incorrect drawing for the fool-proof telephone talent switch (RW, Feb. 6). The

correct drawing is pictured in Figure 1. Sorry for the mixup and thanks to those of you that called the error to our attention.

Got a simple time saving tip to share with your fellow engineers? Earn a few dollars, and get SBE recertification credit for being published in a national trade paper by FAXing your idea to 703-998-2966.

\*\*\*

John Bisset, a principal with the contract engineering firm Multiphase Consulting, can be reached at 703-379-1665.



To reach Tony Gervasi at WNOK in Columbia, S.C., call 803-771-0105.

\*\*\*

Planning ahead always seems to be foremost in the engineer's mind. The "What if..." and "How will I respond" goes with the territory. One category to be considered is the loss of a transmitter blower motor.

If your engineering budget won't allow you to buy a replacement to be kept as a spare, at least copy down the pertinent motor identification numbers next time you clean out the trans-

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# Rites of Passage on the Job

## From Honeymoon to Hardship to High Regard, It Takes Time to Master Your Role in the Workplace

by John "Q" Shepler

### Part I of II

**ROCKFORD, Ill.** "I hate this job. I'm getting out of here just as soon as I can."

You've heard these words, right? Most likely they were the sound of your own voice at one time or another. Don't think you've been discovered. Every-

body has these thoughts. Some people have them all the time.

Now, how about this: "I love this job. I can't imagine doing anything else."

I'll bet you've had these thoughts, too. Perhaps they don't come as often or last as long, but there had to be a moment in every job when you felt that way. Maybe it was when you won an award. Maybe it was just the satisfaction of solving a particularly tricky problem. Maybe it was just because someone brought in a cake for your birthday.

As one who has changed jobs more than a few times, I have noticed a pattern in all this. Most jobs seem to have stages. Moreover, how you feel about a job depends somewhat on what stage you're in.

I've also found that real success doesn't come until you have reached the advanced stage. So, if you don't allow yourself the time and energy to get to the advanced stage, you'll never really hit that sweet spot of success.

Let's take a look at these job stages and see if this doesn't make sense.

### Stage 1: The honeymoon

Like every marriage, every job starts off with a honeymoon. This is a period

of acceptance where you can do no wrong. Nobody expects the new person to be up to speed on anything. So, you can fumble around, ask dumb questions, make a few boo-boos and come and go from the station at will. Your bosses and coworkers will just smile. You're new.

It is tempting to confuse the red carpet treatment you receive during the honeymoon with your real status in the company. Established employees aren't entitled to such courtesies, as you'll soon find out.

How long does the honeymoon last? A few days to a few weeks is typical. Go around acting like you inherited the place and it's sure to end in days, maybe hours.

The best way to handle the honeymoon period is to treat it like a probation. Get to the job as quickly as possible and learn as much as you can as fast as you can. Act like the clock is running out. It is.

### Stage 2: The learning phase

I hate this time. You're the newcomer. Everybody knows everybody else, except you. Everybody knows the rules, except you. Everybody has a routine. Everybody knows what to expect next. Everybody has a certain amount of rhythm in their work. Everybody except you, that is. The honeymoon is

over and you're expected to produce like the others. Except that they have an advantage. They've been around and know their jobs. You're still fumbling.

## Q-TIPS

Even if you had exactly the same position in the last station, this place is different and it will take awhile to learn the idiosyncrasies of the facilities and the people. It's an uncomfortable period when you feel like an outsider and perhaps even a little incompetent. It's a time for reminiscing about how great the last job was. Oh, if you could just go back.

Don't do it. You came here for a reason. Give it a chance. If you bail out now and go back to your old job, or someplace else, you'll never know whether you would have made it and gone on to even greater glory.

Grit your teeth if you must, but live through this period at any cost. In a few months things will start to smooth out. After a year, you'll have been through a complete business cycle and will know what's coming next week and next month. You'll feel a lot better. Promise.

### Stage 3: Routine competence

It's been two years and now you're good at what you do. No more sleepless nights worrying about what disaster will befall you tomorrow. You know the job and the people well enough that normal work surprises are taken in stride. Real disasters are few and far between. When they happen, you rise to the occasion. The crisis is put under control, and then it's back

(continued on page 26)

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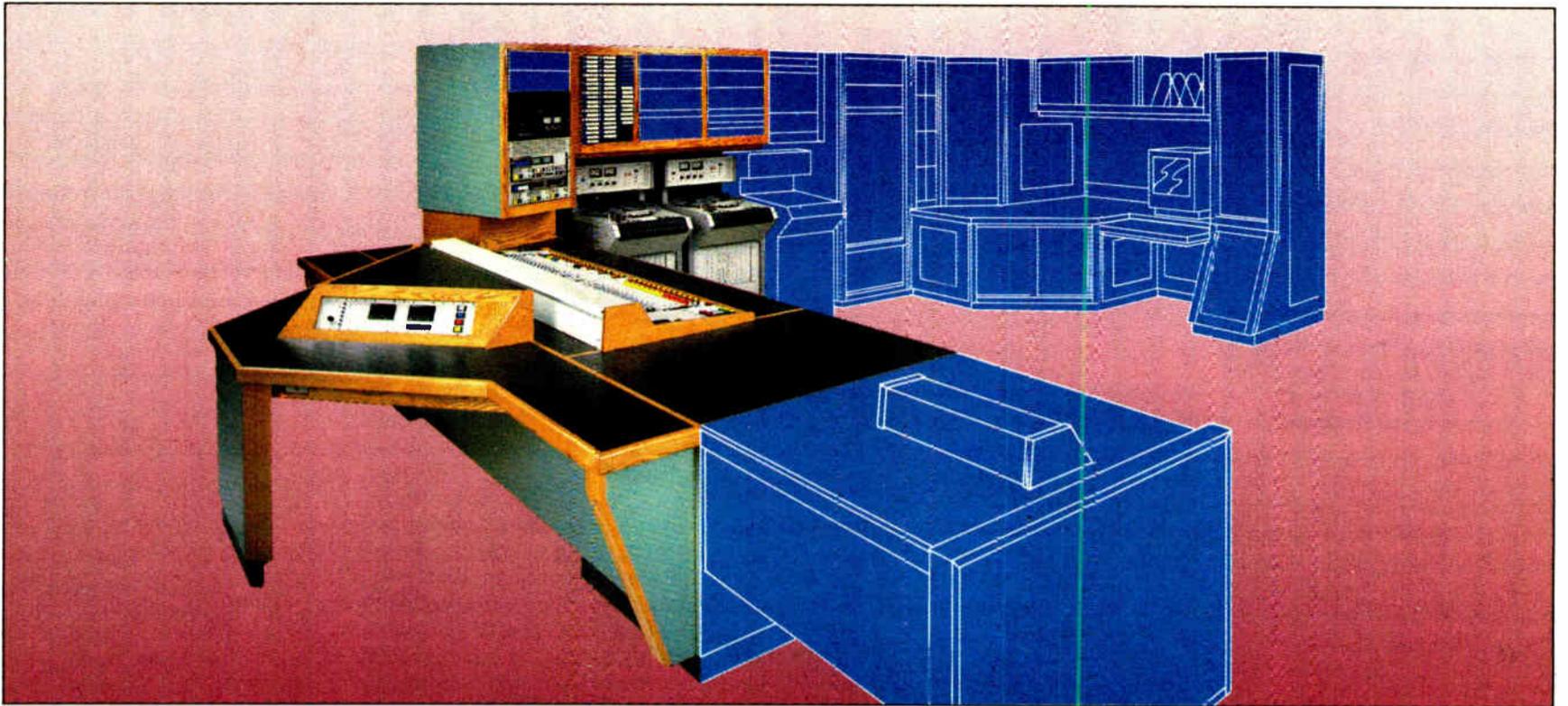
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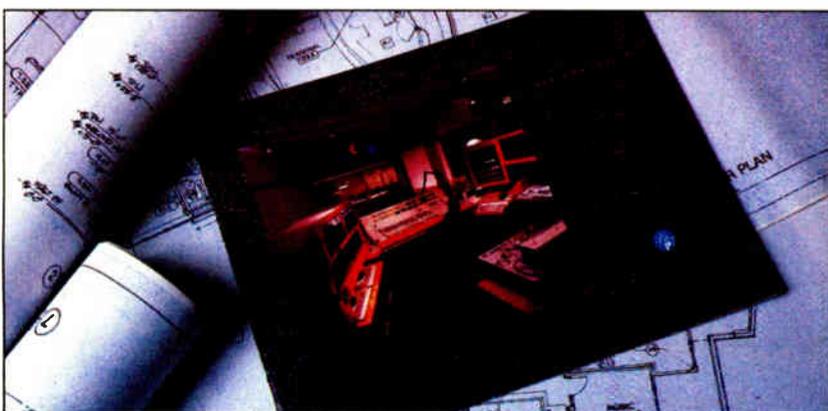
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# Watch for Tower Burnouts

by Harold Hallikainen

**SAN LUIS OBISPO, Calif.** The FCC recently issued several substantial fines for inoperable tower lights. Certainly, they know tower lights are going to fail and have no problem with this. The

## INSIGHT ON RULES

problem arises when no one knows the tower lights are out.

Each station (having a lit tower) is required to make a daily inspection of the tower lights or tower light indicator or have an automatic alarm that will report the failure of any lamp. If a station is complying with the daily inspection requirement, it is hard to see how the FCC could cite a burn-out that of which a station is unaware.

If you find that a steady-burning top light or any flashing beacon has failed, the FAA is to be notified within 30 minutes of the observed outage. Since the lights are only required to be observed once a day, this may be up to a day after the actual failure.

The Commission is actually giving us some leeway by not requiring an automatic alarm. The FCC generally expects defective tower lights to be fixed within

a few weeks. Although not specifically required, it is suggested that the results of all tower light inspections be recorded in the station log. You are required to log the failure (and restoration) of any lamp (see section 17.49 of the rules).

### Improper operation

I've seen cases where the FCC found improper tower light operation and the

specification of all the control devices, indicators and alarms to ensure they are operating properly. I'd suggest such an inspection include a simulated failure of a lamp. Can the operator detect the failure? You can easily simulate a failure by adding one 116 W lamp to the lighting circuit after the current sampling transformer.

AM stations might have a light in the tower coupling unit that is always on

Table 1.

RF radiation compliance information sources:

"Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation" (OST 65)  
Publication PB#86-127081, call 800-336-4700 to order.

"A Broadcaster's Guide to FCC Radiation Regulation Compliance"  
National Association of Broadcasters, call 800-368-5644 to order.

"Further Guidance for Broadcasters Regarding Radio Frequency Radiation and the Environment"  
FCC Public Notice, Jan. 28, 1986.

"RF Radiation Compliance"  
Proceedings of the 1989 Society of Broadcast Engineers and Broadcast Engineering Conference, October 1989.

"Radio Frequency Radiation—A Case Study"  
"Radio Frequency Radiation—An Update"  
Broadcast Engineering, February 1991.

studio indicator said the lights were operating properly. Rule 17.47(a)(1) requires tower light indicators to properly detect the failure of any lamp (whether failure of that lamp is required to be reported to the FAA or not).

Further, 17.47(b) requires a quarterly in-

(this also prevents condensation in the cabinet). To test the tower light indicator, turn this lamp off. This would give the same indication as the failure of a steady-burning side light.

FM stations might have a transmitter site "night light" that serves the same purpose. I've seen too many stations that just calibrate the remote indication to peak at 100 percent when everything is operating properly. The operator can identify the failure of a flashing beacon, but that's about all.

Once a lamp is added to allow simulated failures, I'd suggest operators (or system software, in programmable systems) observe the minimum and maximum indication over a one-minute period.

### Scan meter readings

As an alternative, a system could include the tower light indications in a

scan of all meter readings and accumulate the minimum and maximum indications over 10 samples. A limit chart (or evaluation routine) can be prepared based on the lighting load.

If you have a typical tower lighting load (two 116 W steady-burning side lights, one "extra" 116 W steady-burning lamp, two flashing 620 W lamps), a decrease of the minimum to 67 percent of the typical minimum (probably use 84 percent of the typical minimum as a threshold) indicates the loss of one steady-burning lamp (though we don't know which one).

A decrease of the typical maximum to 61 percent of typical maximum (using 80 percent as a threshold) indicates the loss of one flashing lamp. In addition, a very high minimum would indicate the flasher is stuck on, while a very low minimum indicates the flasher is stuck off (or both lamps have failed).

During the daily inspection, the operator should log the minimum and maximum indication observed for each tower, along with the evaluation of the results. If a detected failure requires notification of the FAA, that should be done and a notation made. I'd try to make the notation traceable—who at the FAA took the information, etc.

### Catch problems before the FCC

The vast majority of the violations I've found in my review of FCC files should have been caught by the chief operator. I've been working with the NAB on a

Table 2.

Following are some sources with ideas about RFR compliance:

Bob Weirather/Harris Corp.  
Tom King/Kintronic Laboratories  
Ben Dawson/Hatfield & Dawson  
Jim Hatfield/Hatfield & Dawson  
Robert Cleveland/FCC  
Dane Ericksen/Hammitt & Edison

book to help the chief operator catch the problems before the FCC does. It contains inspection forms based on FCC inspection forms and should be available by the NAB convention in April.

Again, the FCC rules recognize that equipment will fail. There is almost always a way for you to stay on the air while making repairs. The failure of the equipment is to be logged and diligent progress must be shown towards making the repair. One station was fined for having its tower lights out for more than 10 years. That was not good progress.

Along with the sessions on fancy new emerging technology, NAB will have lots of sessions of concern to station chief operators. These include sessions on contract engineering, EBS, FCC rules, etc. I'll look forward to seeing you there.

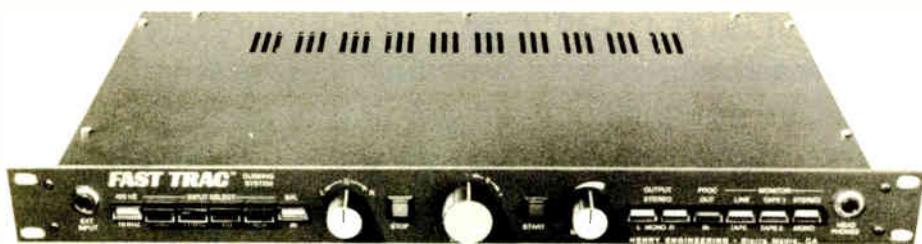
And a final note: Last month we finished up my opinions on what could be done to ensure compliance with the FCC specifications for human exposure to radiation.

I have listed some additional information sources in Table 1. In addition, I made lots of phone calls in writing the series. Most of those I spoke with (and you may wish to speak with) are listed in Table 2. I'd like to thank all those who helped.

Harold Hallikainen is president of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems. He also teaches electronics at Cuesta College, San Luis Obispo. He can be reached at 805-541-0200, or on Internet at HHallikainen@vax.seng.CalPoly.edu.

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# Coordinating Product Delivery

by Barry Mishkind

**TUCSON, Ariz.** Last time out we started discussing some problems in trying to get equipment delivery to mesh properly with construction schedules and station needs.

Let's check in with Joe, an engineer who had planned a new transmitter installation and had done his homework—or most of it, anyway.

What happened to this fine young fellow was that after comparing transmitter specifications, quality and prices, he took the word of the salesman as to delivery time.

## ECLECTIC ENGINEER

This is not unusual. If you sign a contract with a company, you expect that in return for the rather large check you are handing over you'll get prompt, honest treatment.

Joe planned for installation in 90 days. The transmitter company he preferred said they "might" be able to meet the schedule, but couldn't guarantee. The second choice manufacturer said, "No problem. Sign here."

You've probably already guessed that 90 days later, there was no transmitter. Indeed, delivery wouldn't actually occur for another month. Eventually, it became clear the manufacturer never really intended to deliver on time; after all, the company had the money in hand.

The number of problems this caused can't be fully explored here, but suffice it to say there was enough pressure upon Joe from the station management to get the construction completed in time for the next book. Dealing with a manufacturer who was unresponsive or dishonest just made matters worse.

### The other side

Of course, talking to the reps and suppliers brings another side of the issue to light. Understanding their situation can help get you better service on your order.

Tim Hawks of RF Specialties of Texas, says most stations forget that acquiring new equipment is a really a four-stage process, involving financial decisions, ordering decisions, manufacturing considerations and shipping considerations.

"A problem or mistake at any one of these four points can drag the entire process to a halt," Hawks said. Even errors that are not anyone's "fault," such as a key part turning up defective, can cost valuable time.

That's because in order to reduce costs, many manufacturers have adopted the Japanese system of ordering components to arrive just as they are needed. So what happens if the last transformer or resistor in stock turns up bad, with the next shipment still in the middle of the ocean?

Hawks says, "It's easy for a week or more to be lost from that or from a computer glitch or credit problem or, really, any number of factors." Indeed, added together, several weeks often get added to delivery schedules without any ma-

nor problems occurring.

As we mentioned last time, some stations' way of dealing with this is to always plead "emergency," seeking expedited delivery for whatever they order.

### Accommodations

Most distributors do try to accommodate stations' needs, especially in true emergencies, and even when poor planning results in short lead times. Still, it isn't always easy to locate the needed item anywhere.

Another ploy used by some stations is to try to use their corporate business to get preferential treatment, holding out hundreds of thousands of dollars of business as a carrot. In the current economic times, this can become a potent argument.

Sadly, that ends up putting some manufacturers in a dilemma: either anger a potential large client, or burn a small station. Perhaps this is the tiger that bit our friend Joe.

True, there are manufacturers that refuse to jump clients over previously accepted orders. They may lose some sales, but they tend to get a lot of repeat business from appreciative clients.

### Shotgun ordering

Another annoyance suppliers have to deal with comes from those stations that cover their lack of planning by shotgun ordering excessive stocks, planning to return what they don't need for credit.

This creates several difficulties for the distributor who gets caught in the middle. How? By getting returned merchandise in poor condition: rack screw marks, scratches or missing parts, not to mention the cash cost in providing the equipment in the first place.

All of these costs get passed on, as the unit must be remanufactured before it can be sold again. Some manufacturers have had to go even further, charging up

to 50 percent restocking fees or refusing returns altogether.

One more factor that can result in delays is the matter of credit. With so many companies working with tight money, stations that have been poor payers may receive demands for C.O.D., or even cash with order only. Trying to replace a major part of a transmitter at 3 a.m. can become a real pain in the lower anatomy.

All in all, by putting yourself in the supplier's place for a moment, you can anticipate many of these possible hassles and smooth the way for quick delivery, whether it is a transmitter, antenna, console or cart machine.

### Bringing it all together

So, summing up the challenge: Plan properly for lead times, anticipate bottlenecks and pick what you know to be a reliable, honest supplier. If you do, everything comes together at the right place at the right time.

Most of the time.

Recall that when we left off last time, a new transmitter was en route to the station. I was racing around, trying to get everything ready. The contractors were moving along nicely, thank you.

And just as I was getting to feel like the project was pulling together, the transmitter phone rang. The program director was calling, happy to report the transmitter had arrived at the address the GM used in ordering it.

"Yep, they unloaded it outside the studio about 15 minutes ago and left. How were you planning to get it to the transmitter site?"

Ah yes, the best laid plans of mice and men.

Before leaving, a few callers have asked about the free computer program offered by RW for your PC. D&A is a distance and azimuth calculator with some neat enhancements. It lets you store your most used sets of coordinates

(like your transmitter and/or studio) and allows you to rerun calculations without re-entering everything from scratch.

It's available by sending a 3.5-inch or 5.25-inch diskette to me at 2033 S. Augusta Place, Tucson, Ariz., 85710. Please include \$5 for postage and handling. Last year's program, COVPRED, will also be included free.

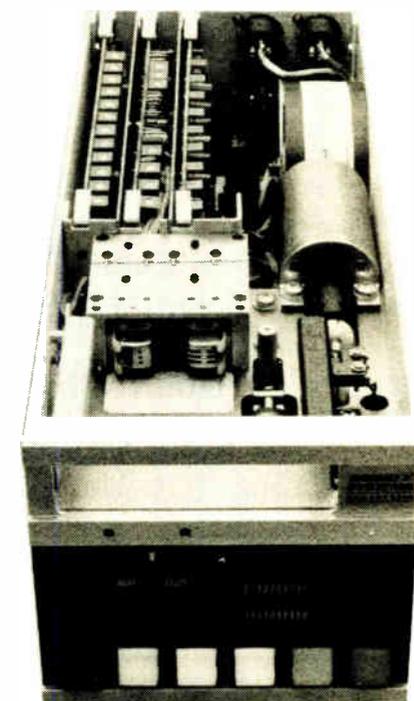
Barry Mishkind, aka RW's Eclectic Engineer, is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797, or on FidoNet 1:300/11.

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World Radio History

# Advantages of DAT Transports

(continued from page 20)

for ultra-precise cueing *within* the designated segment.

In addition to a DAT machine's inherent ability to quickly and accurately locate predetermined PNO locations, under bidirectional serial control the software could continuously monitor the current absolute time being output from the deck—and thus accurately cue the machine to a designated H:M:S:F location.

Bear in mind that some DAT machines only offer up to 99 individual PNO designations; several hundred stings, bumpers and IDs might need

to be dubbed onto a 120-minute DAT cassette, each addressable to within a DAT frame.

## Broadcast software development

It goes without saying that serial-capable DAT machines are only as intelligent as the software that controls them. ES-Bus and P2 protocols are relatively easy to use and comprise several dozen commands made up of two or more bytes, plus a checksum, packaged into asynchronous data messages running at 38.4 kbps, with even or odd parity.

P2-compatible transport commands

fall into the simple two-byte command category, while more complex "go-to-PNO" and interrogation commands, plus commands being issued to individual or groups of machines under ES-bus networked control, might consist of as many as a dozen bytes of data.

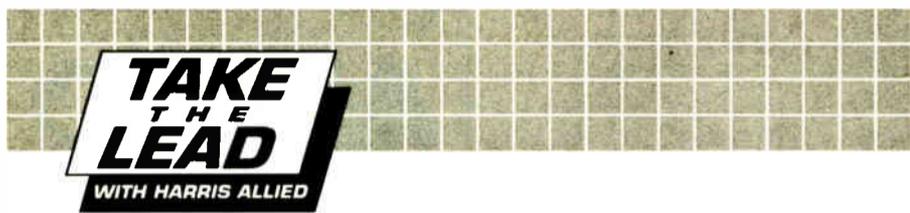
Most automation systems and PCs can be set up to output ES-Bus or P2-compatible commands from their balanced RS-422 or unbalanced RS-232C serial I/O ports. Controlling software can be written in a variety of languages, including assembler or machine code. For most applications, however, high-level languages such as QuickBASIC, Pascal, "C," etc., are easier to develop and debug. (High-level languages will also simplify the often time-consuming tasks of developing screen display and keyboard- or mouse-based input routines).

One firm is even offering a series of interface utilities designed to streamline the development of application-specific software for its new serial-capable DAT. A custom-developed "Developer's Toolkit," available in versions for both Apple Macintosh and IBM PC-compatible systems, provides a variety of transport, system control and interrogation functions via modular "C" utilities.

Now that DAT machines are being made available with sophisticated bidirectional serial control interfaces, it is perhaps inevitable that an increasing number of broadcasters will be looking to provide integrated system control of various audio replay and associated functions.

■ ■ ■

*Mel Lambert has been intimately involved with the production and broadcast industries on both sides of the Atlantic for more than a dozen years. Now principal of Media&Marketing, a consulting service for the professional audio industry, he can be reached at 818-753-9510.*



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## Rites of Passage for The Work Environment

(continued from page 22) to normal.

Most people are capable of meeting their job requirements. They find a comfort zone somewhere in between excellence and incompetence and stay there for years. Many are quite happy to have a predictable job that they can handle. They take the extra energy that once was needed just to make it through the day and apply it to family, social life or hobbies. They are happy and contented.

We all need this period of a year to several years of competent work to keep our bosses happy and build up some efficiency in our work routine. You'll never become a leader as long as every day is a mad dash just to stay ahead of the next impending disaster. You need to gain control of the job and then master it.

You'll know you have completed this phase when things are starting to seem too quiet. Maybe even a little boredom is setting in. Time to get up and get moving again.

### Stage 4: Leadership/recognition

In my opinion, this is the place to be. This is the phase where you do great things. It's where people start to see you as better than average. Raises are given more regularly. You invent new ideas and get them established. You gain industry recognition and even awards. Job offers come your way. Life is grand.

How do you get to this magical place? You need time, certainly. You have to get through the competency phase and master the daily routine first. Why? Because your job description isn't going to change. You are.

To move into the leadership phase you have to do everything you did before and then some. The achievement is accomplished during the hour or two a day that is left over from normal tasks. You've created this time by becoming efficient in your work. Now you have the choice of frittering it away or investing it in excellence.

You'll need to push yourself. Make a list of projects that you think would really improve things. Now turn that list into a plan and sketch out detailed plans for a few of these projects.

Talk up the projects. Get others to start salivating too. Now that you have support, talk the boss into letting you proceed. Perhaps it takes a few extra expense or capital dollars. Sell the dream of how great things will be and you'll get at least some support.

Let's hold this thought until next month. I'd like to talk more about how you can rise from being OK to being excellent. Then we'll look at how you can use the knowledge about these job phases to direct your future career moves.

■ ■ ■

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

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**Sony STR-7055** solid state amp, AM/FM, BO. Pinetucket Recording, 747 Wire, Auburn AL 36830. 205-826-0390.

**Crown DC-150** w/o IOC, \$200 ea; Soundcraftsman 5002 power amp, 500 W/chnl, \$500. B Wilson, 212 Southside, Campbellville KY 42718. 502-789-1505.

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**Marti PGM-20** line amp, \$50; Spotmaster 1x5 mono DA, \$50. P Wells, KJQY, San Diego. 619-238-1037.

**Haffer DH-500**, 255 W/chnl, rack mount, factory performance checked recently, vgc, \$400+shipping; Crown IC-150 stereo audio preamp, 2 phono inputs, 2 tape inputs & several aux inputs, rack mountable, gd cond, \$60+shipping. Bill, DeFelice Prod, 93-2R Fowler St, New Haven CT 06515. 203-397-2595.

**Leak Point One** stereo vacuum tube hi fi preamp, made in England, excel sound, \$195. J McLane, ODD-E-O, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

**Ampex 602** octal plug-in Nuvistor mic preamps 96440-01, (2), \$35 ea; (2) Altec 1588C octal plug-in mic preamps w/xlrmer & phantom, \$20 ea; (2) Altec 1588B octal plug-in mic preamps w/xlrmer, \$10 ea. J Newman, Box 1211, Newport RI 02840.

**RCA BA-33** program amps (5), mostly for parts, some working. H Kneller, WKII, 3151 Cooper St, Punta Gorda FL 33950. 813-639-1112.

**DuKane audio dist amp** w4 mic preamp cards, mixer card #2A155, (7) 2A160 line amp cards, all in 110-1437 card frame, outputs unbalanced, all rack mount, \$100; dual 24 V pwr supply for above, \$50; Shure Voice Gates (4), pwr supply, rack panel, mic level I/O balanced, \$50/lot. E Davison, 135 N IL, Springfield IL 62702. 217-787-0800.

**Magnecord CM6K** 10 W tube mon amp, rack mount, rebuilt, sounds gd, \$50; Precision S60 tube amps (3), 60 W, 2 low imp mic inputs, clean & working, \$50 ea; McGohan M1003 100 W tube amp, 2 low imp mic inputs, clean & working, \$75; amp/spkr in suitcase, 8 W, phone line input, \$35. E Davison, 135 N IL, Springfield IL 62702. 217-787-0800.

**Harris program amp**, monitor amp, stand alone, as new, \$150 ea. C Porter, WEAZ, POB 498, Carthage IL 62379. 217-357-3128.

**McIntosh MC-2500**, silver, \$2575/BO; black MC-2500, fact sealed, \$3575/BO; (2) MC-240, \$975 ea/BO; (3) MC-40, (2) MC-225, \$575 ea/BO; PS Audio 200C, \$975/BO. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

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**Sansui B-2301**, BA-5000, C-2301; Luxman M-4000, M-4000-A, M-6000. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

**Altec Lansing 287F or 287W**, any cond; any amps by Western Electric. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33191. 305-866-5401.

**Scully '100'** recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 1131 Virginia Ave, Campbell CA 95008. 408-866-8434.

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**Windcharger**, 120' on ground w/guys, \$500 FOB Duluth MN. J Stromquist, WNCB, 2828 Piedmont, Duluth MN 55811. 218-722-3017.

**Jampro 8-bay w/brackets & radomes** on 99.1, no retune required ±400KC. Was replaced for a no airtime lost xmttr move. Factory retune within 1MC for \$5000. Also, (2) Mark 6' dishes, 950MHz, mdl P-9A72G w/approx. 75' of 7/8 coax. All on ground in Ft. Smith AR. Don Patrick, 501-646-6142.

**Dielectric coax switch**, 1-5/8", 4-port motorized w/interrupters, new wiper & contact stock, recently rebuilt in vgc, \$1500; MCI coax switch, 1-5/8" 4-port motorized w/interrupters, recently rebuilt in vgc, \$850; MCI coax switch 3" 4-port w/interrupters, gd cond, \$1700. B Webster, WLIT, 150 N Michigan, Chicago IL 60515. 312-329-9002.

**Utility tower G480**, 445' high, all but 2 sections in gd cond, w/new guy wires & insulators, base insulator, side lights & beacon, on ground in 20' sections, 30" face. D Loughry, WFRB, POB 430, Frostburg MD 21532. 301-689-8871.

**RING TRANSFORMERS** (2), 3.5 KVA, 110V/60Hz, one like new; Dielectric AS0000-406 230VAC coaxial switch w/24V control, rebuilt by Dielectric, like new. D Gorman, 215-249-9662.

**Rohn 65**, (2) sections, 18" face solid rod, 20' sections, \$300 ea; Rohn 80 (10) 20' sections, 42" face, \$400; 6" coax, one 130' section, one 120' section, BO. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

**LDF 5-50A** heliax, 450', new; Jampro 3-bay antenna H/V, 100.5 MHz. S Delay, 217-498-7339.

**Phelps-Dodge CFM-2P** CP 2-bay at 107.1 MHz, \$475. P Wells, KJQY, San Diego. 619-238-1037.

**ERI unshielded sample loops** (3) & iso coils for AM directional monitoring, BO; transformers, chokes, etc from Collins 1 kW AM xmttr, 10 V filament xmttrs, etc, BO. C Gennaro, WJMS, 222 S Lawrence, Ironwood MI 49938. 906-932-2411.

**Rohn 90' tower**, land & building in Springdale AR, gd tower site. J Richardson, KXIO, POB 37, Clarksville AR 72830. 501-754-2076.

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**Shively 6810**, 6-bays w/deicers, 103.3 MHz, \$750. D Hainer, WCRF, 9756 Barr Rd, Cleveland OH 44141. 216-526-1111.

**Rigid feedline**, (20) 20' sections w/end terminations, (4) 90° elbows & (6) assorted short pieces, alal 1-5/8 rigid feedline, just taken out of service, BO. J Bisset, Multiphase Consulting, 703-379-1665.

**Gates FMC-7A** 7-bay FM antenna, working when removed, extra heaters, 103.1 MHz. J Goeman, KJAM, Box D, Madison SD 57042. 605-256-4514.

**RCA FBC-8C** 8-bay high pwr wide-icers, tuned to 102.3 MHz, excel cond, BO; RCA BFA-4A, 4-bay hor pol high pwr on 102.3 mHz, BO. T Edmison, WDKN, 106 E College, Dickson TN 37055. 615-446-0752.

**RCA BFC6B** 6-bay FM antenna w/deicers, tuned to 88.5 MHz, w/(5) spare bays, located at US Twr Frederick MD, \$2800/BO. M Byrnes, WAMU, American Univ, Washington DC 20016. 202-885-1069.

**CSP/Vector Tech 4-tower AM** phasing unit w/all phasing controls & Potomac Inst antenna monitor, currently on 1360 kHz, mint cond, BO. R Wright, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-6200.

**EG&G 4-level**, 3 flash boxes/level w/top AOL & controller, gd cond, TOP AOL in new cond, \$22500. M Pollock, WFXG-TV, POB 204540, Augusta GA 30917. 404-650-0054.

**Atlas 160'** self-supporting twr, 18' at base, all drawings, excel cond, you disassemble & transport, \$995. M DeClue, KOKI-TV, Tulsa OK 74145. 918-622-2300.

**World Tower 8809-2**, 429', 2 yrs old, 30"-24" face, w/lighting, solid rod, high wind/ice specs, like new, \$16500. B Carr, WRED, 1201 Fremont Pike, Woodville OH 43469. 419-837-9576.

**EIA Flanges** 3 1/8" rigid coax line, (55) 20' pieces, 50 ohm, stored indoors, \$200 ea. L Bruce, WROR, 3 Fenway Plaza, Boston MA 022-5. 617-236-6841.

**Dielectric IM-2400** dehydrator, \$1500; Cablewave 920187-004 angle member adaptor kits (25 of 10 ea), \$30/klt. G Liebisch, WPTF/WQDR, Box 29521, Raleigh NC 27626. 919 790-6315.

**Andrew MDS** antenna, horz polarized, freq 2150-2163 MHz, w/200' 5" W/G, connectors & hardware, \$3500/BO. D Hill, KXAL, POB 1393, Mt Pleasant TX 75455. 903-572-6536.

## FM - ANTENNAS

Designed and built for your frequency. Choose from 1 to 12 bays and five power levels. Financing available. Call Jimmie Joynt at S.W.R. 800/279-3326

### Want to Buy

**Air Heliax**, 340' of 1 to 1-5/8" for non-profit FM, cash or tax deductible receipt. D Van Zandt, WJLU, 2596 SR 44, New Smyrna FL 32168. 904-427-9000.

**Air dielectric 1-5/8 coax**, need 300'; Rohn tower flasher & photo light switch for 300mm beacon. J Richardson, KXIO, POB 37, Clarksville AR 72830. 501-754-2076.

**Transmission line dehydrator** unit, all types. P Salois, KPCR, Box 1, Bowling Green MO 63334. 314-324-2283.

**Want Cablewave LP** 12 bay circular polarized FM antenna, need immediately. K Kichel, K'JC, 1207 Louisa St, Rayville LA 71269. 318-728-5852.

## AUDIO PRODUCTION

### Want to Sell

**LUREI 529** cut only 27 band EQ terminal connection in & outs, \$350 ea or \$600/pr; Tech-nic S1200 MK 3 TT, \$200; dbx 3BX expander, \$200. B Wilson, 212 Southside, Campbellville KY 42718. 502-789-1505.

**Audio Digital TC-4** digital delay 64 seconds, mono, excel cond, \$600. G Faltus, WZMX, 905 Wethersfield, Hartford CT 06114. 203-296-1175.

**Audio Digital TC2** 2.25 sec. 18 kHz digital delay & effects unit, direct millisecond readout, \$575. R McMillen, 3235 SE 39th Ave, Portland OR 97202. 503-239-6070.

**Fairchild 659A** Reverbertron (2), \$100 ea/BO; Dolby A301 type A NR, 2 chnl (2), \$300 ea/BO. R Rhodes, POB 1550, NY NY 10101. 212-245-5045.

**Aitac 15676A** tube mixers (3), \$100 ea; Altec 1607A mixer amp (4), \$100 ea/all. J Parsons Sr, 10375 Cannas, N Huntingdon PA 15842. 412-863-9590.

**Eventide H910** Harmonizer, BO; Realistic parametric EQ (4), BO; Realistic 4 chnl mic mixer, 35-1105 (3), BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

**Shure SR-107** graphic EQ, excel cond, \$150 plus shpg. B Leslie, Pro Recdg Srvc, 13709 Maple Leaf, Cleveland OH 44125. 216-662-1435.

**dbx 21** Type II decoder unit for tapes & records w/manual, new cond, BO/trade. E O'Brien, Imperial Sound, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

**Dolby 361 A** Type NR (2) ready for SR cards, \$1175/BO. R McMillen, 3235 SE 39th Ave, Portland OR 97202. 503-239-6070.

**AKG R-25** new remote control for AKG BX-25 reverb unit, long cable, BO/trade. J Roper, Imperial Studios, 383 N Studio, Terra Haute IN 47803. 812-877-2663.

**Burwen TNE 7000A** transient noise eliminator (2), like new cond, \$175 ea plus \$10 shipping. M Gollub, WMJS, POB 547, Prince Frederick MD 20678. 301-535-2201.

**Orban 536A** de-esser, \$275 plus \$10 shipping. M Gollub, WMJS, POB 547, Prince Frederick MD 20678. 301-535-2201.

**Howe Audio 2100** Phase Chaser, excel cond, \$1200/BO. G Fullhart, WVKK, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

**dbx 900 series** rack w/(2) 942 Type II 2-chnl decoder & (2) 411 Type II encoder/decoder, BO; Eventide H910 Harmonizer, not working, BO. K Stokes, WKJN, 3029 Sherwood Forest #200, Baton Rouge LA 70816. 504-292-9556.

**Travel trailer** 14' mod for remote studio use, 8 chnl SS console w/mon amp & spkrs, 5' rack, gd cabinet, \$4000. J Sellmeyer, Rt 1 Box 270, McKinney TX 75069. 214-542-2056.

**Shure M68** (3), & level lock, all mounted in custom wood cabinet w/sliding doors, excel cond, \$300+shipping. C Easlick, MES Co, 2233 Cumberland, Lansing MI 48906. FAX 517-321-1900.

**dbx 157** 2-chnl rack mount, \$150. Tiki Recording Studios, 195 S 26th St, San Jose CA 95116. 408-286-4091.

## CASSETTES - CARTS - REELS

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Circle 54 On Reader Service Card

**Gentner pre-wired patch panels**, 6' cables to punch blacks, panels are 1/4", 26 across (13 stereo) w/monitor row at bottom, sell/trade. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

**Rolling Radio remote van**, '87 Toyota, 66,000 miles, w/console, 100 W speaker amp, cellphone. S Griffin, WYAY/WYAI-FM, 200 Galleria Pkwy #900, Atlanta GA 30339. 404-955-0106.

**dbx 150** type 1 NR (2), rack mount, balanced in/out, excel cond, \$100 ea; Aphex Aural Exciter broadcast model, rack mount, balanced in/out, excel cond, \$500/BO. M Byrnes, WAMU, American Univ, Washington DC 20016. 202-885-1069.

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Circle 117 on Reader Service Card

**AUDIO . . . WTS**

dbx 700 digital audio processor (2) in excel cond. \$500/pr. FOB. L Lyman, Tactical Electronics, POB 1743, Melbourne FL 32902. 407-676-6907.

**Want to Buy**

Symetrix 528A mic processors, gd to excel cond only, buy/trade. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5854.

Ham radio operators looking for surplus audio processors, mixers & mics, as well as other inexpensive gear that could help bdct engrs play radio at home among enthusiasts for vintage AM. Please write wofferings. WA3VJB, Box 73, West Friendship MD 21794-0073.

Lyrec 15 ips tape timer, \$50; Orban 526A single chnl de-esser, \$175. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

**AUTOMATION EQUIP**

**Want to Sell**

Satcue 400 switcher by Colorado Magnetics, \$400. H Widsten, KGNB, 1540 Loop 337 North, New Braunfels TX 78130. 512-625-7111.

MEI Satmaster satellite programmer plus (2) SMC 452 stereo bi-directional Carousels, 5 yrs old, \$8000 plus shipping. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

MW Persons automation programmer, like new, \$700; Otari ARS-1000 (5), new heads, gd cond, \$750 ea/\$3500 for all. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers Bch FL 33931. 813-574-5548.

Revox PR-99 play only (2), gd cond, 2 Trk stereo, \$1000 ea. C Stalnaker, KEZQ, POB 100, Little Rock AR 72203. 501-372-7740.

SMC 250RS mono Carousels (2), vgc, \$600 ea. M Persons, WJYJ, Box 706, Brainerd MN 56401. 218-829-1326.

Harris System 9000 w/event controller for 12 sources, source cards, all system computer cards, pwr supply, cables for (4) Otari ARS-1000 stereo reel decks, (4) Carousels, data entry CRT workstation, (2) standard system equip racks; controller fully operational when removed, BO, buyer ships. K Eilert, KWED, 609 E Court St, Seguin TX 78155. 512-379-2234.

IGM Basic A control system, 3000 event memory, video monitor, log printer, remote control, 13 source cards, EN FSK logging system w/TV terminal, 12 yrs old, will sell as unit or separately, BO; IGM Go-Carts, 42 tray, stereo electr w/mono heads, 12 yrs old, gd cond (2), \$900 ea. D Gander, KDUZ, Box 10, Hutchinson MN 55350. 612-587-2140.

Automation system w/(6) 350 RS Carousels, (3) 250 RSC Carousels, (6) equip rack, Revox A77, DP-1 programmer, AS 20 switcher & remote control unit, TS 25 tone decoder, plus many more items, \$3000. E Dulaney, KYKK, 619 N Turner, Hobbs NM 88240. 505-397-4969.

# BEE

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JVC KY2000B 3-tube color camera w/AC adaptor, shoulder pad, case, mic holder, VTR cable, Anton-Bauer battery bracket, Tamron 10-100 zoom, \$1000; JVC KY1900 3-tube color w/AC adaptor, case, Tamron 10-100 zoom, \$900; Panasonic WV3160 single tube color, \$400. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

IGM time announcer 382 A's (2) w/manual; Ampex 602 R-R w/manual: (2) SMC 252 Carousels, stripped but few gd parts; SMC 20ARS Carousel, stripped, trays left; (2) Gates RDC 10 remote controls; Gates audio amp. R Pastorik, WCMY, 216 W Lafayette St, Ottawa IL 61350. 815-434-6050.

MEI MP-1000, 8-source sequencer, 3 yrs old, excel cond, alone or w/custom wall cabinet w/(4) Ampex 445 decks w/pre-amps & tone detectors, \$4500 complete, you ship. H Kneller, WKII, 3151 Cooper St, Punta Gorda FL 33950. 813-639-1112.

Schafer older relay style automation controller in one rack, \$300; Cetec 7000 various source cards, \$450 ea; Schafer Audiofile A2 (2), \$2500 ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

SMC DP-20 w/(6) SMC 350 mono Carousels, (2) Otari ARS-1000 reels, (2) ITC 750 reels, (2) SMC TS-25 dual tone sensors, (2) SMC drawer type dual mono cart machines, single play cart machine, (5) racks, desk type brain, system capable of 20 stereo inputs, has backfill & network cards; also have (2) SMC R/P cart machines, mono & stereo, many spare cards & all books, BO. G Smith, KORQ, 915-673-2545.

SMC 350RSB, Carousels, rack, pwr supply, DS-20 switcher, RP1000 brain & assorted parts, BO. D Dunsmoor, KRRZ/KZPR, 216 S Bdwy, Minot ND 58702. 701-852-4646.

Conex CS-25 dual 25 Hz tone sensor w/manual, excel cond, \$300. B Watson, KSAK, 1551 E Amhr, W Covina CA 91792. 814-946-6249.

SMC Carousel 350-RSB, perf cond, ready to go on air, \$1200/BO/trade; SMC Carousel 250-RS (2), recently rebuilt, plus (1) for parts, \$500/BO/trade. S Callahan, WFTI-FM, 1120 Pinellas Bayway #103, Tiem Verde FL 33715. 813-866-3544.

Schafer 903E, gd cond, all but R-Rs, w/spare parts inventory, \$5500/BO, we pay half shipping. K Brownal, KTRZ, Box 808, Riverton WY 82501.

BE Control 16X audio source cards (4), \$40 ea; BE live-assist remote control panel, new, never used, \$175. G Jones, SW Mediacast, 110 Sierra Rd, Kerrville TX 78028. 512-367-4587.

Complete automation system for satellite network, (2) 48 tray Instacarts, format Sentry FS12B, working when removed from service. B Umberger, WMTZ/WHBO, 18167 US 19 N #500, Clearwater FL 34624. 813-536-9600.

Autogram double Carousel random control, built into drawer w/pins, basic but cheap & complete, \$50; SMC 581-A double play cart, breaks or time announcer, missing one card, like new, \$200. D Jack, Mountain Media, POB 1826, Boise ID 83701. 208-286-7676.

SMC System, (6) 350 RS Carousels, (3) 250 RSC Carousels, (6) racks, DP-1, AS 20, currently on air, \$3500. E Dulaney, KYKK, 619 N Turner, Hobbs NM 88240. 505-397-4969.

IGM EC System, complete, BAI, 3 Carousels, 3 carts, 2 new racks, Otari ARS-1000, new '88. BO. J Phillips, WZOM, 409 Clinton, Defiance OH 43512. 419-782-8591.

IGM Go Cart 24 (2), Carousels in excel cond, 5 yrs old, \$2000 ea/\$3800 both. R Graiff, WPUT, Box 1055, Patterson NY 12563. 914-878-3307.

**BUSINESS OPPORTUNITIES**

**Want to Buy**

Communication equipment or parts manufacturing company wanted. Write to RAM, 1639 Old Dixie Highway, Vero Beach FL 32960.

**CAMERAS (VIDEO)**

**Want to Sell**

Panasonic WV-RC30 remote control unit for Panasonic 777 color camera w/50' multi-pin cable, \$500. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

JVC KA-3U component back for JVC KY Series camera, outputs Betacam & M format, \$295. D Brennan, Brennan Custom Video, 3596 Lorna Ridge, Birmingham AL 35216.

RCA TK-76B 3-plumbicon bdct camera, pwr, case, etc, 20:1 zoom, just overhauled, excel cond, \$1200; JVC KY-2000 3-salicon bdct camera, pwr, gd cond, \$1000. U George, Satellite TV, 314 West 52nd, NY NY 10019. 212-969-0240.

Sony AVC 3400 B&W portable (2), \$50 ea; Panasonic WV 360P B&W, \$100; Panasonic WV 340P B&W, \$100. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

Panasonic AG-450 (2), S-VHS pro camcorders w/all access, like new, \$1200 ea/firm. R Larson, Larson Prod, 3 Braden St, P.I. ME 04769. 207-764-3770.

Panasonic WV CD20 (2) B&W security cameras w/lens, new CCD, 8mm lens, 25mm lens, wall mounts, \$2000. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

Sony HVC-2400 2/3 color tricolor w/zoom lens, w/SL-2000 deck & NP-1 batteries, \$150. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011.

Panasonic AK-30 w/bdct grade 3 plumbicon tubes, batteries, case, cable, gd cond, \$4595. D Brennan, Brennan Custom Video, 3596 Lorna Ridge, Birmingham AL 35216.

RCA TK760 studio color camera (2), w/CCUs, 15/1 Angenieux, paint boxes, cables & cases, \$4500/both. C Polorti, 10005 Lacy Ave, Morrisville PA 19067. 215-945-3990.

Sony BVP-30 camera w/CA3 adaptor, Fujinon 14x9 lens w/2X extender, beta back avail, excel cond, \$8500. Roman, World Video, 10625 Scripps, San Diego CA 92131. 619-695-1045.

**CART MACHINES**

**Want to Sell**

ITC 99B mono recorder, \$1650; ITC RP mono recorder, 3 tones, \$775; UMC 11-113 mono repro, 3 tones, \$375. P Wells, KJOY, San Diego CA, 619-238-1037.

Gates mono, (5), one for spare parts w/modules, (3) Gates mono, CPD, CDP, cart record amps. Richard Lynn, 615-458-6616.

ATC mono rack mounts (5), like Criterion 60 Series, works fine, spare modules, \$125 ea; SMC R/P mono in gd cond, \$500. P Wolf, WCRM, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

Tapecaster 700-P PB in great working cond, \$350; Spotmaster TP1-A cart winder w/timer, \$150; UMC 40 H-85 cart motor, \$100. S Dynes, Dynes Comm, 307 S Penn, Wheeling WV 26003. 304-233-8856.

BE 500 DR, mono R/P Spotmaster, \$200. G Sive, Your Video Conn, 31844 Rancho Amigos Rd, Bonsall CA 92003. 619-749-7662.

Sparta Century Series stereo, 1 kHz tone decoder only, gd cond, \$275. F Anderson, WSCQ, 1440 Knox Abbott, W Columbia SC 29169. 803-791-1653.

ITC Omega mono (3), PB, R/P, like new, \$750 ea play only, \$950 R/P. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers Bch FL 33931. 813-574-5548.

ITC ELS-IV bulk eraser/splice finder, \$500/BO. G Fulhart, WVKK, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

RCA RT-7B decks (6); (4) BA-7 record amps, gd-poor cond, BO. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

BE 2100 PS stereo PB (3), like new, \$850 ea/\$2400 all, plus UPS. G Jones, Southwest Mediacast, 110 Sierra, Kerrville TX 78028. 512-367-4587.

# EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers, write Radio World, PO Box 1214, Falls Church, VA 22041, Attn: \_\_\_\_\_

**POSITIONS WANTED**

Production whiz avail w/tons of network writing & engineering exper. Bruce Ranes, 718-526-6501.

Anne/Jock w/4 yrs exper in radio & clubs, will relocate, wants to keep learning. Brian, Rt 2 Box 370, McAlester OK 74501. 918-423-8041.

Ex-Armed Forces DJ, 3 yrs exper seeks on-air or prod position w/Florida station, energetic, witty, aggressive team player. L Erickson, 813-985-4875.

Announcer/News Director/Engineer w/over 25 yrs exper in all phases of radio seeking position in South Georgia or Florida. Bill Sutton, 803-245-4902 (PM's), 803-245-2411 (days).

Announcer w/2 yrs non-comm exper seeks FT or PT comm position within driving distance of Philadelphia PA. Mill, 215-533-3773.

Traffic Reporter w/dynamic voice & personality seeks FT/PT announcer or entertainment editor position in a major market, ready to relocate. 214-644-2152.

Engineer seeking position, just back from Middle East assignment, high-power AM/FM/shortwave exper, resume avail, will go anywhere. Send responses to: Radio World, POB 1214, Falls Church VA 22041. Attn: Box 91-03-01.

Engineer seeks position as Chief or Assistant Chief in Wisconsin, SBE & NARTE certified, FCC licensed. Reply to, Engineer, POB 11319, Eugene OR 97440.

DJ seeks medium market area in SW or S US or Australia, England, 2 yrs exper as AM, drive time, asst news dir, PSA dir, radio sales & retail mgr, trained by UTD School or Broadcasting in Phoenix AZ, tape & resume on request. B Reed, 909 W Hester, Silver City NM 88061. 505-388-4804.

Engineer w/20+ yrs in all phases of radio seeking employment, excel references, call Cecil at 817-325-2253.

Volunteer, no salary req'd, willing to learn all phases of brdcstg, production studio, news & sales, avail PT in Rockland NY-Westchester CT-N Bergen County NJ area. Mark, 914-357-2424 (days).

Exper announcer seeks FT in SW US, England, Australia, Guam or English countries, 2 yrs as news director, does color in sports, morning drive. Bobby, 909 W Hester Dr, Silver City NM 88061. 505-388-4804.

CE w/big production voice & over 15 yrs hands-on eng exper seeks eng position w/production in competitive top 100 market. G Morgan, 704-583-8676.

CE, 14-year pro, wants radio or AM/FM/TV in med to lrg market, prefer Midwest, family man, stable, inquire now to: Radio World, POB 1214, Falls Church VA 22041. ATTN: Box 91-04-01.

Burning desire to be #1, 30-ish male seeks air shift, humorously ironic, irreverent, silent majority opinionated, 2 yrs exper volunteer newscasts, money unimportant, opportunity is. NY-NJ-PA area. J Benson, 17 W Main St #5, MdtN NY 10940. 914-343-9184.

News/talk stations: radio's best producer avail to upgrade your programming, can write news, anchor & production too. P Dro, POB 78098, St Pete FL 33734. 813-822-5303.

AM-FM radio eng, 30 yrs exp, 50,000 W AM directional, AM stereo, 100,000 W FM, CO/DOE of groups, lets talk. J Bowers, 309-688-6953.

CE w/30 yrs exper in AM-FM willing to relocate anywhere. F Shields, POB 194, Hunt TX 78024. 512-238-4334.

Radio newsman/anncr seeks FT position in N Indiana, 16 yrs exp, done it all; references, tape & resume avail. T Murray, RR 3 Box 385, Rochester IN 46975. 219-223-4496.

Chicago metro area DJ w/2 yrs exp seeking major market slot, nights, FM, AOR, AC, will relocate anywhere, will express mail resume/tape. B Dohm, 534 E 37th Ave #31, Hobart IN 46342. 219-962-3392.

20 yrs exper in all phases incl engineering, programming, business & talk radio, seek position which includes talk. Jim, 717-373-1484.

Entry lvl w/small brdcster, prefer N Eng area, On-Air exper, DJ, exper musician, bandleader, vast personal library. P Nash, 13 Custer St, Brockton MA 02401. 508-584-6056.

Veteran eng avail, temp or permanent, very exper in studio, satellite, automation, RF facilities from translators through 50 kW AM-DA, construction, budgeting, mgmnt, On-Air news, computers & TV. Radio World, POB 1214, Falls Church VA 22041. ATTN: 91-04-02 RW.

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**Chief Engineer** for leading CHR station in Pacific Northwest; excellent people skills plus construction & troubleshooting experience required. A superb opportunity on a great team. Send resume to Radio World, POB 1214, Falls Church VA 22041. Attn: 91-04-03 RW.

# EMPLOYMENT SECTION

**HELP WANTED:** Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$55/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

**POSITIONS WANTED:** Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 3 issues of Radio World. Contact information will be provided, but if a box number is required, there is a \$5 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

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PO Box 1214, Falls Church, VA 22041**

**PHONE: 703-998-7600 FAX: 703-998-2966**

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**CART . . . WTS**

BE 5304 stereo triple decker used as demo, less than 20 hrs use, excel cond, \$2400. B Robinson, Musicworks Inc, 128 Holiday Ct, Franklin TN 37064. 1-800-251-9000.

Spotmaster 300B R/P deck, \$350. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Audicord Series 100 R/P, gd cond, \$650. G Smith, KTLK, 915-673-5252.

Tapecaster 700 R/P, gd cond, \$200; Audicord A-21 R/P, \$300; (2) Tapeaster 700-P, gd cond, \$150 ea; (350) Audiopak & Fidelpac carts, various lengths, spare parts, foreclosure sale, \$1 ea. G Milsteen, WTYN-AM, 1241 E Lakeshore Dr, Landrum SC 29356. 803-457-3568.

BE 1070, 2-stereo play, 1 stereo RP, numerous modules for ATC Criterion I, \$350; cue amps, pgm amps, pwr supplies, etc, \$25 ea. H Kneller, WKII, 3151 Cooper St, Punta Gorda FL 33950. 813-639-1112.

Harris Criterion 80 & 90 Series (10), play or record, mono or stereo, \$300-350/ea; Harris 90-3 triple deck mono, \$750. G Liebisch, WPTF/WQDR, Box 29521, Raleigh NC 27626. 919-790-6315.

Audicord E Series, 3 PB, 1 R/P, BO. J Phillips, WZOM, 409 Clinton, Defiance OH 43512. 419-782-8591.

ITC RP R/P cart machine, 3 tone stereo, excel cond, \$1100+shipping; Harris Criterion 80 PBK, 3 tone, mono, gd cond, \$350/ea+shipping; ITC SP, 3 tone, mono, like new, \$800. J Sellmeier, Rt 1 Box 270, McKinney TX 75069. 214-542-2056.

**Want to Buy**

Stereo cart machine, only needs to play not record, buy or trade. C Hubbeling, KTEQ, 501 E St Joseph, Rapid City SD 57701. 605-394-2231.

Complete rack mount adaptor for ITC 3D cart machine. F Kelly, WRZQ, POB 690, Columbus OH 47201. 812-378-1073.

Stereo record head for Gates Criterion or IGM 92 record center. R Fess, WLRB/WKAS, 119 W Carroll St, Macomb IL 61455. 309-833-5561.

Tapecaster RP & P in poor cond or need repairs. A Ishkanian, 9723 Riggs Rd, Adelphi MD 20783. 301-439-7222.

**CASSETTE & REEL-TO-REEL RECORDERS**

**Want to Sell**

Ampeg 350 stereo rcd, \$375; (2) Inovonics 370 R/P electr, \$375/pr; MCI JH-110B FT stereo for 14" reels, \$2375. P Wells, KJQY, San Diego CA, 619-238-1037.

Ampeg 601 in custom woodgrain cabinet; Ampeg AG440B in roll around cabinet; Comex Bleepmate 675 program delay 3 or 6 sec delay w/remote switch; (2) Ampeg R-R's, mdl unknown. Richard Lynn, 615-458-6616.

Tascam 32-2 R/P, small or large reels, 2-speed, like new, never installed, \$1200. P Brown, KSPI, 905 Preston, Still Water OK 74075. 405-372-7800.

Otari ARS 1000 w/tone sensor, motor needs bearings but works, gd cond otherwise, \$550. G Smith, KKHR, 915-676-9898.

Telex RP-85 slow speed logger deck, gd cond, \$800/BO. G Fulhart, WVKs, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

## HEAD RECONDITIONING

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Tascam 32, 10.5" reel capacity, new in factory sealed box, \$1000. C Onan, 51 Crandall St, Glens Falls NY 12801. 518-798-4739 aft 5PM.

Stellavox SP-7 interal crystal, mono, case, manual, spares & sound sync, \$900. G Sive, Your Video Conn, 31844 Rancho Amigos Rd, Bonsall CA 92003. 619-749-7662.

Ampeg 601 in custom woodgrain case; (2) Ampeg R-R's; (3) Gates mono cart record amps; (5) Gates mono cart machines; Gates mono cart machines. R Lynn, 615-458-6616.

3M 400 2 trk 1/4", will take 10.5" reel, 15 & 7.5 ips, \$800. Katherine, Linden Inc, 229 N Henry, Alexandria VA 22314. 703-549-4424.

Crown BX-800 3-speed, 2 trk deck, tube-type elect, needs heads, BO/trade. M O'Brien, Imperial Snd, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

MCI/Sony JH110-C-8 8 trk, 1", in factory console w/Auto-locator III, gd cond, \$3250. M Leach, Waves, 1956 N Cahuenga, Los Angeles CA 90068. 213-466-6141.

Otari ARS 1000 reels w/tone sensor (2), gd cond, \$650 ea; ITC 750 PB only reels (2), gd cond, \$450 ea; SMC TS-25 dual tone sensor, one card needs repair, \$175. G Smith, KTLK, 915-673-5252.

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Tascam 34 4-trk, 7.5-15 ips, 10" reel capability, like new cond, low hrs, w/manuals & original packing box, \$695. B Osborne, Audio-Visual Assoc, 4780 E 65th, Indianapolis IN 46220. 317-253-8562.

Edison Envoy 515 voice writer; Roberts 4 trk photo sync 1057; Advent stereo cassette w/Dolby; Uher CG-320 stereo cassette; Sony TC-353 stereo. Pinetucket Recording, 747 Wire, Auburn AL 36830. 205-826-0390.

Pioneer RT-901, stereo 1/4 trk, rack mounted, 10" reels, heads gd to fair, overall cond gd, w/manual & NAB hub adaptors, \$150/BO, you ship or pick up. T Adams, New Wisconsin Radio Reading Service, POB 5541, Madison WI 53705.

Auditronics AV123-4TS 1/4 trk; Infonics RR-1 FT; Infonics RR-2 2 trk, all in gd cond, \$200; Soundscriber audio logging recorder, fair cond, BO. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

Telex 300, like new cond, w/manuals, BO. D Bisbee, 685 S Roys, Columbus OH 43204.

Sony/MCI JH 110-C-8 1" 8 trk, excel cond, w/manual, \$4600. R Leonardi, Voices, 16 E 48th, NY NY 10017. 212-935-9820.

Forex MY250R00-31214-D capstan motor, BO. M O'Brien, Imperial Snd, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

SMC 250RS, (2) Carousels, \$400 ea; ITC 760 (2) 2-trk P/B's, \$400 ea; Telex Magnecord 1021 mono R/P, \$100 ea; ITC 750 (2) 2-trk P/B, \$375 ea. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Akai CR-80D-SS quad & stereo 8 trk recorder & player, gd cond, BO/trade. E O'Brien, Imperial Sound, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

## HEAD RELAPPING/ REPLACEMENT

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Revox A-77 2 reel w/built in 25 Hz detectors, gd cond, \$550. F Anderson, WSCQ, 1440 Knox Abbott, W Columbia SC 29169. 803-791-1653.

Tapsonic TRS70, \$300; Teac A7030 & A3300SX2T, \$350 ea; Tascam 34 4 chnl, \$800; Teac A3340SX chnl, \$600; Teac A505 tube type, \$300; Akai 4000D, \$100; Sony TC650D, \$130; Teac A4010, \$100. J Parsons Sr, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Tascam wired remote control for 80-8 & similar Tascam/Teac reel decks, \$50+shipping. Bill, DeFecice Prod, 93-2R Fowler St, New Haven CT 06515. 203-397-2595.

## Ampex, ITC, Scully Reel-to-Reel Tape Recorder Spare Parts, Accessories, Motor Remanufacturing.



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Tape-A-thon open reel tape players, bi-directional 3 3/4 ips, half trk, (2) portable 7" & 10 1/2"; (1) 10 1/2" rack mount, all working, \$50 ea. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Nakamichi 1000-ZXL computer-controlled cassette deck, w/NR-100 Dolby C, rack mount w/rosewood case, low hrs, excel cond, \$1575/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Technics 2-trk 1500 w/remote & rack mount, \$850. D Gold, Gold Star Rec, 11434 Ventura Blvd, #102, Studio City CA 91604. 818-986-2911.

Ampeg 351, (2), 30667-01-C, Simpson VU meters, excel cond, \$40 ea. J Newman, Box 1211, Newport RI 02840.

ITC 770, (4) PB & (1) R/P, gd cond, all w/new heads, 1 has 25 Hz detector, will consider pkg deal, \$500 to \$800. P Lierman, KCSP, 601 W Collins Dr, Casper WY 82601. 307-265-5414.

Ampeg AG440-C audio tape rcd, 2-trk stereo, w/(2) Inovonics 370 elect, Ruslang console, excel cond, \$1500. R Barwig, Barwig Recording, 5254 W Agatite Ave, Chicago IL 60630. 312-283-2820.

Otari ARS-1000 stereo reproducers (8), new heads, excel cond, \$900 ea/(2) or more \$800 ea. R Graiff, WPUT, Box 1055, Patterson NY 12563. 914-878-3307.

Studer port case for A77 w/mn spkrs & pwr amps, excel cond, \$275. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

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North Hollywood, CA 91607 FAX 818-784-3763

Otari ARS1000 (4), automated radio producers, remote controls, foreclosure sale, \$500 ea. G Milsteen, WTYN-AM, 1241 E Lakehore Dr, Landrum SC 29356. 803-457-3568

Revox PR99 1/2 trk, 7 1/2 & 15 ips, new cond, \$1604. D Furhey, Audio Center, 1812 Brim, Toledo OH 43613. 419-474-4301.

Technics 1500 stereo 2-trk, \$850; Revox A-77 stereo reel, \$450; Revox A-77 stereo reel w/elec amp, \$200. R Chambers, KSUE AM/FM, 3-15 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Otari 5050 floor stand/roll around stands (3), black metal tubing w/rcdr tilting mounts, never used, \$150 ea. R Bersani, Talk Info Ctr, 130 Enterprise Dr, Marshfield MA. 617-834-4400.

Ampeg 350 mono, tube elect, complete, gd appearance, \$200. D Jack, Mountain Media, POB 1826, Boise ID 83701. 208-286-7676.

Ampeg 351 bridging input B-17331-1 (2), \$20 ea; (1) Ampeg bridging input 4580116-10, \$20; (5) Ampeg 440 bridging input 4580200-01, \$35 ea. Newman, Box 1211, Newport RI 02840.

TEAC C3RX 3-head, rack mount, \$275; Ampex MM1000 8-trk, 1", grt shape, sell all or parts, \$2600. Tiki Recording Studios, 195 S 26th St, San Jose CA 95116. 408-286-4091.

Studer HS-77 Mk IV special fact order FT mono, 15/7.5 ips, 10 hrs use, wood case, excel cond, \$475/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Panasonic SV-250 port DAT rcd, mint cond, BO. R Kaufman, Pams Prod, POB 482247, Garland TX 75046. 214-271-7625 (after 3PM).

Otari 5050B-II 1/2 trk, 14", brand new in box, \$2350. A de Freitas, WJHU-FM, 2216 N Charles St, Baltimore MD 21218. 301-338-9548.

Otari MX5050 BQII, rack mount, manual, solid mechanically, some head wear, \$1300. P Thompson, Moonlight Sound, 4763 WCR 32, Longmont CO 80504. 303-535-4748.

Ampeg 351 FT mono head-stack, housing, gain, cables, excel cond, \$70. J Newman, Box 1211, Newport RI 02840.

Nakamichi MR-1 cassette deck, gd cond, \$400; (2) Ampeg 350 mono w/Inovonics elect in cabinet, \$350 ea; Scully 280B 4 trk 1/2" cabinet, \$950; (2) Scully 280 mono, no cabinet, \$250; (1) ITC 750 stereo playback decks, \$300 ea. G Liebisch, WPTF/WQDR, Box 25251, Raleigh NC 27626. 919-790-6315.

**Want to Buy**

Ampeg MR-70 2 trk in gd, original cond. D deForrest, Insight Prod, 7441 Wayne Ave, Ste 10-C, Miami Bch FL 33141. 305-866-5401.

Cassio open reel recorders, pro-portable rcders, logging machines, all models; also nee open reel rcdr accessories. J Morinelli, J Morinelli Entertain, 901 Fairfax Rd, Drexel Hill PA 19026. 215-789-2742.

Karl Heitz Fi-Cord 300A portable R-R; also will consider all other models of rcders, accessories, manuals, new parts stock, displays, etc. J Morinelli, J Morinelli Entertain, 901 Fairfax Rd, Drexel Hill PA 19026. 215-789-2742.

MCI/Sony capstan & reel motors, any cond., rcdg 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.

Ampeg ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

**CATV-MATV EQUIPMENT**

**Want to Sell**

Channelmatic Spotmatic Jr (4) & net-share switcher 4 chnl, cable ad insertion equip, \$1300 ea; Tele-Engineering Ad Cue Jr, cable ad insertion controller, \$1200. R Stone, W-AIR, #22 Bay, Petoskey MI 49770. 616-348-2000.

Jerrold UM-2 & UM-4 TV modulators, BO. Pinetucket Recording, 747 Wire, Auburn AL 36830. 205-826-0390.

**COMPUTERS**

**Want to Sell**

Digital 350 prof, dual disc drive w/10 meg hard drive, PC complete (2), \$200 ea. P Russell, Bowdoin College, Sills Halls, Brunswick ME 04011.

Blue Chip IBM XT compatible, 512K, 30 meg HD, CGA, color monitor, BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

Tandy 6000HD II (2), w/printers, software, lots of disk space, excel cond, BO; Apple Macintosh Hypercard software pkg, new in box, BO. R Fess, WLRB/WKAS, 119 W Carroll St, Macomb IL 61455. 309-833-5561.

IBM PCjr (2), BASIC, Lotus 1-2-3, keyboards, cables, software, uses CGA monitor, BO. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

**CONSOLES**

**Want to Sell**

McCurdy SS 7500 custom 10-mixer audio console, \$1200. D Gunderson, KCCM, Box 72 Concordia College, Moorhead MN 56562. 218-299-3666.

Sony MX-6S 6 chnl mic & line mixer, like new cond, BO/trade. E O'Brien, Imperial Sound, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

Ramsa WR 8816 16x4x2 mixing console, like new, \$3600 FOB. G Jones, Southwest Mediacast, 110 Sierra, Kerrville TX 78028. 512-367-4587.

Ramko DC 8MS 8 chnl, stereo 18 inputs, excel cond, \$3800. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Yamaha EM1600 6 chnl powered mixer, BO; Pyle MXK-73 hi freq crossovers, (2), BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

Musimatic end console, 10 input stereo mixing console, \$450; Peavey PA-1000S 10 input stereo mixing console w/built in EQ & 200 W amp, \$700. J McKinley, WJMR, 155 N Main, Fredericktown OH 43019. 614-694-1577.

Tapco C-12 12x2x2 board w/phantom pwr, \$700. Katherine, Linden Inc, 229 N Henry, Alexandria VA 22314. 703-549-4424.

Gately EM 7, EQ 7 2 chnl stereo w/board EQ, echo, patch bay, monitor amp, CM Lab's & custom cabinet w/monitor system, \$795. T Shea, Shea Snd Stds, 973 McKinley, Baldwin NY 11510. 516-223-7291.

Harris Medalist 12 chnl stereo, gd cond, avail in April, \$2000. G Faltus, WZMX, 905 Wetherfield, Hartford CT 06114. 203-296-1175.

Collins mono ten pot, \$300 plus shpg. C Larsen, KAMI, 815 Meridian, Cozad NE 64130. 308-784-1580.

Allen & Heath Modular Series 2000 8 chnl in/out mixing console w/equalization, pan pots, mixdown facility, patch bay, \$750. B Sitzman, Music For All, 110 County Rd 146, Trumansburg NY 14886. 607-723-2970.

RCA BC 15/18 mono 8 chnl 32 inputs, gd cond, w/manual, \$500 plus shipping. R Kerbaw, WTNJ, Box 1127, Beckley WV 25602. 304-877-5592.

Sonex, 1/2 rolls. Richard Lynn, 615-458-6616.

Tascam 388 Studio 8, \$2300. P Wolf, WCRM, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

BE 8M250A, 8 chnl monaural, 2 yrs old, excel cond, \$2000/BO, you ship or pick up. T Adams, New Wisconsin Radio Reading Service, POB 5541, Madison WI 53705.

Wheatstone A-500, 6 chnl expandable on-air/prod console, brand new in crate, \$7000. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers Bch FL 33931. 813-574-5548.

Wheatstone 8X, 18x8x2 production board w/interal patch bay, gd cond, \$2900. M Leach, Waves, 1956 N Cahuenga, Los Angeles CA 90068. 213-468-6141.

Sparta 3410 8 chnl stereo prod or air board, gd cond w/dcs, \$400. D Seavy, KROC, 122 SW 4th, Rochester MN 55902.

Gates Yard for parts. J Schloss, KICD, POB 7248, Spencer IA 31301. 712-262-1240.

Gates Executive stereo console, excel cond, \$500; Microtrak Sport II stereo console/teletext, foreclosure sale, \$500. G Milsteen, WTYN-AM, 1241 E Lakeshore Dr, Landrum SC 29356. 803-457-3568.

Sphere 32x24 console w/Ampex MM1000 24-trk rcd, \$27,000/both. Tiki Recording Studios, 195 S 26th St, San Jose CA 95116. 408-286-4091.

Ramsa T820B, 1.5 yrs old, 20x16x8x2, perfect production board w/8 trk, all manuals, \$4000. K Thomas, Rebel Recording, 5555 Radio Ln, Jacksonville FL 32205. 904-368-7711.

Trident VFM 24x8 mixing console w/road case, \$2500. D Furhey, Audio Center, 1812 Brim, Toledo OH 43613. 419-474-4301.

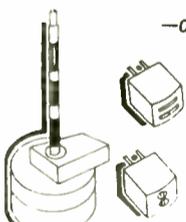
Collins vintage remote mixer, used for Boston Red Sox broadcasts, BO. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

Tascam 3 recording mixer, 8 mic or line ins, 4 outs w/4 VU, sep 8x2 mixer, like new, \$500; Ramko DAG R/E mono dist amp, line in, 6 line outs, \$100; Magnecorder PT6-1M4 mixer, 4 Daven 30/60 ohm pots, XLR conn rack panel, \$25. E Davison, 135 N IL, Springfield IL 62702. 217-787-0800.

TAC Matchless studio console, 26 inputs, 24 buss, 8 aux sends, gd cond, 2 mute groups, full TT patch bay, 5 yrs old, \$14,000. J Block, Production Block, 906 E 5th St, Austin TX 78702. 512-472-8975.

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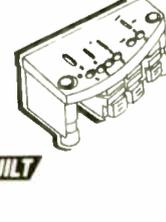
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**CONSOLES . . . WTS**

Quantum QM-8 8 inputs, 4 busses, quad & stereo mon. +4 dBm nom, +18 dBm max. lrg Triad input xfmrs, Duncan linear faders, audiophile qual. excel cond. \$475/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Rockwell Mark 8 stereo 8 chnl, slightly modified, gd cond. in service, avail late summer, sell/trade. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

Shure M67 mixer & RCA version of same, both in excel cond. \$125 ea. H Bluer, 108 Hamilton Ave, Silver Spring MD 20901. 301-365-2798.

Teac 144 Portastudio, 4 chnl stereo board w/high speed cassette, excel cond. w/manual. \$200/BO. R Fess, WLRB/WKAS, 119 W Carroll St, Macomb IL 61455. 309-833-5561.

Tascam M-520, 20x8x2 multi-trk console, mint cond. BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. 214-271-7625 (after 3PM).

Sony MX-16 8x4 mixer, mic/line inputs, input pad, headphone mon, slider pots, excel cond, you ship. \$150. G Hutchins, WZAP, POB 369, Bristol VA 24203. 703-669-6950.

Audix 12 chnl stereo console, fair cond, w/IB, \$1500+shipping. J Sellmeyer, Rt 1 Box 270, McKinney TX 75069. 214-542-2056.

Ramco SC-5M w/manual, \$550. R Chambers, KSUE AM/FM, 3-15 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Cetec Centurion I, 18 chnl input, 3 outputs, fair cond, just removed from service, \$1150. R Beierle, KFYR-TV, 200 N 4th St, Bismarck ND 58501. 701-255-5757.

Cetec 12-chnl mixing board, (2) phono cap & echoeffect sends, great for road/multi-trk use, \$400/BO. Lynn, World Class, POB 7055, Redlands CA 92375. 714-798-6483.

Soundcraft 400B, 24-chnl, manual, flight case, small lights, great board, \$4500. P Thompson, Moonlight Sound, 4763 WCR 32, Longmont CO 80504. 303-535-4748.

**Want to Buy**

Gates Ambassador or President cards & spare parts incl preamps, TT amps & misc parts. J Mitchell, KSTL, 814 N 3rd St, St Louis MO 63102. 314-645-4649.

Wheatstone 12 chnl console or equivalent; also, Otari MX50 rcrdr & Yamaha SPX 900 effects processor. R Chambers, KSUE AM/FM, 3-15 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

**DISCO & SOUND EQUIPMENT**

**Want to Sell**

Studio Sound S-305 passive filter sets (2), matched pair, rack mount, very rare, \$175 ea. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

JBL D16R2405, brand new replacement diaphragm for 2405 tweeter, 16 ohm, BO/trade; Switchcraft 645 stereo speaker selector box, selects up to 6 pairs of speaker systems, like new, BO/trade; JBL 51340 assorted x-over cards, (2) 500 Hz, (2) 800 Hz, (2) blank, 5 kHz, BO/trade. J Roper, Imperial Studios, 383 N Studio, Terra Haute IN 47803. 812-877-2663.

University components: (2) N-3 adjustable LC networks, \$20 ea; (2) C-63-W adjust-response 15" woofers, \$20 ea; (2) HF-206 hypersonic tweeters (drvs & horns), \$40 ea; (2) T-30 mid-range drvs & H-600 horns assemblies, \$30 ea. J Newman, Box 1211, Newport RI 02840.

JBL/Crown PA w/PM 700 Yamaha 1176 comp limiter, PS 400, Biamp 250, 8 mics, snake, JBL speakers, (2) monitors, vgc, \$3500. H Bous, Amer Comm Sound, 1204 Axtell Dr, Cayce SC 29033. 803-791-3804.

Ampex/JBL unmounted 12-ohm 7" speakers (2) for 600-series portable speaker-amps, excel cond, \$50 ea. J Newman, Box 1211, Newport RI 02840.

Yamaha SPX-90 II, effect box, like new, \$400. K Thomas, Rebel Recording, 5555 Radio Ln, Jacksonville FL 32205. 904-388-7711.

Publison Internal Machine 90, digital reverb, pitch shifting, delay, sampling memory, MIDI interface, independent stereo in/stereo out, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. 214-271-7625 (after 3PM).

Snake 16 phantom-pwr inputs wext ps, 250' Belden 19-pair cable w/mil connectors & stnlss-steel strain reliefs, 10' Neumann XLR snake mates w/box or Belden snake, excel cond, \$575/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Snake cable, 12 shielded pairs, XLR male/female each end, 100'. \$75. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Soundolier 510-5 aluminum can baffles for 5" spkrs (6), new in cartons, \$25/lot; Soundolier flush ceiling baffles for 8" spkrs, (7) 67-8 louvered & (10) 68-8 low ceiling diffuser, all new, \$3/ea, min \$15; intercom sub stations, new, (4) Rauland 45 ohm & (3) Bogen 16 ohm, \$5/ea, min \$15. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Aitec 9061A from 9200A console (3), ratchet-type EQs & mounts, \$20 ea. J Newman, Box 1211, Newport RI 02840.

Technics 1200 Numark JBL disco sound system, (2) speakers, Biamp 250 amp, (2) TTs, excel cond, \$2500. H Bous, Amer Comm Sound, 1204 Axtell Dr, Cayce SC 29033. 803-791-3804.

**Want to Buy**

Disc recording equip incl Presto, Rek-O-Kut, Fairchild, Neumann, blanks, needles, manuals & advice on how to make blanks. K Gutzke, Custom Recording, 7134 15th Ave South, Minneapolis MN 55423. 612-866-6183.

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**LIMITERS**

**Want to Sell**

Gates Solid Statesman AGC's (2), \$250/pr. H Widsten, KGNB, 1540 Loop 337 North, New Braunfels TX 78130. 512-625-7311.

Gates Solid Statesman, \$175. P Wells, KJQY, San Diego. 619-238-1037

CRL PMC-300A AM w/CRL SPF-300 NRSC adapter, excel cond, \$1000; CRL IPP-100 mic processor, \$1200. M Persons, WJWJ, Box 706, Brainerd MN 56401. 218-829-1326.

CRL SGC800, SEC800, SMP900A AM-4 stereo pkg, like new, w/manuals, instructions & parts for all modifications to date, BO. S Murdoch, WFNS, 7201 E Hillsborough, Tampa FL 33610. 813-620-9100.

Aphex 250 type III exciter w/bass enhancement, like new, \$700. J McKinley, WJMR, 155 N Main, Fredericktown OH 43019. 614-694-1577.

Optimod 8000A, gd cond, \$1200. Mr. Ericson, 212-477-2489.

Shure M62V Level Loc, BO; Compliter 610, one good, one fair, BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

Motorola C-QUAM & CRL processing for AM. 314-576-0909.

Harris ME-1 mod enhancer, \$150; Harris MSP 90 AM tri-band AGC, \$1000; Inovonics 230 AM multiband audio processor, \$900. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

CBS Volumax 400, clean, works, \$100; BE Spotmaster CLE 500, \$450. P Wolf, WCRM, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

RCA BA-6A in excel cond, w/rack mount shelf, face plate cover & connectors, \$250 plus shpg. B Leslie, Pro Recdg Srvc, 13709 Maple Leaf, Cleveland OH 44125. 216-662-1435.

CRL SEC-800 spectral energy compressor, like new, \$700/BO. A Burns, WRLC, 908-932-4105.

CBS 411 & 410, stereo 411 Volumax converted to flat response, mono 410 FM Volumax. H Kneller, WKII, 3151 Cooper St, Punta Gorda FL 33950. 813-639-1112.

Optimod 8000A, gd cond, used for back up, \$1700. B Watson, KSAC, 1551 E Amhr, W Covina CA 91792. 814-946-6249.

CRL complete 3-piece AM processor, w/preparation processor, spectral energy processor & NRSC clipper matrix unit, like new, \$2000. R Wright, 1208 N Locust Ave, Lawrenceburg TN 38464. 615-762-6200.

Dorrough 310 processor, AM/FM, gd cond, \$900+shipping. J Sellmeyer, Rt 1 Box 270, McKinney TX 75069. 214-542-2056.

Modulation Assoc CP 803, gd cond. C Edwards, WJWJ, 210 S Jackson St, New Lex OH 43764. 614-342-1988.

**Optimod 8000A \$1495 & UP 414-482-2638**

Harris Solid Statesman FM (2), BO; Spotmaster FM sound briener, 2-chnl AGC/peak limiter, BO. K Stokes, WKJN, 3029 Sherwood Forest #200, Baton Rouge LA 70816. 504-292-9556.

Harris MSP-90 dual AM peak limiter, \$500. H Kneller, WKII, 3151 Cooper St, Punta Gorda FL 33950. 813-639-1112.

Dorrough DAP-310, tri-band audio processors w/AM limiter cards, FM limiter cards & alignment system card, vgc, recently removed from service, \$700+shipping. Bill, DeFelice Prod, 93-2R Fowler St, New Haven CT 06515. 203-397-2595.

Kahn Symmetra-Peak SP58-1A (2), \$250 ea. L Bruce, WROR, 3 Fenway Plaza, Boston MA 02215. 617-236-6841.

Orban Optimod 8000, clean unit, \$575/BO. B Gray, Gray Audio, 223 W Mountain Rd, W Simsbury CT 06092. 203-658-7766.

CRL FACTORY SALE: Used & discontinued models, AGC's, limiters, etc. Call Walter Ellis or Bill Ammons, 1-800-535-7648.

**Want to Buy**

CBS Labs 4450 stereo Audimax AGC. J Pearce, KSSS, 2864 S Circle, Ste 150, Colorado Springs CO 80906. 719-579-0880.

CBS Labs 4450 stereo Audimax AGC. J Pearce, KSSS, 2864 S Circle Dr, Ste 150, Colorado Springs CO 80906. 719-579-0880.

Orban Optimod 8100A, D Brooks, WCIC-FM, 3263 Court St, Pekin IL 61554. 309-353-9191.

Dorrough DAP or similar multi-band AM processor, under \$200. Tim, WOWB/WLFFH, 341 S Second St, Little Falls NY 13365. 315-866-1230.

**MICROPHONES**

**Want to Sell**

Neumann U-87 new capsule, excel body, sound great, \$1350; Phase Linear 700, works, \$275; Phase Linear 400, loud & cheap, \$225. R McMillen, 3235 SE 39th Ave, Portland OR 97202. 503-239-6070.

RCA ribbon mics including (1) 44-BX; (1) 77-D; KU3A10,0001; BK-11; BK-5; SK-46; WE639A, will trade for other high quality condenser, dynamic, ribbon mics & audio equip. Tracy Eaves, 615-821-6099 (evenings).

EV RE16, BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

RCA Classic ribbon mics, send for list. B Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

B&K Type 2801 condenser mic, pwr supply, tube type, BO/trade. M O'Brien, Imperial Snd, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

Telefunken Tube CM-61 by Schoeps, very rare, uses std plug-in tube w/custom pwr supply, mint cond, \$2475/BO. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Sennheiser MD 441U mic, in case, excel cond, \$250; Electro Voice 635 mic, gd cond, \$50. R Barwig, Barwig Recording, 5254 W Agatite Ave, Chicago IL 60630. 312-283-2820.

Sennheiser MD-421-U, w/clip & cord, like new, \$175. D Jack, Mountain Media, POB 1826, Boise ID 83701. 208-286-7676.

Old Electro-Voice 635 mics w/Auricon camera labels, 50 ohm black, \$25, 250 ohm grey, \$35; Altec 690A dyn mic fits G telephone handset in place of F1 xmr, noise canceling design, new, \$25; Sennheiser MD214 lavaliere mic, used, \$35. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

**Want to Buy**

RCA 44's, 77's, WE & other ribbon mics, working or not, also looking for dynamic & other types of mics. B Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

RCA BK-5A or B w/windscreen, gd cond. R Laine, POB 10665, Golden CO 80401. 303-238-7830.

RCA 77DXs or 44BXs, vintage ribbon mics, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. 214-271-7625 (after 3PM).

AKG CE-1 or CE-2 capsules for SE-5E preamp. N Pearsall, Synergy Sound, POB 632, Lutmacum WA 98325. 206-732-4198.

Sennheiser MD 421 in new cond w/case, \$300. E Welch, 182 Monitor Cir, Monks Corner SC 29461. 803-761-7583.

**MISCELLANEOUS**

**Want to Sell**

**Rotron Blowers for Eloom, CCA, CSI, McMartin, Harris, rebuilt & new.** Goodrich Enterprises Inc. 11435 Manderson St., Omaha, NE 68164 402 493 1886 FAX 402 331 0638

Executone Gateway K2100 electr busness phone system, 5 lines, 20 extensions, working system or use for parts, \$800/BO. G Fullhart, WVKS, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

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Patch bay, \$65; antique tube tester in vgc, \$125; 52 album sized mailers, \$25/all. S Dynes, Dynes Comm, 307 S Penn, Wheeling WV 26003. 304-233-8856.

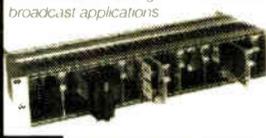
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Kohler 30 kW 3-phase gen, currently runs on propane, \$6000. G Fallus, WZMX, 905 Wethersfield, Hartford CT 06114. 203-296-1175.

Heathkit weather station, display only, \$25; Gentner Silence Sensor, \$95. P Wells, KJQY, San Diego. 619-238-1037.

WE patch panels (12), tip, ring, sleeve, 6 rows of 24 jacks, normalled wire wrap or solder, patch cords avail from ADC, \$35 ea plus shipping; Gates/Harris 994-4703-003 & 994-5066-001 motors w/limit switches, as is, \$50 ea plus shipping; Square D 200 amp 3-phase safety switch 3PDT center off, gd cond, \$100 plus shipping. R Korbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

VHS video sales training tapes (16) 30 topics, \$1500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

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MISCELLANEOUS . . . WTS

Transformers for tube equip, new & like new: Thordarson T1SS93, T17R31, T75C61; Stan- cor A4701; UTC LS31 (2), LS30, LS32, LS34, LS141 (2), LS151, S31, S33, S34, S40, HA100, HA100X, HA101, HA101X, HA130X, HA133 (2); very low prices, call w/BO. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Ampex 350, 351 knobs, excel cond, lrg \$5, small \$2.50. J Newman, Box 1211, Newport RI 02840.

Toshiba Strata telephone systems (3); #1 has 10 lines, 10 phones; #2 has 20 lines, 20 phones; #3 has 8 lines, 20 phones; \$1000 to \$2500. Roman, World Video, 10625 Scripps, San Diego CA 92131. 619-695-1045.

Altec line xfmers, (7), red, 15095, \$20 ea; (2) black Altec line xfmers, 15356A, \$20 ea; (2) gen Altec mic xfrmr, 4722, \$20 ea. J Newman, Box 1211, Newport RI 02840.

Blonder Tongue AMT audio modulator for TV chnl 10, puts a radio on MATV systems, \$75. E Davison, 135 N IL, Springfield IL 62702. 217-787-0800.

Grampian cutter heads, 1D feedback (tand- berg); patch bays (4) 24 inputs single, also patch cords; Daven 800 ohms attenuators (sil- ent) (8) excel; Presto 6N cutter lead screws; Editorial blocks for recorders 1/2"; EV 12TRX speakers (2) & cabinets. Mr. Oliver, 212-874-7660 in afternoons.

Harmon-Kardon mixers, new DPR7; Meiss- ner mixer five inputs-battery; Cannon plugs, 3 prong, male & female; 40 new tubes & resis- tors cheap; Lafayette TE22 audio gen; Sen- core transistor & diode tester; manuals for Ampex, Pultec, Altec & others. Mr. Oliver 212-874-7660 in afternoons.

Want to Buy

Naval observatory clock, brown case, cream face, used by ABC radio & affiliates in the '40s/'50s, REA light flashes with reset. T Heathwood, Heritage Radio, POB 16, Boston MA 02167. 617-969-9966.

Jazz record collections, 10" LP/12" LP be- bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NUNY 10003. 212-674-3060.

RCA Broadcast News, especially 1955 and earlier. Russ Hamnett, KNAU, Flagstaff AZ 86011. 1-800-523-8870.

MONITORS

Want to Sell

Belar AMM-1 AM mod monitor, clean & works, fine, \$450. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers Bch FL 33931. 813-574-5548.

TFT 760 EBS system w/AM rcvr, tone gen & decoder, gd cond; McMartin TBM 2200 stereo monitor & TBM 4000A FM/SCA monitor, American made, vintage, FCC type approved w/manuals, BO. B Webster, WLIT, 150 N Michigan, Chicago IL 60615. 312-329-9002.

Harris FT80/FS80/FC80, working when re- moved, no crystal, \$750/set of 3. D Bryan, WCAZ, POB 498, Carthage IL 62321. 217-357-3128.

McMartin TBM-1500 AM mod mon, excel cond, \$500+shipping; Belar RFA-2 AM RF amp, excel cond, \$450+shipping. J Sellmeyer, Rt 1 Box 270, McKinney TX 75069. 214-542-2056.

Belar AMM-1 AM mod mon, \$500. R Wright, 1208 N Locust Ave. Lawrenceburg TN 38464. 615-762-6200.

TFT 760 EBS AM rcvr/gen/decoder, needs work, fair cond, BO. B Harris, KXLT, 5350 S Roslyn St #210, Engelwood CO 80111. 303-741-5654.

Want to Buy

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

MOVIE PROD EQUIP

Want to Sell

Bell & Howell Ringmaster 821A & 16mm projectors, 00 Series, \$300-\$400; also Neu- made Super X 16mm power rewriter, \$375. Katherine, Linden Inc, 229 N Henry, Alexan- dria VA 22314. 703-524-4424.

Mitchell 16 standard w/acc, magis, lens, mo- tors, cases, mat box, very clean, \$3500. G Give, Your Video Conn, 31844 Rancho Ami- gos Rd, Bonsall CA 92003. 619-749-7662.

Bell & Howell 566 high-intensity Marc-300 16mm sound movie projectors (2), w/pwr supplies, change over cables & more, excel cond, \$1095 pair or \$625 ea. G Ormrod, GFO Prod, 432 E X St, Tumwater WA 98501. 206-352-8028.

Stancil-Hoffman portable 16mm magnetic sound rcrdr, 220V, gd cond, \$200; Moviola 16mm 4-gang sync, gd cond, \$100; (2) Hilux 152 variable anamorphic lenses, excel cond, \$150 ea; Spectra Professional light meter in case w/all slides & diffuser, excel cond, \$100. R Barwig, Barwig Recording, 5254 W Aga- tile Ave, Chicago IL 60630. 312-283-2820.

Want to Buy

Reasonably priced movie equip, cameras, lenses, Nagra & Stellavox tape rcrder, other film related items. H Bluer, 108 Hamilton Ave, Silver Spring MD 20901. 301-365-2798.

RECEIVERS & TRANSCEIVERS

Want to Sell

EICO MX-99 tube-type FM multiplex autoda- pter, complete w/manual, new cond, BO/trade; Dyna FM-3 tube type, FM tuner needs align- ment, BO/trade. E O'Brien, Imperial Sound, 383 N Studio, Terre Haute IN 47803. 812-877-2663.

AM STEREO RECEIVERS Portable, Home/Studio, Auto RRADCO GROUP 708-513-1386

Janiel SP2000 stereo 2 chnl sat rcvr proces- sor; (2) Janiel BCR2000 sat TV rcvr; Micro- dyne 1100-FFC sat rcvr; Microwave Assoc VR-3X sat rcvr; Macom 4/MS sat rcvr, BO/all, you ship. R Lynn, 615-458-6616.

GE split repeater for 2 meters w/449 MHz 10 W link w/(2) 3-element yagis, 40 W out, rcvr has preamp, \$300. P Russell, Bowdoin Col- lege, Sills Hall, Brunswick ME 04011.

Panasonic RF-4800 shortwave rcvr, like new. P Baillon, Miles City Bdcg, 1218 Pioneer Bldg, St Paul MN 55101. 612-222-5555.

Gorman Redlich CEB EBS encoder/decoder, \$200. K Stokes, WKJN, 3029 Sherwood For- est #200, Baton Rouge LA 70816. 504-292-9556.

Atwater Kent TA rcvr, breadboard construc- tion w/horn spkr, complete, \$800. D Jack, Mountain Media, POB 1826, Boise ID 83701. 208-286-7676.

Panasonic RF-4800 shortwave rcvr. P Bail- lon, Miles City Bdcg, 1218 Pioneer Bldg, St Paul MN 55101. 612-222-5555.

Bogen TP200 digital AM/FM stereo tuner, new, shielded, \$150; Bogen TP50 mono AM/FM tuner, new, \$75. E Davison, 135 N IL- linois, Springfield IL 62702. 217-787-0800.

Precision 111 FM tuner SS, \$25; Precision 112A AM/FM tuner, rack mount, \$50. E Davi- son, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Kenwood R300, impressive SW rcvr, \$150/BO. D Gold, Gold Star Rec, 11434 Ven- tura Blvd, 102, Studio City CA 91604. 818-986-2911.

Want to Buy

McMartin TMB-1005 5-chnl rack mounted FM & SCA rcvr. R Bersani, Talk Info Ctr, 130 En- terprise Dr, Marshfield MA. 617-834-4400.

Hammarlund HQ Series general coverage rcvrs, HQ-100, -145, -180, etc, or equivalent, need not be working. M Zuccaro, Voice & Vid- eo, 5038 Ruffner St, San Diego CA 92111. 619-271-8294.

REMOTE & MICROWAVE EQUIP

Want to Sell

Andrew PL 619 C, 6' solid reflector dish w/feedhorn & mount, for TV use in 1.9-2.3 GHz band, \$1400. A Bobaw, WDLT, 2402 Wolf Ridge, Mobile AL 36618. 205-344-3698.

Marti RPT-25 & R-50/450 xmters & rcvrs set up for stereo, 450.925 & 455.925, recently factory re-aligned, \$2400/all or BO. G Fulhart, WVKs, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

Marti STL-8 (2) xmters & (2) rcvrs for stereo STL system, will reset to your freq, \$3500. J McKinley, WJMR, 155 N Main, Fredericktown OH 43019. 614-694-1577.

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Microdyne 1100-PCDR (5) satellite demodu- lator/receiver, SCPC, freq agile, compander- ed, 70 MHz input, excel cond, only one rack unit high, \$1200/BO, you ship or pick up. T Adams, New Wisconsin Radio Reading Service, POB 5541, Madison WI 53705.

Marti M-30B xmt & matching receiver on 170.15 MHz, works, \$500. G Smith, KORQ, 915-673-2545.

Moseley TRC-15 for 10 kHz subcarrier w/Hallikainen digital display & ITO-177 com- puter interface, fair cond, \$400. G Fallus, WZMX, 905 Wethersfield, Hartford CT 06114. 203-296-1175.

Symetrix T1-101 telephone hybrid, \$300. M Persons, WJY, Box 706, Brainerd MN 56401. 218-829-1329.

Scientific Atlanta DAT-32 w/7.5 & 1.5 stereo card, also cue. Dale, NW Talk Radio, POB 68088, Oak Grove OR 97268. 503-774-0459.

COMREX RENTALS 2 and 3-Line Systems Call Steve for details Silver Lake Audio (516) 623-6114

Micro Control PTS-10/PRS-10 composite STL system on 947.000 MHz, \$2900/BO; Micro Control RSU-10 composite STL rcvr, au- tomatic switcher, BO. F Anderson, WSCQ, 1440 Knox Abbott, W Columbia SC 29169. 803-791-1653.

Marti RPT-2 dual freq, gd cond, \$800 plus shipping. R Kerbaw, WTNJ, Box 1127, Beck- ley WV 25802. 304-877-5592.

Bext STL TX-RX, new, S Delay, 217-496-7339.

Moseley SCG-8 & SCD-8 FM subcarrier gen & FM subcarrier demodulator, 110 kHz, P. Bail- lon, Miles City Bdcg, 1218 Pioneer Bldg, St Paul MN 55101. 612-222-5555.

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Advanced Microdynamics TC-8 remote con- trol w/relay board; CRL Systems SG-800A FM stereo gen; CRL Systems SEC-8000 spectral energy compressor; VersaCount V-322 FM exciter xmt, \$6000/BO. A Burns, W.R.C. 908-932-4105.

Moseley MRC-1600 w/92 kHz card, excel cond, \$2100; Moseley SCG-8 185 kHz sub- carrier gen & rcvr system, \$800. T Ringer, WI- CO, POB 909, Salisbury MD 21801. 301-742-3212.

Moseley SCG-8 FM subcarrier gen & Moseley SCD-8 FM subcarrier demodulator 110 kHz. P Baillon, Miles City Bdcg, 1218 Pi- oneer Bldg, St Paul MN 55101. 612-222-5555.

Gentner EFT-900A digital freq extender w/rack mount, \$600/BO. N Scott, KPLA, POB 77, Oakdale CA 95381. 209-847-7700.

Hnat-Hindes telephone interfaces (2), vgc, \$150 ea. G Arroyo, WONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-687-9345.

Gentner SPH3 telephone hybrid, gd cond, re- moved from service 12/89, sell/trade. B Har- ris, KXLT, 5350 S Roslyn St #210, Engelwood CO 80111. 303-741-5654.

Harris 6100/6550 satellite receive station & rcvr, foreclosure sale, \$1500. G Milsteen, WTYN-AM, 1241 E Lakeshore Dr, Landrum SC 29356. 803-457-3568.

Rust RC-1000 wire line remote, working when removed, new studio unit selector switch, \$300. H Kneller, WKIL, 3151 Cooper St, Pun- ta Gorda FL 33950. 813-639-1112.

Macom MA23CC xmt, rcvr & antennas, gd cond, 23 GHz, will trade for Moseley PCL 606C or S7500. C Haynes, WJMI/WORD, 1850 Lynch St, Jackson MS 39203.

Want to Buy

Any Ku-band TV satellite uplink, portable or not, prefer Ku-band. U George, Satellite TV, 314 West 52nd, NY NY 10019. 212-969-0240.

QEI 7775 FM ATS. E Moody, KJEM, 216 N Main, Bentonville AR 72712. 501-273-9039.

Fairchild Dart-384 7.5 kHz dual audio mod- ule. J Cole, WBTM, 710 Grove, Danville VA 24541. 804-793-4411.

Satellite rcvr to pick up Unistar Country. B Hearst, WWCH, 725 Wood St, Clarion PA 16214. 814-226-8600.

STATIONS

Want to Sell

LPTV CP in Ladysmith VA, hits Richmond, 800 W, chnl 40. 703-569-5308 leave message.

AM station in Western KY/Southern IL, town of 60,000, gd revenue, presold contracts, financing available, \$135,000 firm. 314-576-0909.

MISSOURI AM/FM COMBO \$595,000 414-482-2638

Financing wanted for stereo AM, CP ob- tained, will serve 3 major markets in SE Ariz- ona. Rex, 1121 Plaza Azul, Sierra Vista AZ 85635. 602-458-5431.

AM & FM radio stations for sale in Centra. Ar- kansas, selling all or part, some financng. 501-376-0880 week days, 501-470-1525 nights/weekends.

Want to Buy

Brdcstr w/29 yrs exper looking for AM/FM or combo radio station, seeking financial as- sistance and need a no-down arrangement. Gary, Los Angeles. 213-661-6528.

STEREO GENERATORS

Want to Sell

BE AX10 & AS10 AM stereo gen & monitor w/manuals, BO. S Murdoch, WFNS, 7201 E Hillsborough, Tampa FL 33610. 813-620-9100.

AEL 2203 in gd cond, \$400; RCA BTS-1B in vgc, \$600; Wilkinson SG-1E in gd cond, \$450. J McKinley, WJMR, 155 N Main, Frederick- town OH 43019. 614-694-1577.

Moseley SCG4-T 67kHzSCA gen (2), \$250. P Wells, KJQY, San Diego. 619-238-1037.

Moseley SCA SCD-8 & SCG-8, on 185 kHz, like new, \$750/both; Marti SC-910 SCA gen on 67 kHz, \$225. D Jack, Mountain Media, POB 1826, Boise ID 83701. 208-286-7676.

Want to Buy

Low pass filter 53 kHz low pass filter for Col- lins 310Z-2 exciter/stereo gen, urgently need- ed. J Pearce, KSSS, 2864 S Circle Ste 150, Colorado Springs CO 80906. 719-579-3880.

SWITCHERS (VIDEO)

Want to Sell

Panasonic WJ 540P B&W, \$150. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

TAPES, CARTS & REELS

Want to Sell

ABC wire cart racks (2) on floor stands, holding 500 carts ea, \$225 or all for \$600; Scotchcart II's weasy listening/lite-jazz library (500), well recorded in stereo, \$250 or \$950/all; L.E.L. alignment gauges (1 set) for Ampro cart decks, \$15. P Wells, KJQY, San Diego CA, 619-238-1037.

Prod music library 8 vol on LPs, BO; patch panel wired, BO. C Larko Prod, 916 Fairfield Ave, Ft Wayne IN 46802. 219-424-2405.

Audico manual cassette loaders (3), \$800 ea or \$2150/all. Kalthrine, Linden Inc, 229 N Henry, Alexandria VA 22314. 703-524-4424.

Country music 57 reels, from 50's, 60's, 70's on 10.5" metal reels, fair cond, 25 Hz tone on tape, \$10/reel. B Anderson, WTYG, POB 9, Charleston MS 38921. 601-647-5600.

A&D Cartridge Rebuilding Service We clean, load & pack. Serviced within 10 work days! Work guaranteed! 3706 Vold Ct., Eau Claire, WI #4701 (715) 835-7347

Fidelipac 300 gray, approx 2000 in various lengths, various cond, 50¢ ea plus shipping. R Kerbaw, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Audiopak NAB Type AA carts (45), excel working cond, various lengths, \$45; Fidelipac NAB Type AA carts (220) in excel working cond, various lengths, \$220. S Dynes, Dynes Comm, 307 S Penn, Wheeling WV 26003. 304-233-8856.

Fidelipac 300 gray carts (200), \$1 ea or all for \$150. E Moody, KJEM, 216 N Main, Ben- tonville AR 72712. 501-273-9039.

Record library, hundreds of gospel & coun- try/western LP's, BO/all; Compac Executec 3-line, G station electr key system w/intercom, as is, BC. S Murdoch, WFNS, 7201 E Hills- borough, Tampa FL 33610. 813-621-9100.

FINEST REBUILT TRANSMITTERS FM TRANSMITTERS 1 kW Gates FM1B 1 kW ITA 1000B 1 kW RCA BTF1D 1 kW Collins 830D1 1 kW RCA BTF1E 1 kW Harris FM 1H 2.5kW Collins 831D1 2.5kW Continental 814R2 3 kW RCA BTF 3E 3 kW G.E. 3KW 3.5kW B.E. 3.5A 3.5kW McMartin BF 3.5K 5 kW RCA BTF-5D 5 kW RCA BTF-5E 5 kW AEL 5KD 0 kW RCA BTF10D 10 kW Gates FM10B 10 kW Harris FM 10H 20 kW CCA 20,000E 20 kW Collins 831G1 20 kW RCA BTF-20E1 25 kW Wilkinson 25000 25 kW McMartin BF25K 25 kW Harris FM-25K 30 kW McMartin BF30K AM TRANSMITTERS 250W RCA 250GL 1 kW Gates BC1F 1 kW Gates BC1T 1 kW Gates BC1J 1 kW CCA 1000D 1 kW Collins 20V2 1 kW Collins 820D1 1 kW McMartin BF-1K 1 kW Harris MW-1A 1 kW Bauer 707 1 kW Gates BC-1G 1 kW Gates BC5E 5 kW RCA BTA5T 5 kW Collins 21E 5 kW RCA BTA-5L 5 kW Harris BC-5H 5 kW Wilkinson 5000E 5 kW Collins 820E/F 5 kW Gates BC-5P2 10 kW RCA BTA-10H 10 kW Harris BC-10H 50 kW RCA 50G 50 kW GE/Canada 50KW 50 kW Continental 317B 50 kW Harris MW

ARMSTRONG TRANSMITTERS 5046 Smoral Road Syracuse, NY (315) 488-1269 FAX (315) 488-1365

TM Producer commercial & production li- brary w/cue sheets & newspaper campaign layouts, foreclosure sale, \$250. G Milsteen, WTYN-AM, 1241 E Lakeshore Dr, Landrum SC 29356. 803-457-3568.

Complete nostalgia/big band format w/2780 ste- eo cuts on 129 metal reels of Ampex 406, w/13 reels of big band Christmas music, excel cond, \$20/reel or trade for equip. S Cal- lahan, WFTI-FM, 1120 Pinellas Bayway, St Pe- te FL. 813-866-3544.

Fidelipac 300 Gray carts (250), most in gd cond, \$200/all or \$1 ea. E Welch, 182 Moni- tor Cir, Monks Corner SC 29461. 803-761-7513.

Want to Buy

Jingles used by NBC affiliates for the News & Information Service format in early 70's, usually supplied on 7" reels. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-995-1717.

TAX DEDUCT EQUIP

Capital Children's Museum needs mics, headphones, CD players, Hi-8, VHS & 3/4" cameras, decks & access. C Grotek, Capital Children's Museum, 800 3rd St NE, Washing- ton DC 20002. 202-675-6872.

5 kW FM xmt, 2 element antenna, RF watt- meter, 200' coax, sat rcvr equip. T Hunt, Ki- la, 2201 S 6th, Las Vegas NV 89104. 702-721-5452.

Equip for non-profit educ FM in SD need- ed incl cart machines, bdct console, will also trade. C Hubbeling, KTEQ, 501 E St Joseph, Rapid City SD 57701. 605-394-2231.

Equip donations for non-profit organization, 16,000 W AM, new 50 kW FM, 88.5 MHz, in- cluding studio microwave & xmt. W Golofth, WBHY, POB 1328, Mobile AL 36633. 205-432-8484.

Educ FM station wants IBM or compatible computer w/MS-DOS, 20MB hard drive, flo- ppy drive, monitor, printer; will accept parts to assemble such system; will pay shipping. R Starliper, WMSS, 214 N Race St, Middletown PA 17057. 717-948-9138.

BE 8S250 stereo preamp cards; BE 8S250 stereo headphone card; oscilloscope; freq gen (up to 20 kHz); mics; headphones. A Burns, WRLC. 908-932-4105.

Bdct training school for underprivileged needs any AM bdct equip for training students unable to attend regular bdctg schools, able to pay shipping on small items. F Smith, The Bdct Training School For the Under- privileged, 2408 Chamberlain, Chattanooga TN 37404. 615-6247126.

Monte Vista Christian School, would ap- preciate any donations of used TV broadcast equipment. T Quinn, 408-475-0423.

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

TEST EQUIPMENT

Want to Sell

Technics SH-3433, 4-chnl audio scope, sim- ple oscilloscope, FM multipath scope, \$300/BO. Alan, Calvery Baptist, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-4444.

Tektronix 555 quad-trace oscilloscope w/pwr supply & roll around cart, \$600. J McKinley, WJMR, 155 N Main, Fredericktown OH 43019. 614-694-1577.

Tek 528 waveform monitor, strong tube, re- cent calibration, all paperwork, \$800. G Give, Your Video Conn, 31844 Rancho Amigos Rd, Bonsall CA 92003. 619-749-7662.

Radio Design Labs ACM-1, new, in factory box, for use in monitoring AM noise in FM xmters, \$1250 prepaid/insured UPS. D Peluso, KJUL, 2880 E Flamingo, Las

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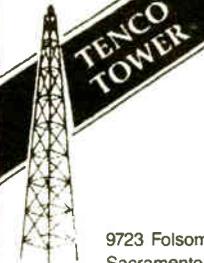
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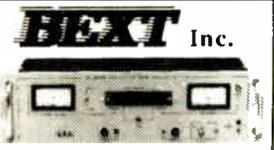
Gates FM5C 5 kW xmtr, \$3000/BO. T. Tucker, Desert West, POB 36717, Tucson AZ 85740. 602-797-108.

Harris 5 kW FM w/MX-15, gd cond, \$14,500. P Wolf, WZCR, 2010 San Carlos Blvd, Ft Myers Bch FL 33931. 813-574-5548.

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Harris MS-15 exciter composite input, \$2000; Harris FM2.5H3, tuned to 92.1, TE-3 exciter, \$12,000; Harris FM2.5H3, working when removed from 105.5, TE-3 exciter, \$8000. D Bryan, WCAZ, POB 498, Carthage IL 62321. 217-357-3128.

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FM xmtr, 4-10 kW for non-profit Christian station, cash or tax deductible receipt, will pick up. D Van Zandt, WJLU, 2598 SR 44, New Smyrna FL 32168. 904-427-9000.

FM 10 kW, no PCB's, need by April, single phase preferred. P Saldic, KPCR, POB 1, Bowling Green MO 63334. 314-324-2283.

FM exciter, under \$400. A Branch, KYAY, 2402 Woodridge Dr, Decatur GA 30033. 404-325-7647.

Jones V-317 10 W single or dual FM translators in working order, \$1000. J Stromquist, WNCB, 2828 Piedmont, Duluth MN 55811. 218-722-3017.

**USED TV TRANSMITTERS, antennas, cable, rigid line, etc. one watt to 110 kW. Fair market price paid. Turnkey handling.**  
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Ory xmtr, 480V to 12,000V, 3-phase, 120 KVA. N Scott, KPLA, POB 77, Oakdale CA 95361. 209-847-7700.

RCA BTA 250K xmtr manual/schematic. S Thompson, 1031 San Antonio, Alameda CA 94501. 415-521-1429.

10 kW FM, 10 yrs old or less, prefer single phase pwr. P Salois, KPCR, Box 1, Bowling Green MO 63334. 314-324-2283.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

### TUBES

#### Want to Sell

Panasonic S4102 video camera tubes (3), some spots, \$10 ea. P Russell, Bowdoin College, Sills Hall, Brunswick ME 04011.

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Circle 71 On Reader Service Card

RCA 8134 Vidicon tubes, (3) used, \$150 ea. R Barwig, Barwig Recording, 5254 W Agatite Ave, Chicago IL 60630. 312-283-2820.

Western Electric 417A & 412A 9 pin triodes, \$12 ea. J McLane, ODD-E-O, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

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| 1972 | Harris/Gates FM20H3, 20 kW FM | 1980 | McMartin BA5K, 5 kW AM     |
| 1971 | Harris FM20H3, 20 kW FM       | 1972 | CCA AM5000D, 5 kW AM       |
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| 1975 | Harris MW50B, 50 kW AM        | 1980 | Cont. 316F, 10 kW AM       |
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**TURNTABLES**

**Want to Sell**

Technics SL-1200 (2), new, \$300 ea. P Wolf, WCRM, 241 NE 10th Ave, Cape Coral FL 33909. 813-574-5548.

Ramko SP-8E stereo TT preamp, \$50 plus shipping. R Kerbawy, WTNJ, Box 1127, Beckley WV 25802. 304-877-5592.

Technics SP-15 quartz direct drive w/preamp in gd cond, BO; Technics SL-D1, working but older mdl, BO. A Bowab, WDLT, 2402 Wolf Ridge, Mobile AL 36618. 205-344-3698.

Technics SP-10MKII (3) in gd cond, \$600 ea. J McKinley, WJMR, 155 N Main, Fredericktown OH 43019. 614-694-1577.

Metron (2) w/tone arms, \$50 ea/\$80 both plus shpg. C Larsen, KAMI, 815 Meridian, Cozad NE 64130. 308-784-1580.

Russco Cue-Master (2) w/tone arms, mounted on table w/folding legs, \$150 plus shpg. C Larsen, KAMI, 815 Meridian, Cozad NE 64130. 308-784-1580.

Sparta MCA-1 TT controller, gd cond, BO/trade. J Roper, Imperial Studios, 383 N Studio, Terra Haute IN 47803. 812-877-2663.

QRK 3-spd w/matching Microtrak tonearm & (2) Gates M6244 TT preamps, complete, vgc, TT motor-mount needs new screws, \$215, B Wertime, 207-Leitersburg Rd, Greencastle PA 17225. 717-597-2213 between 2-6 PM.

Audio Technica stylus ATP-N2, \$12 ea; RCA 8707242-B1 tone arm, \$40; Harris 994-6690-00 equalized preamp, \$35; tonearm w/2 bases, (2) tonearm rests, (2) head shell & weights, \$65. S Dynes, Dynes Comm, 307 S Penn, Wheeling WV 26003. 304-233-8856.

Technics SP-25 (2) w/S-220 tonearms, \$300 ea/BO. G Fullhart, WVKS, 4665 W Bancroft, Toledo OH 43615. 419-531-1681.

Technics SP-10 MKII w/Micro-Trak arm, no base, gd cond, \$300/BO. B Gray, Gray Audio, 223 W Mountain Rd, W Simsbury CT 06092. 203-658-7786.

Stanton 310B prof stereo phone preamp, brand new, balanced output, HF adjustable; Technics SP-15 (2), brand new in box; SP-15 on black base w/tone arm, gd cond; sell/trade. B Harris, KXLT, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

**Want to Buy**

RCA, Presto disc recorders & assoc equip, blanks, needles & pre-recorded acetates or pressed transcriptions. B Davies, Virgo Prod, 5548 Elmer, N Hollywood CA 91601. 818-761-9831.

Rek-O-Kut TT & Fairchild 16" arm which play old 78 rpm AFRS records. R Lamb, POB 8159, Portland OR 97207.

Need motor mounts for (2) Gates CB11 16" TTs. L Townsend, Imaginary Entertainment, 332 N Dean Rd, Auburn AL 30830. 205-821-7156.

**VIDEO PROD EQUIP**

**Want to Sell**

Convergence 195 LM editor w/Type 5 cards, like new, \$3750. R Peterson, Pacific Comm, 1801E 4th Ave, Oly WA 98506. 206-754-7081.

Panasonic Edit System S-VHS (2), AG-1960's w/A95 edit controller, low hrs, perfect cond, w/manuals, \$2000/firm. R Larson, Larson Prod, 3 Braden St, P.I. ME 04769. 207-764-3770.

CMX Edge A/B controller w/Sony Type V interfaces, gd cond, \$1600. G Sive, Your Video Conn, 31844 Rancho Amigos Rd, Bonsall CA 92003. 619-749-7662.

Laird VC2000P video processor, \$600; JVC BR6400 1/2" VHS source deck, rack mount kit, RM P53U hand held remote control, \$1000; Sony RM300 handheld auto search control, \$100. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

Sony AC-2400 & AC-3400 power supplies, BO/trade. J Roper, Imperial Studios, 383 N Studio, Terra Haute IN 47803. 812-877-2663.

Sharp AP55, \$100; JVC CD1636 (new), \$300. J Parsons Sr, 10375 Cannas, N Huntingdon PA 15642. 412-863-9590.

Convergence 195 LM editor w/Type 5 interfaces, 3 yrs old, excel cond, 3750. R Peterson, Pacific Comm, 1801 E 4th Ave, Olympia WA 98506. 206-754-7081.

Echolab SE2 6-input 2-buss special effects gen w/Sony CG101 color sync gen; TEK RM529 waveform mon; (2) Hitachi 14" color video mon, excel cond, \$2000/BO. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

JVC RM82V video editing controller for JVC 34" editors, excel cond, \$225. G Ormrod, GFO Prod, 432 E X St, Tumwater WA 98501. 206-352-8028.

Sony LDP-1000 industrial laser video disk player, plays CAV & CLV disks, w/external sync & subcarrier inputs for use on line, RS232C serial port for computer interface, RM1002 remote, flight case, \$500. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

Bosch Compositor dual-chnl character gen, (2) keyboards, graphics compose console election pkg, working cond, \$1800; Chyron RGU-1 dual-chnl character gen, (3) keyboards, 2-me-colorizers, remote panel, manuals, disks, in use now, \$8500. Roman, World Video, 10625 Scripps, San Diego CA 92131. 619-695-1045.

**Want to Buy**

RGB encoder for converting composite video to RGB signal. B Cooke, GBC Electronics, 125 Birch St, Blountville TN 37617. 615-323-2976.

**VIDEO TAPE RECORDERS**

**Want to Sell**

JVC CR4400U 3/4 port recorders (4) w/access, \$800 ea/BO; (3) Sony RM-430 edit controllers, \$500/BO; JVC BR-6400U VHS recorder, \$1500/BO. T Quinn, Monte Vista St, 208 Cherry, Capitola CA 95010. 408-475-0423.

Sony VO 5600 w/low hrs, \$1300. G Sive, Your Video Conn, 31844 Rancho Amigos Rd, Bonsall CA 92003. 619-749-7662.

Amperex VPR-2B 1" w/dynamic tracking, edit ports, excel cond (3), \$12,000 ea or \$30K/all. U George, Satellite TV, 314 West 52nd, NY NY 10019. 212-969-0240.

Sony VP 5000 videocassette U-matic PB, BO. A Bowab, WDLT, 2402 Wolf Ridge, Mobile AL 36618. 205-344-3698.

Sony VO-5850 edit system w/ECS-90 edit controllers, time code, \$300 ea; Sony BVU-110 bdct port U-matic 110's w/time code & case, \$600 ea; Sony BVU-50 w/case, \$195 ea, BP-90 batts, chgr avail. U George, Satellite TV, 314 West 52nd, NY NY 10019. 212-969-0240.

Sony VP-5000 U-matic VCR, \$500/BO. P Wells, KJOY, San Diego. 619-238-1037.

Sony VP-5000 3/4" PB video decks (4), \$800 ea; Sony VO-5600 3/4" R/P video decks (4), \$900 ea; Sony EV-DT-1 video 8 portable tape player w/5" screen, nearly new, \$575. R Stone, W-AIR, 322 Bay, Petos Key MI 49770. 616-348-2000.

Panasonic NV 3020, (3) 1/2" R-R, \$50 ea; (2) Sony AV 3600 1/2" R-R, \$50 ea; Concord VTR 370 1/2" R-R, \$50; (2) Sony AV 3400 1/2" portable R-R, \$50. D Hurd, Harding Univ, Box 853 Station A, Searcy AR 72143. 501-279-4658.

Amperex ACR25 (2), just removed from operation, \$4500. R Beierle, KFYR-TV, 200 N 4th St, Bismarck ND 58501. 701-255-5757.

Amperex VR1200B parts, lrg inventory of new video head panels, capstan & blower motors, filters, vacuum pumps, audio/ctl/erase stacks, complete set of manuals & more, \$500+shipping. J Krepol, RNDL, 6147 Walker St, Philadelphia PA 19135. 215-624-1050.

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