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Radio World[®]

Vol 15, No 15

Radio's Best Read Newspaper

August 7, 1991

First L-Band Tests Begin

by James Careless

MONTREAL Analog L-band propagation tests underway here and already completed in Ottawa should give broadcasters a real-world insight into the feasibility of establishing digital audio broadcasting (DAB) in this segment of the spectrum.

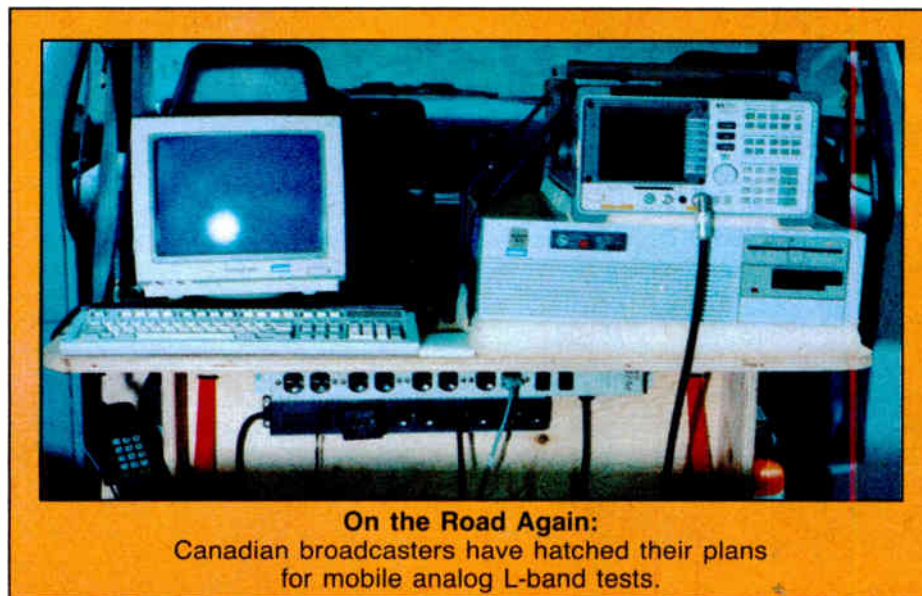
A Canadian consortium that brought the first demonstration of the Eureka 147 DAB system to North America last summer organized the project. Participants are the Canadian Department of Communications, the Communications Research Center, the Canadian Broadcasting Corp. and the Canadian Association of Broadcasters.

Outdoor tests were completed in Ottawa by mid-July, and experiments designed to evaluate propagation characteristics outside and inside buildings were to be completed in Montreal by the end of August.

The tests use a carrier wave and digital data stream broadcast to a specially-equipped van that maps out reception quality throughout the cities.

Proof for L-band

Francois Conway, a supervising engineering with the Canadian Broadcasting Corp. and coordinator and chairman of the consortium, said initial analysis of the data should be complete by late September.



On the Road Again:
Canadian broadcasters have hatched their plans for mobile analog L-band tests.

Canada wants the results to support its preliminary endorsement of L-band for satellite and terrestrial delivery

of DAB before the 1992 World Administrative Radio Conference (WARC).

(continued on page 12)

ABC, CBS Select SEDAT

by Frank Beacham

NEW YORK Using Scientific-Atlanta's SEDAT digital audio system and a

newly-launched satellite, ABC and CBS radio networks have expanded to a new 57 channel audio feed system with enhanced quality digital sound and future compatibility with proposed new DAB systems.

The joint venture between the two radio networks represents a second milestone in the satellite transmission of digital sound, by significantly increasing the sonic quality and available channel real estate available on satellites.

The new system, which went into effect on July 29, allowed ABC to move from 19 to 46 channel capability while CBS increased from six to 11 channels. It was made possible by using Scientific-Atlanta's digital compression technology, known as Spectrum Efficient Digital Audio Technology (SEDAT).

SEDAT replaces the networks' use of DAT-32 or Digital Audio Technology Systems (DATS), also a patented Scientific-Atlanta technology. It was the first widespread satellite application for digital audio. With its 15 kHz capability, DATS provided broadcasters with an alternative to costly terrestrial systems and was adopted by ABC, CBS, NBC and U.S. (United Stations) in 1982.

Twenty times more channels

DATS offered 20 times the number of channels per data stream compared to single channel per carrier analog systems.

(continued on page 13)

"Pioneer" Too Vague

by Judith Gross

WASHINGTON Two opposing parties have asked the FCC to revisit its decision on awarding a "pioneer's preference" to technical innovators—for entirely different reasons.

Since the June release of the Commission's Report and Order, Strother Communications President Ron Strother, who hopes to experiment with DAB systems across a variety of frequencies, and the NAB, which has endorsed the Eureka DAB system, have filed petitions for reconsideration.

The pioneer's preference was adopted to reward innovators who propose services using new technologies by granting one license in a single market.

But Strother, who supported the concept, has argued in his reconsideration appeal that a single license in a single market is not enough incentive.

His reconsideration petition pointed out that while a single license might be justified for a national service such as satellite DAB, there could be thousands of licenses for terrestrial DAB.

Strother anticipated spending several million dollars on his research and said, "a single terrestrial DAB license, even in a major radio market, would be a paltry reward." He suggested that the Commission decide the magnitude of the reward case-by-case, when it considers the eligibility of a "pioneer."

Strother also asked the Commission to clarify its rules regarding experimentation. Noting that he chose Boston and Washington, D.C. for his experiments because of the data they would provide, he asked that the FCC allow pioneers to receive licenses in areas other than the one where experiments are carried out.

Strother also argued that while the completion of experiments would be necessary to awarding the final preference, the Commission should award a conditional preference before such experiments are completed.

The NAB, however, opposed the idea of rewarding pioneers. It asked the Commission to narrow the definition of a preference to "at best, a weighted—not decisive—factor in the licensing process."

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NEWS BRIEFS

L-Band DAB Tests Slated for D.C.

WASHINGTON The NAB has confirmed that it will conduct DAB L-band tests here sometime in the fall, but the association has not released any details.

"It is our plan to conduct an L-band test here in Washington this fall," NAB Executive VP of Technology Michael Rau said.

Rau would not elaborate on

any specific dates or sites from which the tests would take place, commenting that the details are still being worked out.

In other DAB news, the NAB said it is still trying to line up a Eureka demonstration for the September Radio '91 show in San Francisco. Eureka's equipment was scheduled for a European consumer electronics show that conflicts with the NAB show.

Rau said the NAB has not yet given up on getting a DAB demonstration at Radio '91. "We are trying very hard to get Eureka to San Francisco," he said.

The Eureka system had its debut in the U.S. during the NAB's spring show in Las Vegas via mobile demo.

Quello, Confirmed, Sworn In

WASHINGTON FCC Commissioner James Quello was confirmed by the U.S. Senate and sworn in for his fourth term last month.

Quello, who was reappointed

by President Bush in May and sworn in July 12, began his tenure at the FCC in 1974. His latest term will expire in 1996.

SBE Officers Nominated

INDIANAPOLIS The Society of Broadcast Engineers (SBE) has submitted candidates for office and board of directors, to be voted on in September and announced at the October convention.

Nominated officers are: Richard Farquhar for president; Jerry Whitaker, VP; William Hineman, secretary; and Robert

Goza, treasurer.

Nominated board of directors candidates are: Terrance Baun, Michael Fast, Paul Montoya, Tom M. Padwa, Troy Pennington, Robert Reymont and Edward Roos.

Officers serve one-year terms while the 12-member board of directors serve staggered three-year terms.

WZAL President Dies From Electrocution

MCDONOUGH, Ga. The president of WZAL-AM was electrocuted and later died after working on the station's transmitter July 10, according to local police authorities.

The Henry County Police Department said they believed Jim Devan, 43, who was listed as president, GM, and news director of the station, was accidentally electrocuted while making repairs at the transmitter site.

Devan was transported to the Henry General Hospital where he later died. At press time, police said the accident was still under investigation pending an autopsy.

WZAL is a 2.5 kW station located about an hour south of Atlanta.

New Allocations Branch Chief Named

WASHINGTON The FCC has named David Siddall the new chief of the Allocations Branch.

Siddall, a communications attorney, previously worked in the Mass Media Bureau in various capacities from 1988 to 1991. Most recently, he drafted the Commission's HDTV policies and was a representative on the Implementation Subcommittee of the Federal Advisory Committee on Advanced Television Service.

Prior to joining Mass Media, Siddall worked in the Common Carrier Bureau.

(continued on page 7)

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SBE Site-Hopping Opposed

by Charles Taylor

INDIANAPOLIS, Ind. The scheduling of the 1992 Society of Broadcast Engineers' (SBE) national convention in San Jose, Calif., has some manufacturers fearing a repeat of the organization's last western-region show.

The 1988 Denver show drew acidic criticism from vendors, who claimed that lackluster attendance and sales resulted from scheduling the show too far west. The Denver show drew only 2,200 registered attendees, including exhibitors.

A number of manufacturers made clear following the convention that a centrally located show, such as 1990's successful appearance in St. Louis, brings the most favorable results.

In May, however, SBE announced that its Board of Directors had approved San Jose as the 1992 site, scheduled for Oct. 14 to 17. The 1993 show will convene Oct. 13 to 16 in Richmond, Va.

Worse than Houston

"San Jose is an even worse mistake than Houston," where the show will be held this year, CRL Marketing Manager Bill Ammons said. "It will be a very regional show. I would have ventured that they had enough input that they would have put it back toward the middle of the country."

Wheatstone President Gary Snow pointed out that groups already are cutting back on shows because of budgetary concerns and a West Coast trip may be beyond the pocketbooks of many of them.

"It (San Jose) is a driveable show for a handful of stations, but when you get past that, someone's going to have to be really motivated to pay the expensive airfare," Snow said. "Clearly, we saw at NAB that the larger groups are cutting back on the size of their show staffs. I would also project they are cutting back on the shows they will be going to."

Despite the concerns, SBE officials

maintain that the San Jose show has everything going for it.

"From our point of view, I would think that vendors would be very pleased," said show organizer Eddie Barker, president of Eddie Barker and Associates.

"San Jose is quite a town with quite a facility for engineers and technical people; it's kind of a technical mecca, with the Silicon Valley. I don't see any down side to it," he noted.

SBE Executive Director Stephen Ingram said the western location is part of the organization's plan to rotate shows over a three-year cycle in the east, west and central regions of the country "so that we can tap the entire membership. The idea is to increase attendance at the show."

Draw on demographics

Ingram supported the San Jose show, saying that it will draw on the demographics of SBE membership.

"Most manufacturers would agree that the number one thing they're looking for is the attendance of people who either buy or influence buying. They may not realize what the demographics are, but the majority of our members are located on the two coasts with the East Coast highest and the West Coast second highest.

"A lot of people thought a central location would be best, but a show should be at least somewhat reflective of the membership. The East Coast and West Coast are going to have the greatest concentration of members," Ingram said.

Despite the distinct regionalism of SBE's membership, Ingram claimed that the annual show remains national in scope: "That's the nature of the association. It is a national show. We only have one that we put on from the association."

Manufacturers, however, do not necessarily agree.

"A national show? Unfortunately, no," Bradley Broadcast National Sales Manager Neil Glassman said. "We attended in 1990, but we're not intending to exhibit

in 1991. We now show support by supporting activities of the chapters in our area."

Unfortunately, no

Pacific Recorders & Engineering, based in Carlsbad, Calif., also will not exhibit, despite the company's proximity to the show. "Bringing it to the West Coast will just bring the show down more, even for a West Coast manufacturer. Broadcasting is not a regional business," said Mike Dosch, Pacific's manager of marketing and product development.

"I do think it will tap the entire California and Pacific Northwest regions and

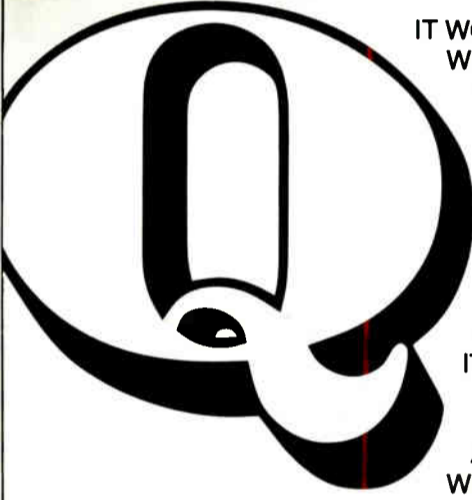
perhaps the Southwest U.S., but in reality, it ends up being more regional than I think planners would like it to be," said Kevinn Tam, broadcast technology manager for marketing with Dolby Laboratories in San Francisco.

Some regard the 1991 Houston show as a trial for future SBE gatherings.

"We're committed to Houston. We think it has a lot of potential," Wheatstone's Snow said. "But we're not committed to San Jose. Whether we go there depends on how it goes in Houston. I would say that a lot of us feel that way."

"We had a big drop in domestic traffic at NAB this year. Domestic radio traffic was down 25 percent," CRL's Ammons said. "Houston is really going to tell what the state of the economy is. If it doesn't prove successful, then they've lost it as a show."


COULD IT COME TO THIS?




IT WOULD BE HARD TO SAY WHETHER JUKEBOX CAUSED THE DEATH OF HUMAN SPEECH OR WHETHER MUSIC CAME TO FILL AN ALREADY WIDENING VOID, BUT UNLESS THE MUSIC IS STOPPED NOW THE HUMAN RACE, MUMBLING, SNAPPING ITS FINGERS AND TWITCHING ITS HIPS, WILL SINK BACK INTO AN AMEBIC STATE WHERE IT WILL TAKE THE COAGULATION OF HUNDREDS OF TEENAGERS TO MAKE UP A SINGLE UNIT OF VITAL FORCE, WHICH, ONCE FORMED, WILL ONLY LIVE ON SATURDAYS, CONSUME ITSELF ON THE TERRACES OF FOOTBALL STADIA AND DIE.*

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Does The L Stand For Lonely?

by Judith Gross

FALLS CHURCH, Va. Is it me, or is it beginning to feel a mite lonely out there in L-band land? I'm not saying that we won't get it, or even that we don't need it. Nothing like that.

Actually I think it's a good move to grab as much spectrum as you can, and if there's some that may be up for grabs because of WARC (the U.S. military notwithstanding) I say, "Go for it."



But here we are, joined by our neighbors to the north, and Brazil and maybe Mexico, seeking to procure spectrum for terrestrial DAB in a band that may be too costly for broadcasting as we know it, and may not give the kind of coverage we want in any practical kind of way.

Plus, this band has been proposed as being ideal for satellite DAB and we're going to try to make it work for terrestrial, mostly to keep satellites from becoming competition for existing broadcasters. Not so in other parts of the world.

Now, take Europe, for instance. In Germany, where DAB was born, they've decided to relocate whomever is on TV channel 12 and use that little spectrum slice for DAB. That's right, everybody out. Last one out is an analog-head! Nyah, nyah!

And our new friends, the Soviet Union, where FM is scarce, put aside a block of the FM band for DAB. OK, OK, there are lots fewer stations in those countries than in the U.S.

But, if you're a DAB-at-L-band supporter you've got to be feeling a little out in left field after looking at other countries' DAB spectrum plans.

None of the European countries are targeting anything higher than the UHF band. Draw your own conclusions.

Meanwhile, up north, where, I trust, it's a mite cooler than here in Swampland, U.S.A., Canadian broadcasters, public and private, and their equivalent of the FCC, the DOC, are taking a look at what happens to signals at the infamous L-band.

Let me say this once more, clearly. They are not testing DAB. They are testing propagation, attenuation from buildings and foliage and power requirements at or around 1500 MHz.

Canadian engineers have rigged up a continuous wave tube and are performing tests (see story in this issue for details) to get some kind of data on what happens when you broadcast up that high.

The test results will be a help, but we really won't know definitively if we're batting in the wrong ballpark with L-band until L-band tests of DAB, probably Eureka, are undertaken later this year.

Then there's the equipment. Lots of grandiose plans to test; test frequencies are being allocated and there's lots of interest from all quarters. But who has L-band DAB equipment? It just isn't there yet.

It was a lot of gloom and doom, but hard to argue with that article in the *Sunday New York Times* a few weeks back about radio's economic woes and some creative ways of handling them.

You might know a newspaper, especially the *Times*, wouldn't write a lengthy article on its competition unless it was something less than positive. But it did give us a look at hard reality and was well-researched and all. So how do we cope?

Well, in other parts of the economy there's reason to believe things are starting to climb upward again. You see a little indicator here and there. But let's face it.

There had to be an adjustment of some sort, what with the empty paper being tossed around in financial deals. And we probably won't ever go back to that big, fat, ballooning time again.

It will probably be a steadier, more common sense type of growth as things finally ease up, and some of the more fragile

players may not be around once the smoke clears. For the rest of us plugging away at the day-to-day, though, I think we'll have a reason to smile again.

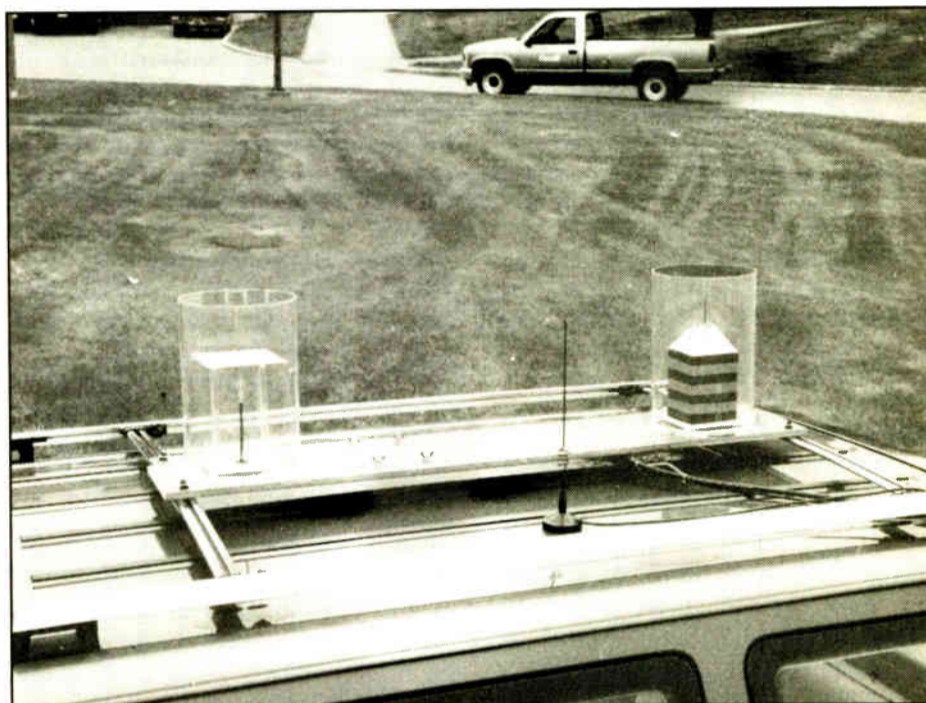
Good thing I happened to read the *Times* piece at the beach, or I might have been really depressed. Now if I could just get the newsprint ink off my beach ball . . .

Well, it's been tried before, but the ones

those in the studio from high radiation levels. Sure. They spelled "emitted" and "picnickers" incorrectly in the process, so either the notice was written in extreme haste or extreme hoax.

No-pest tones. Yeah, and I got a bridge for sale in Brooklyn.

Hard to believe this, but (drum roll, please) it's almost show time. Just when



The quest for L-band from a Canadian van roof. (Lindsay directional transmitting array.)

behind this one were pretty bold about it. And not very good spellers. A press release on the letterhead of WKCI-FM in Connecticut announced that the Fourth of July would be the station's "no-pest" weekend. Yes, this again.

The release claimed that the station would broadcast an inaudible tone that would drive bugs batty, so if you would just keep your dial tuned to KC101, you wouldn't have to deal with those pesky critters (they didn't specify which insects) while you munched on your Independence Day hot dogs and downed a brewski.

Yeah, right. It also claimed that the station made some modifications to protect

you had begun to actually enjoy that slow, dog-day pace, when the lemonade was starting to grow on you and you even started to daydream about digging your toes in the sand, the calendar says we only have about a month until the fall convention circuit starts.

But grab another cold one and hold that thought until next time, when we'll lay the hot stuff on you. Until then, if your calendar really is saying anything to you I think you really do need that vacation.

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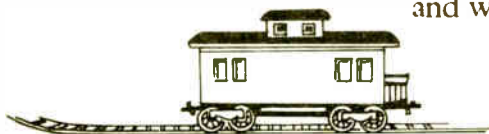


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Understanding the balance sheet

Dear RW,

In the May 22 issue of RW, John Cummuta presents a wonderful introduction to accounting fundamentals for the engineering manager. In all segments of engineering, managers will need to develop an aptitude for business basics. I recognized this nearly four years ago when I started my quest for an M.B.A. degree to complement my degrees in engineering and computer science.

In his attempt to rationalize the concept of the balance sheet, John may have left the reader somewhat confused: In the strictest sense of terms equity is *not* a liability, although both items are grouped on the right side of the balance sheet. Liabilities are economic obligations of the organization to *outsiders*. An example of this is a debt to a bank. The usual evidence of this debt is a promissory note that states the terms of payment.

Owner's equity is the residual interest (that is, *claim* against) the organization's assets after deducting liabilities. The arithmetic expression of the balance sheet is as follows:

Assets=Liabilities+Owner's Equity

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Next Issue
Radio World
August 21, 1991

For the sake of accuracy, several other points in the article deserve clarification. The term "P&L" has now been replaced by "Income Statement." A business either produces a profit *or* a loss, not a profit *and* loss. Inasmuch as some accountants still cling to the older term, present-day textbooks and journal articles refer to the new term.

In Figure 1, "Profit and Losses," interest payment and taxes are not generally considered as a part of General and Administrative overhead. In John's example, return *on* investment (interest), should be classified separately from return *of* investment (principal). Taxes and interest expense should be grouped separately to arrive at Net Income (the ubiquitous "bottom line").

In addition to the balance sheet and income statement, the statement of cash flows (SCF) can be a very effective tool for analyzing a company's source and use of funds. As John pointed out early in the article, the success of failure of a small business relies on *cash flow*. Many businesses in history have failed because of their inability to meet short-term financial obligations. With the aid of the SCF and financial ratio analysis, most businesses and individuals can stay financially healthy.

I always look forward to reading John's *Engineering Manager* articles. Perhaps more space could be dedicated to these topics in the future.

Paul B. Christensen, DE
Taylor Communications, Inc.
Jacksonville, Fla.

DAB bottom line

Dear RW,

As I read of the excitement of the new age of broadcasting, Digital Audio Broadcasting (DAB), I have yet to read anything about the cost of going to DAB, regardless of the method used. Not even a rough idea!

While it appears that everyone is jumping on the bandwagon, what about the small market, Class A/Class 4 owner-operator, who may not have a huge capital equipment budget? How will they afford the change, or will they fall by the wayside . . . or does anyone care?

I would appreciate someone addressing that issue in the future. Keep up the good work.

Bob Simonson
Simonson Communications
Kalamazoo, Mich.

Irresponsible piracy

Dear RW,

"Responsible Piracy"? Hogwash!

It is enough of a problem to get *licensed* broadcasters to operate "responsibly for a reason," and to "not interfere with any licensed broadcast service" (*Readers Forum*, June 26). What makes Mr. Cole think anyone irresponsible enough to go against the laws of society would do as well?

I would accept his statement that "any successful broadcast engineer has . . . at

Once again, Canada is on the leading edge of research into digital audio broadcasting (DAB). This time, however, the U.S. can play a complementary role.

A consortium of Canadian companies, including the Canadian Broadcasting Corporation, is conducting tests of L-band propagation characteristics in a mobile environment. Signal permeability and power requirements are being evaluated to determine whether DAB could indeed be practically implemented in the band.

The Canadians hope test findings will be available in time to support their endorsement of satellite and terrestrial DAB L-band spectrum allocation at the 1992 World Administrative Radio Conference (WARC). And they aren't the only ones who should be eager to learn the results.

The NAB has supported co-primary status for satellite and terrestrial DAB at WARC, and the FCC has cryptically acknowledged that "some" L-band spectrum should be reserved for the technology. On the other side of the fence, the Air Force (which now has use of the spectrum) and in-band DAB system proponents would like to see the tests prove L-band to be inappropriate, each for their own reasons.

Here at home, the NAB is also planning a study of L-band propagation, although U.S. tests are still only slated for some unspecified time after the Radio '91 convention.

It's appropriate that the NAB is planning its own battery of tests, but it is important also to have a free flow of information between the NAB and the Canadian consortium. Ideally, the two sets of tests should be complementary, so that the issue can be thoroughly addressed and a consensus of opinion can be reached quickly.

Certainly, some differences in results are to be expected, unless testing procedures and measurement methods involved are identical. With the appropriate spirit of cooperation, however, broadcasters will be able to know for the first time since L-band was proposed for DAB use whether the spectrum will work for digital transmission.

Canadian broadcasters have taken a forward-thinking attitude toward the rapidly developing technology of DAB. This should encourage the NAB in its own testing. The future of L-band DAB may very well turn on the findings of these two groups.

—RW

Putting L-Band to The Test

one time or another put an illegal transmitter on the air" only if his definition of *successful* is one who is inherently dishonest and incapable of being trusted. Most engineers, successful or not, would not become involved in such a scheme. Station owners, on the other hand . . . (just kidding, guys).

With AM stations going dark, I can't believe these poor deprived souls can't find a station within their price range. Maybe they should ask Dad for more allowance. Seriously, it is possible to buy a licensed and built radio station for less than a typical gas station. I haven't heard anyone whine about the "lower income persons" prohibited from buying gas stations. Should society condone "pirate" gas stations—that is, stations with storage tanks not in compliance with EPA regulations? No way.

Neither should we accept unregulated broadcast stations, which could cause immeasurable interference to broadcasters and the public alike, and possibly expose many to unacceptable levels of RF radiation and/or PCBs.

Responsible Piracy? I don't think so. And in the line of responsible journalism, it's high time that *Radio World* limit its content to that which will enhance the professional image of the broadcast engineer. Letters such as Ed Cole's belong in the "Libertarian Digest" or the comic books, not in *Radio World*.

And say, Ed, next time you pass out a "blanket OK" to another pirate, have him write a letter blasting the likes of me. Thanks!

William D. Fawcett, president
Mountain Valley Broadcast Service, Inc.
Harrisonburg, Va.

Deja vu at WWWE—again

Dear RW,

Yes, it was *déjà vu* reading about the "Merry-go-round" life of WWWE (RW,

July 10, 1991). As a life-long Clevelander and broadcaster, some important information was left out by my dear friend Ted Alexander. That information was one owner and two different call letters that were an important part of Cleveland broadcast history.

When NBC Cleveland switched with Westinghouse Philadelphia in 1957, the call letters went from WTAM (NBC) to KYW (Westinghouse). In 1965 when NBC took back the Cleveland market, the call letters became WKYC. In the early 1970s ('72-'73), Gannett bought WKYC from NBC and changed the call letters to WWWE. If that doesn't confuse the reader, nothing will.

I might add that while Westinghouse owned the facility, a number of well-known broadcasters came through that golden era: Martin and Howard, Jerry Gee, Jim Stagg and the late Jim Runyon, who could make the white pages of the phone book sound like a Walt Whitman poem.

Phil Fink
Cleveland, Ohio

TECHNOLOGY BREAKTHROUGHS NOTICE

The final installment of *Technology Breakthroughs*, which deals with digital editing workstations, has been rescheduled.

Originally slated to run in this issue, the feature will instead appear in the Aug. 21 edition of RW. That issue will also preview the NAB Radio '91 convention in San Francisco.

RW regrets any inconvenience that may be caused to our readers due to this rescheduling.



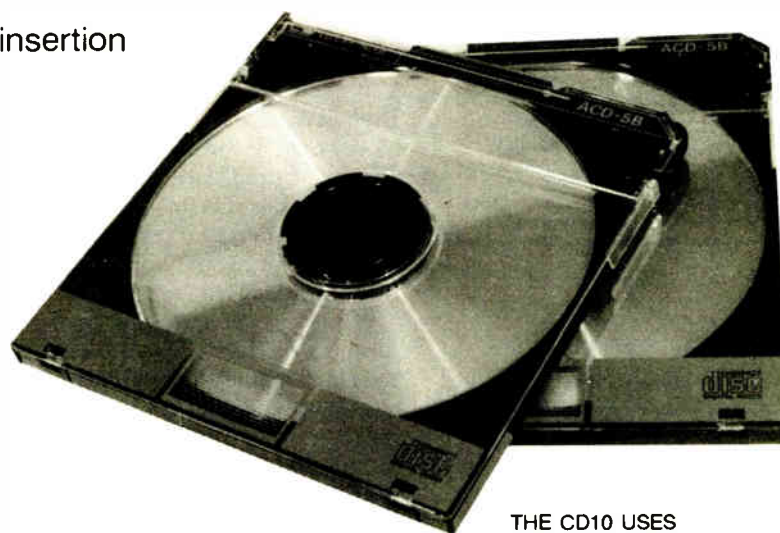
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EBS Comment Deadlines Set

by John Gatski

WASHINGTON If you want to file comments on the FCC's Notice of Inquiry (NOI) into a possible upgrade of Emergency Broadcasting System (EBS) technology, you have until Dec. 31, 1991 to do it.

The NOI's reply comment deadline is February 14, 1992.

In addressing the NOI, the FCC stated, "We seek information in two basic areas: whether there is a need for an updated automatic alerting system in EBS to notify the public of the existence of an emergency condition, and if so, what type of equipment is most appropriate for this application."

The EBS system's technology has been questioned in recent years with its failings in some instances during natural disasters. The EBS system originally was designed for alerting and updating the public in the event of a nuclear attack.

In 1976, EBS's scope was modified to include state and local emergencies, and the two-tone system was adopted. By 1990, more than 11,900 activations had occurred for such state and local emergencies.

In its NOI, the Commission is gathering input as to whether the two-tone alert system, which must be manually activated, should be replaced with technology that could "automatically or semi-automatically" trigger an alert.

Manual to automatic

"Two basic alternative alerting systems are possible: using the in-band audio to convey the alerting information, as in the present two-tone alerting system, or using a non-audio band signaling system, such as an FM subcarrier," the NOI stated.

New in-band systems likely to be looked at include the National Weather Service's WRSAME (Weather Radio Specific Area Message Encoder) and Colorado's ICEBS (Improved Colorado Emergency Broadcast System).

A subcarrier-based technology, the European-developed Radio Data System (RDS), already is being heavily promoted here as an EBS replacement and data display system for auto and home radios.

The technology already is slated for implementation in at least one area. RDS proponent Sage Alerting Systems Inc. already has been contracted to install an RDS-based alerting systems in Jefferson

County Texas, an area surrounded by petro-chemical plants.

Unlike the current EBS system, the RDS-based alert can automatically trigger an alert at a member station, which will sound warnings unless its is manually overridden. Also, the RDS system does not have to interrupt normal audio during testing and non-emergency situations, as can happen with in-band systems, because the 57 kHz subcarrier is inaudible.

Using the NWS

The WRSAME system is now in the initial implementation stage in the NWS's weather radio system. It works by substituting the normal weather radio broadcast with a sequence of digital signaling information that can identify an emergency situation, the type of emergency and the affected area. This is followed by an audio message describing the emergency in detail. An end-of-message signal then terminates the alert.

The technology allows either consumer WRSAME radio receivers to be used at home or it could be used to activate automatic retransmission of the weather alert over the air on FM or AM stations.

"The selective coding feature of WRSAME allows a broadcaster to select what types of emergencies and areas would activate a transmission," the FCC said.

"This system has been tested successfully at KJLA in Kansas City, Mo. and shown to give fast reliable severe storm warnings in a highly automated station environment," the NOI noted.

The WRSAME system would easily be compatible with AM, FM, and television broadcasting, the NOI added.

The ICEBS system also is in-band. Its geographic area ID coding scheme is more complex than WRSAME, but it does not have the type-of-emergency coding. ICEBS does use the same coding scheme for conveying how immi-

nent the emergency is.

Another technology, the California EDIS (Emergency Digital Information Service), uses non-broadcast frequencies to broadcast state/local emergency information to government facilities and to stations to use as EBS information, but it will not be evaluated in the NOI, FCC officials said.

If the FCC decides to change to another system, it could either select the system and mandate its universal use by EBS stations, or it could recommend a standard but allow other systems to be used "if local requirements make them desirable."

NEWS BRIEFS

(continued from page 2)

FCC Lab Gets New Phone System

COLUMBIA, Md. The FCC laboratory now has an automated telephone "attendant" that allows people to call staff members directly and leave voice mail messages.

The new system also allows computer link to such information as how to file applications for equipment authorizations, filing fees, and filing changes for "grantee" information.

The systems provides prompts to allow requests for forms, measurement procedures, and test site lists to be sent to a specific address.

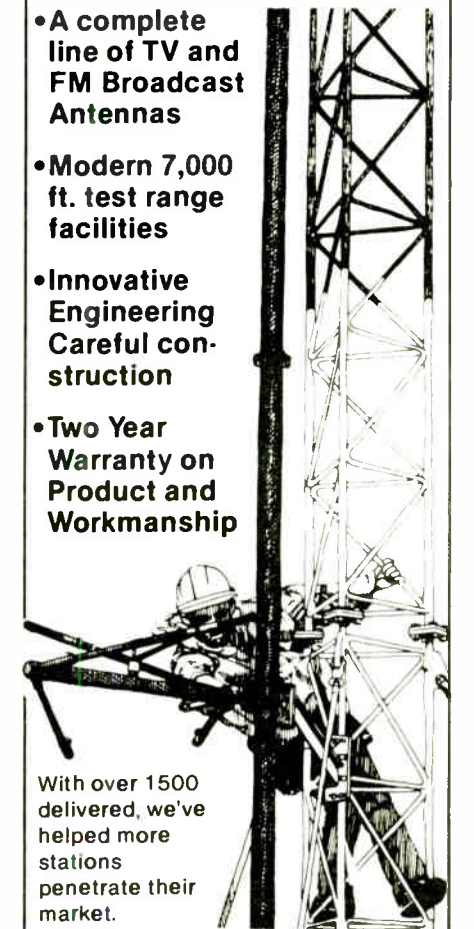
Equipment authorization application status can still be updated via the Public Access Link (PAL) by dialing 301-725-1072. Status inquiries that cannot be made via computer access will be accepted on 301-725-1585, ext. 300 from 2 p.m. to 4:30 p.m., EST.

Questions can be directed to Bob Weber, 301-725-1585.



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High Power AM Station Planned for Caribbean

by Alex Zavistovich

S. CAICOS ISLAND, BWI A New York-based engineer is working on a 100 kW AM station in the Caribbean that will blanket a large part of the Southern Hemisphere with its signal.

According to Bob Janney, currently employed as a maintenance technician at WNEW in N.Y., two Nautel 50 kW solid state AM transmitters and a combiner will be used to transmit from a tiny island in the Caribbean as early as January 1992. Construction of the facility is slated to kick off in mid-August.

The project will mean battling steady winds, the corrosive sea air and the far-from-perfect AC power provided by the local power company. But these conditions are not unfamiliar to Janney. It's not his first experience with the island.

The story actually began for Janney in 1989, when he responded to an advertisement for a CE at The Atlantic Beacon, a facility in the Turks and Caicos Islands, some 600 miles southeast of Miami.

Hired within two days, he promptly moved to the Caribbean. The job, however, quickly proved to be less than ideal. According to Janney, the facility was one of several caught up in the Sunrise Management scandal. Although payroll checks were always met, the facility's operating company—SCA, of Columbia, S.C.—would not provide Janney with parts or funds for maintenance he re-

quired to keep the station going.

"It was like being on a paid vacation," Janney said.

Before long, Janney returned to the U.S., taking a job at WNEW in New York. When a contract engineer working for WNEW discovered that Radiovision Christiana—a religious broadcaster based in Paterson, N.J.—was eyeing The Atlantic Beacon, Janney was recommended to the company. By March, 1991, the ball was rolling again.

According to Janney, the site has four construction authorizations: a 100 kW at 1580 kHz (The Atlantic Beacon, currently operating at 25 kW), two other 100 kW stations at 530 kHz and on shortwave, and a 50 kW facility at 100.1 FM.

It is the 530 kHz facility that Janney is constructing. The station will be operated under the Radiovision Christiana name.

Work on the station, located on South Caicos in the Turks and Caicos chain, is scheduled to begin in mid-August, with a projected completion date of January, 1992, Janney said. Estimated cost is between \$1.3 and \$1.5 million dollars, he said, and will be funded by Radiovision Christiana.

Janney has chosen the Nautel ND-100 transmitter for the job. Essentially two ND-50 50 kW transmitters and a combiner, the unit was at press time expected to be purchased in mid-July. The consulting engineering firm of Carl T. Jones is working on the phasor, ATU and sampling design for the facility.

Ad Tax Considered

by Debra Green

WASHINGTON A proposed 0.25 percent tax on advertising revenue is "not necessarily" a way to force broadcasters to pay for spectrum use, according to a spokesperson for a House task force on political campaign reform.

Perry Pockros, staff director for the House Administration Task Force on Campaign Reform, suggested the tax, to be placed on all advertising, is just one of "between eight and 10 measures" designed to bring about campaign reform.

Chaired by U.S. Rep. Sam Gejdenson (D-Conn.), the Task Force intends to use the revenue to finance political advertisements, campaign expenses and some other proposals before the House Ways & Means Committee.

Broadcasters and publishers would collect the tax and remit it quarterly to the general treasury. According to Pockros, the Task Force believes a tax as small as 0.25 percent on the approximate \$22 billion spent on TV advertising alone last year would not threaten the industry.

The rate, based solely on TV advertising revenues for 1990, reportedly would yield more than \$500 million.

Pockros said it is undecided whether the tax would be on the advertiser, broadcaster or publisher.

The NAB has come out strongly against the tax. "If they are really interested in passing campaign reform legislation, this ad tax proposal is not going to help the cause," NAB Government Affairs Executive VP Jim May said in a prepared statement.

Although the bill probably will face intense opposition in the House, both Congress and the White House have stated they want some campaign reform legislation passed by the 1992 elections.

A spokesperson at Carl T. Jones acknowledged that the company was "one or two days" away from submitting designs to Radiovision Christiana and Janney, but declined to provide any details on the systems.

In creating the new facility, several obstacles had to be overcome, Janney said. Among those were environmental concerns such as the constant wind and the corrosive effects of sea air on the exposed parts of the transmission system.

"Wind at the transmitter site is a constant 15 to 20 knots," Janney said. Towers and associated equipment must be treated and painted, he said, to keep the damaging effects of the sea air to a minimum. The transmitter building was designed as a closed system; the cooling apparatus and other systems are kept within the building.

An additional stumbling block in the creation of the facility is the poor quality

of the AC power provided by the local power company.

"The power company's power is just horrible," said Janney, who added that variations of 15 to 20 percent are common. "Phase-to-phase voltage, line stability, frequency regulation and the quality of the AC is not good at all."

According to Janney, a stipulation of the lease on the island was that the facility would not generate its own power. He noted, however, that the stipulation was valid for only five years from the writing of the original lease, which was drafted in 1985.

Fortunately, the site had at one time been a Coast Guard LORAN site for navigation and ranging; during that time, the Coast Guard generated its own power. Diesel fuel tanks, lines and buildings from that period are intact and in good shape, Janney said, which has prompted him to look into the possibility of generating AC power on-site.

The three-tower, dogleg system for transmitting the 1580 kHz signal is 265 feet tall, with top-loading giving it the equivalent of 345 feet of height. The 530 kHz tower is 500 feet tall, with no top-loading. Signal density at 1 km is approximately 7000 to 8000 mV/m, according to Janney.

With towers of that height, coverage of the station will be extensive. Nighttime service contours are expected to reach Mexico, Cuba, the Bahamas, the Dominican Republic, Haiti, Puerto Rico—in all, "a fair portion of the Southern Hemisphere," Janney said.

Daytime service contours are expected to include Cuba, the Dominican Republic, Haiti, part of North Carolina, Florida and numerous other Gulf Coast states, he added.

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Format Book Takes Radio on the Road

by Frank Beacham

NEW YORK As a commercial photographer on assignment, Paul Rocheleau found himself spending days and nights criss-crossing America's highways. Quickly tiring of listening to audio cassettes, Rocheleau turned to his radio dial—and the result was hours of frustration.

Calling it "radio roulette," Rocheleau quickly learned what motoring radio buffs have known for years: Finding a suitable station in an unknown market is not easy. A third of the stations are almost always on commercial break at any given moment, making it impossible to determine the format.

Near a city, this can mean continuously re-scanning 20 or more signals. And once the "right" station is located, it is often lost 10 minutes down the road when the signal begins to fade.

From this problem Rocheleau saw opportunity. He pitched Berkley Books of



Paul Rocheleau, author of "Radio on Wheels"

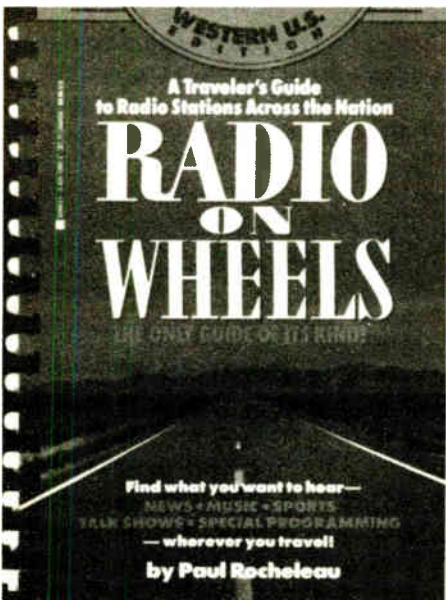
tions offering news and indicate the times of news broadcasts.

Stations with traffic reports have their own auto-shaped icons. Travelers con-

Radio on Wheels views radio from the perspective of the motorist on the interstate highway system.

New York on the idea of "Radio on Wheels," a comprehensive travelers' guidebook on radio stations in America.

The results, published this summer, are eastern and western U.S. editions



that view radio from the perspective of the motorist on the interstate highway system or the unfamiliar visitor to a major American city.

Regional editions

In addition to station call letters, frequency, format and location, "Radio on Wheels" uses data such as signal strength and local topography to rate the signal power of stations along highways.

Because text alone was too complex to interpret for the moving motorist, the book employs interpretive maps based on interstate highways at the top of each page. The graphics allow a quick scan of the book to determine station data. For those needing a news fix, the book features clock-like icons that identify sta-

tending with dangerous weather or road conditions can locate stations giving travel advisories.

Station descriptions

Another useful category describes special programming offered by a station. This information goes beyond format and might include which local football games a station covers or the station's specialty (comedy, music play in long blocks, etc.) in drive-time programming. Public stations may have a college affiliation named, the type of music they tend to play and whether they carry popular radio performers like Garrison Keillor.

In the traveling sections of the book, low power FM stations were generally eliminated from listings due to their poor reception in automobiles. AM station choices also were selective as to what motorists could actually receive along major roadways.

Clear-channel and major news and talk dominate the book's coverage of AM. In the listings for major cities, lower power stations are listed, because linear movement while listening is at a minimum.

Much of the data included in the book was actually checked by Rocheleau and his assistants, who drove 20,000 miles and checked the data with Pioneer and Alpine auto radios.

The two editions of "Radio on Wheels" also feature comb-binding so pages stay open and flat while in use. The retail price of each edition is \$8.95. If sales warrant, Rocheleau and Berkley Publishing plan to update the books yearly.

"Radio on Wheels" is available at quantity discounts for premiums and promotions by radio stations. Contact Bill Folsom, The Berkley Publishing Group, 212-951-8891.

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New Antennas Whip Multipath

by John Gatski

WASHINGTON The sun is shining, the top is down and you're cruising down Easy Street. Cranking up the volume on your new \$600 Brand X receiver, you begin singing along with your favorite song on an area station.

When you pull up to the next stop light, however, suddenly the only sound you hear is your voice bellowing the song solo. The FM signal has faded to a much lower level, and what you do hear is distorted and in mono. You sheepishly look to each side as your bellow drops to a whisper.

But as quickly as the volume disappeared, the signal comes back as you accelerate. Prognosis: FM multipath.

Face it, folks. The more multipath-resistant digital audio broadcasting (DAB) is in our future, but FM is still the dominant band and multipath continues to plague it.

Although there have been some advances in FM reception in an automobile environment, receiver manufacturers acknowledge that much of it has not gone beyond research.

Noted tuner designer Larry Schotz said he knows all about the obstacles in trying

to come up with a system to improve automobile reception. He said auto manufacturers are very careful about adding features that could be expensive and perceived as cosmetically unattractive (such as multiple antennas) on a car.

In the last few years, digital technology has allowed the design of more sensitive receivers that can pull in weaker signals. But receiver design will only go so far, as one manufacturer pointed out. Even a receiver with excellent sensitivity can suffer from multipath-induced signal fade.

Some auto manufacturers have added two-antenna diversity reception to high-end automobile sound systems. Diversity is supposed to overcome multipath by rapidly switching from one antenna to another, automatically selecting the strongest signal.

According to Schotz, there are many variations of diversity, but the more effective ones are expensive and complex.

By merely adding a second antenna and modest circuitry to automatically compare the signals and switch to the strongest one, the results are marginal, he said. For diversity to be effective, the system has to have what is the equivalent of two front-end units, Schotz explained.

Diversity designers are still using whip and windshield antenna combinations. Designers believe the whip antenna still offers very good performance, and windshield antennas have improved since their introduction in the early 1970s.

The original windshield antennas from the 1970s did not perform well, often resulting in poor AM reception and mostly directional FM reception. After a few years of horrible reception complaints, car manufacturers quickly returned to the whip. Only in recent years has the windshield antenna started to make a comeback.

Are there any new antenna systems out there? Schotz said his research firm is working on a new system for an unnamed company, but it is too early to release any details.

Another multi-antenna system already

has been put into production by Blaupunkt. Its Auto Directional System (ADA) is based on the phased-array systems used by the military and some broadcasters.

By using an array of antennas and phase alignment, the ADA can be electronically "aimed," maintaining a stronger signal by eliminating multipath and signal deflections, according to Blaupunkt.

Of course, a multiple antenna array would be rather unsightly mounted on a car's trunk or hood. To minimize manufacturer resistance, Blaupunkt decided to design four antennas for mounting inside

CUE and REVIEW



the bumpers. One element goes into each side of the front and rear bumpers—which means, I suppose, that avid radio fans should try to avoid fender benders.

Like diversity systems, Blaupunkt is targeting OEM installations more than aftermarket, because of the lower cost of integrating the system into the design of the car before it rolls off the assembly line.

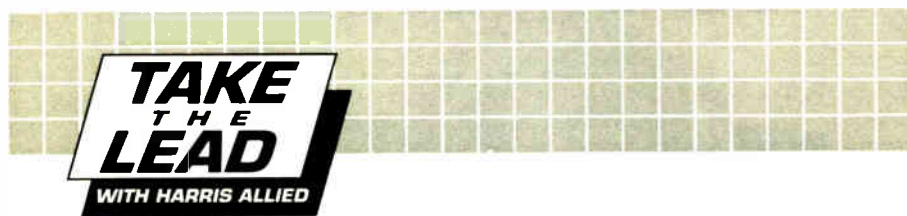
Blaupunkt said their system is more effective than diversity. Company engineers said diversity still can suffer from phase problems and noisy switchover that the phased-array system compensates for.

In talking with manufacturers and designers, it sounds like there is some hope that FM reception can be improved before DAB takes over, but how much will it cost the buyers?

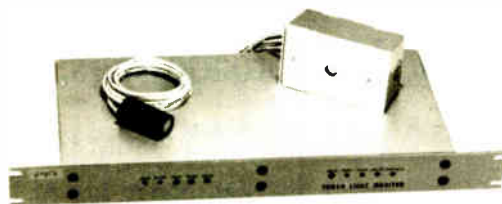
Digital audio is spoiling listeners, and they are willing to invest in better digital equipment. So DAB must be the way to go, right?

Not so fast. It is true you won't hear multipath distortion and fading in and out as with FM, but if a DAB receiver encounters signal problems, you can get total dropout. Instead of having to lower your sing-along voice to avoid off-key embarrassment as with FM multipath, depending on the system that's chosen, you might have to sing a capella while the DAB radio unmutes itself.

Guess that's a topic for a future column.



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SMC 510 single cart player (2), \$150 ea/BO. J McDonald, 303-669-3442.

Telex MC-PR III R/P, like new, \$950. L Chatman, IVA, 424 Commerce Ste 1, Berlin NJ 08009.

Rapid-Q ROM-2 R/P mono, fair cond, \$200 or trade. D Kohn, KESM, 200 Radio La, Eldorado Springs MO 64744.

Fidelitac Zenith & height gages for head alignment, never used, \$50. D Bailey, 3422 Beech, Rowlett TX 75088. 214-475-9796.

BE 5302B mono, triple decker, gd cond, \$1300. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-8348.

3M/ITC Delta I stereo, gd cond, presently working. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-8348.

SMC 792 mono, gd cond, \$900. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-8348, Fax 512-542-4108.

3M/ITC Delta I stereo, gd cond. E Trevino, KBOR, Box 3407, Brownsville TX 78523. 512-541-8348.

BE cart tape winder, almost new, w/timer, both in original packing, \$425. G Cahill, In-visible Inc, POB 5786, Hudson FL 34674. 613-725-5003.

BE/Spotmaster TP-1A cart winder, without timer, \$100, will throw in 100 plus carts for \$150; (3) record amps, mono, for RCA RT-277BA-27 series cart machines, \$40 ea. F Vobbe, Great Northern Bldg Co, POB 5031, Lima OH 45802. FidoNet 1:234:1016.

Want to Buy

ITC 3D mono w/WRA record amp, triple deck. C Waitman, KNEW, 66 Jack London Sq, Oakland CA 94607. 415-836-0910.

Parts & manuals for RCA 7 Series; record amp for RCA 7 Series; parts & record amp for Harris Criterion ATC Series. C Gill, POB 371, Indianapolis IN 48206. 317-923-2800.

Rapid cue R/P mono or stereo, any model, schematics & operative units, must work, need several, may be interested in units for parts. N Williams, WTJZ, 553 Michigan, Hampton VA 23689. 804-723-1270.

Eraser splice finder. KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Tapemaster P & RP 700, any cond from junk to excel, call or write w/descriptions & lowest prices, complete or parts only. T Crockett, Hot Tracks, Box 10501, Blacksburg VA 24060. 703-953-0222.

Stereo record in gd working cond, used carts 40 sec, 70 sec, 100 sec, 2.5 min. A Moll, KLLX, 128 Memory Trail, San Antonio TX 78232. 512-496-0677.

CASSETTE & REEL-TO-REEL RECORDERS**Want to Sell**

Tandberg 748 4 trk, 3 speed, portable case w/opt plastic lid, service & user's manuals, no mica, mint, BO pls shpg; VM 700 portable 1950's consumer unit, fair cond, BO pls shpg. S Delahoyde, Box 33063, Phoenix AZ 85067. 602-937-0908.

Teac 38 1/2" 8 trk, low hrs, excel cond, \$1875; Teac 40-4 4 trk w/dlx, low hrs, \$925. K Flory, The Production Co, Box 1027, Siloam Springs AR 72761. 501-524-4826.

Scully 280-148P, mono 14", fair cond, \$250; Kahn Symetra-peak SP 58-1A, gd cond, \$50; SMC 282 time announce, gd cond, BO; CBS Audiomax 4450 stereo, gd cond, \$200; CBS Volumax 4100, mono, excel cond, \$200. J Thomas, WLEW, Bad Axe MI. 517-268-9931.

Scully 280B 2 trk stereo in factory roll-around cabinet, manuals, new heads, spare capstan motor & other parts, excel cond, \$1000 plus shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

Stancil Hoffman CRM-7 logger Young, WJON, POB 220, St Clair

Crown motor, capstan, Dale HI bi-directional, Crown player, new athon 702-7 & 702-10 portable bi-directional, auto reverse, call prices. E Davison, 135 N Illinois, IL 62702. 217-787-0800.

Ampex AG-440C 1/2" 4 trk in around cabinet, manuals, heads I tie wear, spare set of R/P electro spare parts, vgc, \$1000 plus shpg. WIDD, 610-1/2 Hattie, Eliza 37644. 615-543-5849.

Technics 1520 isolated loop R control in fair cond, \$500. R Sarz POB 83111, Lincoln NE 68501. 41

Scully 270-2 (2) 14" stereo reproducers, 3.75-7.5 ips; also (6) capstan motors, BO; Ampex 35 only w/Schafer electr, excel cond, heads, parts, relays for 350 & BO; PR&E Multisync MDA motor ble speed amp for Ampex & Scull B Royaler, KQM, 1019 Cordova, S 92107. 619-223-3413.

Telefunken M15A 24/32 trk 15K & variopd, \$25K; Telefunken M15/ \$4K; Teac 80-B w/dlx rack Nakamichi 550, BO. R Rhodes, NINY 10101. 212-245-5045.

Pioneer CF-F2121 stereo (2), ic need minor repair, \$60 ea or \$100 mon, WBZK, POB 398, York SC 684-4241.

ITC 850 Series, gd cond, BO. D 901 E Pike Blvd, Weslaco TX 785 1548.

IBM System 34 computer w/ drive, 6 yrs old, excel cond, use bina traffic system, \$3500 plus sh WJKL, 3342 Perry, Camillus NY

Otari 8 SD 1/2" 8 trk w/calibrated tremely clean & reliable +4 or - tions, \$2500/BO. M Martelli, 1st 15 Perkins, Brockton MA 024C 1844.

Revov B77 excel cond, \$1000/BO J-Con Ltd, 200 E Racquet Club, Springs CA 92262. 619-323-435

Teac X-2000R 10.5" 14 trk, 7.5- bi-directional 6-head system, aut motor transport, very low hrs, \$1000. G Curry, Int'l Minisi Peachtree Corners Circle Ste 2E GA 30092. 404-449-6766.

Revov A-77 15/7.5 ips w/Dolby B \$450/BO; Revov B-77, 15/7.5 ips, \$1250/BO. B Henry, KLLK, 12 W lits CA 95490. 707-459-1250.

Otari MX5050-4, 14" 4 trk, lapped, \$950. B Petruzzi, Rouse: E Old Hickory, Madison TN 371 8516.

Ampex 1200 24 trk matched 1 mods, great shape, heads have b many spares, \$30K/pr, will cons breaking set. D Hewitt, Remote F 334, Lahaska PA 18931. 215-79-

Ampex 601 tape transport, as \$30; (3) Rotron 115 V Whisper fan ment cooling, \$10 ea or \$25/ea Welch Media, POB 1455, Monck 29461. 803-761-7585.

Recordex 330H cassette duplica- & 3 slaves, 16X duplication s matic rewind, erase heads, long-li ord heads, LED level meters, \$70K ry, Int'l Ministries, 4725 Peachtr Circle Ste 250, Norcross GA 3005 6766.

Sony/MCI JH-110B-2 R-R consok (2), light use, new heads & pinchr capable, (2) technical manuals & control, \$2800/ea. B Kohtz, KBAY San Jose CA 95150. 408-370-7377.

Otari 5050B2 7.5 & 15 ips 2 trk, less than 1 yr old, excel cond w/manual, \$950/firm. S Mahaffey, Mahaf Prod, 3592 N Delese Ste 12, Vineland NJ 08360. 609-692-3439.

Otari ARS-1000 in excel cond, (4), \$700 ea. C Kner, KCNA, 139 SE J St, Grants Pass OR 97526. 503-474-7564.

Scully 1/2 trk tape heads (26) play; (12) mono Magnacord Presto, play; (16) Magnacord stereo lapped Presto, play, sacrifice price. Call 616-782-9258.

Ampex AG 440B 2 trk, 7.5-15 ips in Rustang console (2), \$700; Ampex 351-2 2 trk 7.1-15 ips w/inovonics 380 electronics in Rustang console (2), \$400; Ampex 351 FT 7.5-15 ips in Rustang console, \$250; Ampex 351 electr (4), \$100. B Reider, WGUC, 1223 Central Pkwy, Cincinnati OH 45214. 513-556-4444.

Scully 280B 4 trk 1/2" in factory roll-around cabinet, manuals, new heads, spare capstan motor & other parts, excel cond, \$1200 plus shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

Ampex 350 FT w/inovonics electr in roll around walnut floor cabinets (2), \$800 ea; Scully 280B 4 trk 1/2" recorder, gd cond, in roll around floor cabinets (2), \$1100 ea.

Revov tape recorders, top-shape factory rebuilds. New heads, etc. Accessories. A77, \$850; B77 (14 trk 7.5 ips), \$1000; G38 (tube mdl) 14 trk 7.5 ips, \$500. Send phone number & address to: JM Technical Arts, POB 6156, Hermitage TN 37076.

Ampex AG-440e-I, gd cond, \$450; Ampex AG-602-2-p, new, \$775; Ampex PR-10-2-p, very gd cond, \$850; many others, call Martin at 219-322-7090.

Want to Buy

Sony TC 788-4 4 trk in gd cond & w/maintenance manual. C Fuller, Voices, POB 153, LaGrange IL 60525. 312-579-9578.

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Any time you care to scan the broadcast equipment classifieds, you can find most of the major names in our industry—with one notable exception. Products manufactured by Pacific Recorders & Engineering seldom if ever show up in these pages.

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Pacific Recorders & Engineering consoles and cart machines are never hard to find. Try any major market station, network studio or smaller facility where professionals demand tools that work as hard, as well, and as long as they do. But please, don't waste your time looking in the classifieds.

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Scully 280-1 (2), ea in Rustang roll-around cabinets w/overbridge, \$3000/pr; (4) Scully 270-2 stereo PB, late mdl, manual, \$3K/all; Ampex AG440B electr chassis, as-is, \$100; Telex 4-chnl, slow-speed logger system, current mdl, \$2000/all; Tape-A-Thon Programmer III, current mdl, \$5000. E Stolz, KWOD, 1425 River Park, Sacramento CA 95815. 916-929-5000.

Scully 255 reproducer, 1/2 trk, stereo, BO. KDKB, POB 6184, Kingman AZ 86402. 602-753-KDKB.

Ampex 350, 7.5-15 ips, FT, cabinet mounted, \$400; Teac A1200, complete, cond unknown, \$100/BO. J McDonaldonald, 303-669-3442.

High speed cassette duplicator mono or stereo to record 10 at one time in working cond, need not be Elabrite. R Swastia, KOKR, 600 Bdwy Ste 220, Kansas City MO 64105. 616-421-1065.

ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 618-907-5161.

MCI/Sony capstan & reel motors, any cond., recd g heads, most mfgs, machines, new, used. Relapped then sold. Amp Services, 224 Datura St No 614, W Palm Beach FL 33401. 800-828-0601, in FL 305-659-4805.

CONSOLES**Want to Sell**

Autogram AC-8/IC-10 spare parts, lamps, idging input transformers, BO. B Royaler, KQM, 1019 Cordova, San Diego CA 92107. 619-223-3413.

Numerik DM 1550 4 chnl DJ mixer, 2 phono inputs, 2 line inputs, 2 mic inputs, 6 band graphic EQ, always in road case, excel cond, \$150. B Fisher, KPOK, Box 477, Bowman ND 58623. 701-523-3883.

Autogram AC-8/IC-10 spare parts, lamps, idging input transformers, BO. M, 1019 Cordova, San Diego CA 3-3413.

1550 4 chnl DJ mixer, 2 phono inputs, 2 mic inputs, 6 band hways in road case, excel cond, r, KPOK, Box 477, Bowman ND 58-3883.

h Systems 8 16 input, 8 subs, 3 effect sends, +4 or -10 level cond, \$3000/BO. M Martelli, 1st 15 Perkins, Brockton MA 02401.

Executive 10 chnl stereo solid-in clean, vgc w/manuals, \$1000 founjoy, WIDD, 610-1/2 Hattie, TN 37644. 615-543-5849.

d cond, BO; Colec 2000 8 pot, r supply, gd cond, BO. D Wolfe, Pike Blvd, Weslaco TX 78586.

Grandson 18 input console, vock 33X16 rodg console 3-band switch bay plus 24 tr harness, Freeman, Pranava Prod, 1227 3y, Los Angeles CA 90069. 213-

o 80 complete w/pwr supply, iders new, works fine, 3 mic in-, includes book, \$800. C Ben-40 Domino Ln, Philadelphia PA 13-9600.

10 chnl, all plug-in amps, digi-omplete set of spare PC boards, wn, WPRS, POB 367, Paris IL 35-6336.

#5 8 chnl stereo, excel cond, all tras, \$5500. R Trumbo, KNLF, icy CA 95971. 916-283-4144.

AC-8 6 chnl 23 input stereo, in-cludes ESE built-in timer, shpg. D Kelley, KISZ, POB 740, 1321. 303-565-1212.

l 12x8x8, lots of extra features, t cond, \$2900. K Flory, The o, Box 1027, Siloam Spring AR 4-4826.

pee A/B 20x16 w/8) 9-band ull patch bay, producers desk, rich, Box 889, Greenville CA 34-6829.

#12, 12x4x2, \$1500. C Green, rogramming. 800-937-2100.

12 in, stereo out & mono & mon-1, \$500. D Bailey, 3422 Beech, 5088. 214-475-9796.

, modified to 7 inputs, complete t manuals, gd cond, BO; Kel-remote broadcast console w/2) proof speakers, gd cond, BO. J, POB 1070, Sunbury PA 17801.

7500 stereo console parts, P&G in preamps, etc. J.C. Aegerter, W Center, Milwaukee WI 53210.

w4 pots; (2) Ramko solid state; 2 tube type w/6 pots; ATI 8 chnl supply, call for details. Adolph,

IL 16x8 monitor mix console, 9 EQ pads, solos, etc, \$950. B ise St Prod, 804 E Old Hickory, 37115. 615-868-8516.

20 20 chnls, mint cond, 6 mos Miller, Airborne Audio, 11647 W near KS 66214. 913-492-8822.

1 5000, 24 inputs, 4 outputs, 3 band, 5 frequency EQ, Duncan spare modules & case, \$2300. louse St Prod, 804 E Old Hick-TN 37115. 615-868-8516.

Midas Pro Custom Recording, 16x8, Remix switch-over, (8) Pro 5, (8) Pro 3 modules, peak meter, clock/timer, flight case, \$10,500. H A-rich, Box 889, Greenville CA 95947. 916-284-6929.

Harris Micromac 16 input mainframe, manu-als, spare pwr supply, \$10,000/BO. V Kilion, KRVN, POB 880, Lexington NE 68850. 308-324-6717.

RCA BC8A dual mono console, clean shape, \$500 plus crating & shipping. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Mill-brook AL 36054. 205-285-8179.

Allen & Heath Systems 8 16 input, 8 subs, 16 monitors, 3 effect sends, +4 or -10 level options, excel cond, \$3000/BO. M Martelli, 1st Impressions, 15 Perkins, Brockton MA 02401. 508-580-1844.

Gates/Harris Executive 10 chnl stereo solid-state console in clean, vgc w/manuals, \$1000 pls shpg. B Mounjoy, WIDD, 610-1/2 Hattie, Elizabethton TN 37644. 615-543-5849.

RCA 8 pot, gd cond, BO; Colec 2000 8 pot, 18 input w/pwr supply, gd cond, BO. D Wolfe, KRIX, 901 E Pike Blvd, Weslaco TX 78586. 512-988-1548.

Audiotronics Grandson 18 input console, \$3600/BO; Speck 33X16 rodg console 3-band sweep EQ, patch bay plus 24 tr harness, \$3795/BO. G Freeman, Pranava Prod, 1227 Sierra Alta Way, Los Angeles CA 90069. 213-457-8390.

Gates Stereo 80 complete w/pwr supply, most rotary faders new, works fine, 3 mic input 4 line input, includes book, \$800. C Ben-ner, WUSL, 440 Domino Ln, Philadelphia PA 19128. 215-483-8900.

QRK Omega 10 chnl, all plug-in amps, digi-tal switches, complete set of spare PC boards, \$4500. B Brown, WPRS, POB 367, Paris IL 61944. 217-465-6336.

Ramko DC8M5 8 chnl stereo, excel cond, all manuals & extras, \$5500. R Trumbo, KNLF, POB 117, Quincy CA 95971. 916-283-4144.

Autogram AC-8 6 chnl 23 input stereo, in excel cond, includes ESE built-in timer, \$4200/BO plus shpg. D Kelley, KISZ, POB 740, Cortez CO 81321. 303-565-1212.

Teac 10-50 12x8x8, lots of extra features, low hrs, mint cond, \$2900. K Flory, The Production Co, Box 1027, Siloam Spring AR 72761. 501-524-4826.

Sphere Eclipse A/B 20x16 w/8) 9-band graphic EQ, full patch bay, producers desk, \$6000. H Alrich, Box 889, Greenville CA 95947. 916-284-6829.

Ramsa WR 8112, 12x4x2, \$1500. C Green, Century 21 Programming. 800-937-2100.

EY EVT 5212 12 in, stereo out & mono & monitor, mint cond, \$500. D Bailey, 3422 Beech, Rowlett TX 75088. 214-475-9796.

RCA BC8A (2), modified to 7 inputs, complete w/spare parts & manuals, gd cond, BO; Kel-don KD20A remote broadcast console w/2) TTs, (2) waterproof speakers, gd cond, BO. J Keller, WKOK, POB 1070, Sunbury PA 17801. 717-286-5838.

McCurdy SS-7500 stereo console parts, P&G faders, plug in preamps, etc. J.C. Aegerter, Salcom, 5431 W Center, Milwaukee WI 53210. 414-445-2300.

BE 4BEM 50 w4 pots; (2) Ramko solid state; Collins 212 F-2 tube type w/6 pots; ATI 8 chnl stereo w/pwr supply, call for details. Adolph, 915-849-2112.

Interface 104L 16x8 monitor mix console, 9 freq, 3 band EQ pads, solos, etc, \$950. B Petruzzi, Rouse St Prod, 804 E Old Hickory, Madison TN 37115. 615-868-8516.

Teac 10-520 20 chnls, mint cond, 6 mos old, \$4250. D Miller, Airborne Audio, 11647 W 83rd Terr, Lenexa KS 66214. 913-492-8822.

Sunn Magna 5000, 24 inputs, 4 outputs, 3 aux sends, 3 band, 5 frequency EQ, Duncan faders & (2) spare modules & case, \$2300. B Petruzzi, Rouse St Prod, 804 E Old Hick-ory, Madison TN 37115. 615-868-8516.

Midas Pro Custom Recording, 16x8, Remix switch-over, (8) Pro 5, (8) Pro 3 modules, peak meter, clock/timer, flight case, \$10,500. H A-rich, Box 889, Greenville CA 95947. 916-284-6929.

Harris Micromac 16 input mainframe, manu-als, spare pwr supply, \$10,000/BO. V Kilion, KRVN, POB 880, Lexington NE 68850. 308-324-6717.

RCA BC8A dual mono console, clean shape, \$500 plus crating & shipping. J Kreines, DeMott/Kreines Films, 5330 Kennedy, Mill-brook AL 36054. 205-285-8179.

MICROPHONES**Want to Sell**

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CAT-LINK digitizes the entire composite signal with no data compression, so you can run the stereo generator and processing at the studio, where they really belong. At the same time, CAT-LINK sends and receives up to four customized auxiliary channels with no crosstalk—SCAs, control channels, voice communications, RS232 data, AM audio, transmitter readings and satellite or remote program feeds. What's more, CAT-LINK gives you extra capabilities like transmitter building surveillance via closed circuit TV and an analog telemetry channel.

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CAT-LINK encodes the fully processed composite signal, then decodes it at the transmitter. You always get full stereo separation, without the phase or amplitude variations that plague two-channel STLs. Dynamic range is up to 84 dB, and your processed composite signal can use virtually all of it. You hear clear, clean, undistorted audio—all the time.

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Stations across the country are avoiding 950 MHz problems by using 23 GHz with CAT-LINK. They've stopped worrying about frequency congestion and interference, repeater-induced signal degradation, and fresnel zone clearance fading. 23 GHz dish sizes also reduce wind loading and tower space requirements.

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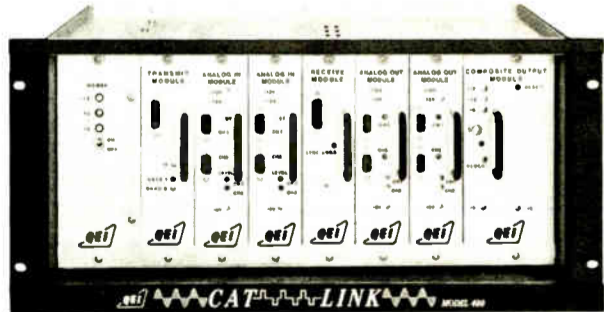
CAT-LINK is cutting phone bills for stations that don't have a clear microwave path. With CAT-LINK, a single bidirectional DS1 line replaces multiple Class A telco lines, providing multi-channel STL and TSL over the same link. Already available virtually anywhere, DS1 service is getting cheaper every day.

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Canada Testing L-Band Propagation for DAB

(continued from page 1)

"If we think it is too expensive to use L-band (for terrestrial DAB) we may want to change our proposal," Conway said.

A key question that Canada wants answered is how much power is required to maintain coverage in the L-band, according to Conway.

"The higher the frequency," he said, "the less favorable it is from a propagation point of view.

"At 60 miles, for example, what would be the ERP (estimated radiated power) to cover the coverage area?"

Power requirements

The tests are conducted at 1497 MHz with a 200 W single-point traveling wave tube (TWT) transmitter. The antenna gain is between 16 and 18 dB, resulting in an effective radiated power of 10 kW.

In Ottawa the antenna average height above ground was 100 meters and in Montreal it is 230 meters.

The tests use pure noise, with no coding or decoding, broadcast in a 7 MHz signal. Measurements are conducted in varying receive bandwidths from 7 MHz to 100 kHz.

In examining propagation characteristics at different bandwidths, engineers are particularly interested in seeing the effect on multipath.

Examining costs

Donald Tyrie, broadcast standards engineer with the Canadian Department of Communications, was optimistic the test would support L-band.

"We're looking on the optimistic side that these tests will show it will be feasible and can be done on an economical scale," he said.

But he added that if the tests prove it will require "megawatts of power," DAB in the L-band may not be realistic.

If single-point transmission proves too

expensive, Conway said that an alternative could be the use of a multi-transmission approach.

The scenario would use a single-point transmitter operating at an affordable reduced power, supplemented with repeaters—a cellular-type arrangement—to maintain the same coverage area of current stations.

New transmitter sites also would be required, along with additional STLs or feeder links.

Equipment modifications

For the bandwidth tests, a pseudo-random bit sequence modulator is linked to the transmitter. To work, this data stream has to be upconverted, amplified, and put through a bandpass filter before it reaches the main amplifier.

To receive these signals, a minivan is equipped with two quarter-wave antennas, a Hewlett Packard 9100 spectrum analyzer, and an IBM-clone PC-AT computer.

Collecting data

"We planned tests in various areas, which are typical of given terrains and building structures... so that we can characterize the echo, or multipath, in all these different environments," said Rene Voyer, manager of sound broadcast systems research at the Communications Research Center, an arm of the Department of Communications.

To collect technically useful data, the van has to sample the signal at one-eighth wavelength intervals. In other words, every time the van travels 2.5 centimeters, the signal has to be checked.

To do these, engineers rigged a bicycle wheel to the back of the van. Calibrated to read 2.5 cm intervals, the wheel controls the sampling rate.

■ ■ ■

James Careless reports for Radio World International from Canada.

Radio Networks Install SEDAT

(continued from page 1)

Now SEDAT provides up to four times the satellite transponder capacity of DATS—plus 20 kHz-quality sound. The new technology also operates on wide-band, T1 and narrow-band formats.

The heart of SEDAT is a compression algorithm that takes advantage of the human ear's ability to ignore noise within a defined bandwidth on a specific frequency, known as "noise-masking." By placing the extra noise signals within these "masked" frequencies, SEDAT allows for high audio quality and bandwidth conservation.

The result is a 128 kilobits per second data stream that can carry digital quality audio. "The amazing part about this is it allows us to take a 50 to 15 kHz channel and split it up into three 20 to 20 kHz channels with better dynamic range and a better signal-to-noise ratio," ABC Radio Engineering VP Dick Martinez said.

A major reason CBS participated in the joint venture, said Tony Masiello, CBS Radio's technical operations director, is that the SEDAT system can easily be switched to MUSICAM, the digital compression system proposed by the Eureka 147 and USA Digital in-band DAB systems.

Compatible with MUSICAM

"Though we are initially using the SEDAT system, it is important to note that the SEDAT cards are compatible with MUSICAM. Should the need occur, we could easily switch to MUSICAM with a simple software change," Masiello said. "It really is a matter of switching out the PROMs."

Noting that the new system is both forward and backward compatible, Martinez said the changeover from DATS to SEDAT is relatively simple. "The beauty of the old system is it allows us to go in and modify and upgrade simply by putting in new encoders and shipping the affiliates a new decoder which goes into their existing receiver," he said.

CBS and ABC decided to switch over to SEDAT just after the new Satcom 5 satellite went into service in mid-July. The two networks had been using Satcom 1 for digital feeds. The switchover by ABC and CBS involves the purchase of about 3,500 SEDAT-based decoder cards and new head-end encoders. The cards, which were delivered to affiliate stations in the early summer, have a list price of \$1,395 each.

Martinez said entire satellite receivers are priced at about \$8,000. He said the SEDAT system ups the total price of a new receiver with card by

increased channel capability for network programming, ABC is leasing some of its excess channels on the new satellite to other programmers. "We've

The SEDAT system retains the original DATS system capability of 11 additional voice-grade and data channels. This allows the networks to address

these enhancements over the DATS system:

- Up to 80 (20 kHz) channels per typical satellite transponder or Ku-band operation;
- Optional data controller for broadcast network security;
- Optional store-and-forward capability allows networks to download digital audio programming for later affiliate playback; and
- Digital interface for serial connection to digital recorders of storage devices.

Now SEDAT provides up to four times the satellite transponder capacity of DATS—plus 20 kHz-quality sound.

about \$200 over the DATS system.

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Celebrating Reginald Who?

by Frank Beacham

MARSHFIELD, Mass. On the 85th anniversary of the world's first radio program, the forgotten inventor of broadcasting recently was honored by this Massachusetts community, known as the birthplace of radio.

The June 16 celebration was not in honor of a well-known name like Marconi or DeForest, but for an inventor obscured by time . . . a man whose name has never made it to most modern history books: Reginald A. Fessenden.

Reginald who? How about the real father of radio broadcasting; the man who broadcast the world's first radio program and accidentally broadcast the first human voice across an ocean; the man who invented the heterodyne radio receiver, the radio compass, and the fathometer (forerunner of sonar). And add to those accomplishments hundreds of other inventions, including the musical instrument amplifier, the turbo-electric drive for battleships, the first pocket pager and the aluminum teabag.

Low key innovator

While Marconi flamboyantly demonstrated the first wireless telegraph using coded dots and dashes in New York in 1899 and became an instant media hero, Fessenden, a college professor, quietly developed a different system, one of wireless telephony. Fessenden wanted to surpass Morse Code broadcasting, which used a transmission system operating at under 100 cycles per second.

To transmit the sound of the human voice, Fessenden needed a radio frequency alternator which would operate at the then unheard of speed of 100,000 cycles per second.

On June 1, 1900, he naively placed an

phone, Fessenden became the world's first disc jockey when he cranked up his phonograph and played Handel's "Largo," and then performed a live violin solo, "O' Holy Night," to astounded ships up and down the eastern seaboard



Fessenden's 29-member staff poses outside the professor's lab (Fessenden not pictured).

order for such a device with General Electric. At first GE rejected Fessenden's order as "so special in character and so different from anything which we have heretofore attempted." But six years later, GE delivered a 50,000 cycle alternator to the young professor.

For the people of Blackman's Point, overlooking the ocean at Brant Rock in this Massachusetts town of 25,000, the Fessenden story is the stuff of legend. It was in 1906 when the professor, having received the GE alternator, hooked up a modulated transmitter to a 420-foot oceanside tower.

On Christmas Eve, in front of a micro-

and as far south as Guantanamo Bay, Cuba.

On the air at Christmas

Fessenden's experimental radio station originally was set up to transmit voice communications from Blackman's Point to a second antenna in Machrihanash, Scotland.

In fact, the first two-way telegraph contact across the Atlantic had occurred between the two towers earlier in the year. But when the tower in Scotland toppled in a storm, Fessenden decided to go ahead and do his planned Christmas Eve and New Year's Eve broadcasts of voice and music anyway.

On that Christmas Eve night he first sent a Morse Code message to ship operators along the Atlantic seaboard informing them of the upcoming voice transmission which could be heard through the speaker of their code receiver.

"The ships at sea in 1906 were snapped to attention by a RCQ, CQS in Morse Code, then a human voice, then a woman's voice singing. It was uncanny. The wireless rooms were crowded. Next, someone was reading a poem. Then there was a violin solo, then a man made a speech and they could catch most of the words," recalled one written account of the night.

The world's first broadcast also produced the world's first case of "mic fright" on the air. Fessenden had not planned to perform on the broadcast, but after the playing of "Largo" there was a moment of dead air when the

young assistant who was supposed to sing froze up in the front of the microphone.

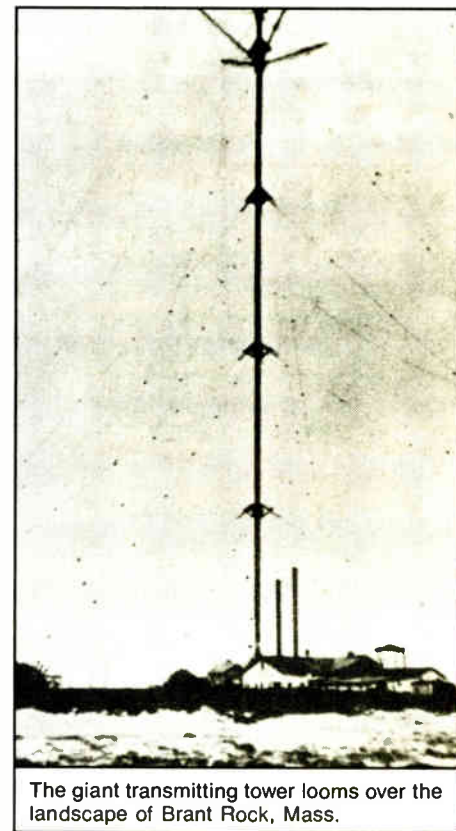
"I had not picked myself to do the singing, but on Christmas Eve I could not get any of the others to either talk, sing or play and consequently had to do it all myself," Fessenden wrote of his performance.

The first paid air talent

To cover such a problem on his second New Year's Eve broadcast, Fessenden decided to hire a professional. Appearing on the broadcast was the first paid artist to perform on the radio medium. Ed Filoon, 24, of Duxbury whistled "Yankee Doodle" and was paid the sum of \$10 for his performance.

Shortly after the broadcasts to the ships, more astonishing news arrived by mail from the professor's engineer in Scotland. "At four o'clock in the morning I was listening for telegraph signals from Brant Rock when, to my astonishment, I heard the voice of Mr. Stein (an assistant) telling the operators of Plymouth how to run the dynamos."

This was news that the first transatlantic voice transmission had taken place weeks earlier . . . and all by accident!



The giant transmitting tower looms over the landscape of Brant Rock, Mass.

In those days, the professor's radio station and tower fascinated the citizens of Marshfield. For the young, climbing the tower was one of life's great adventures. A local resident recalled the climb:

"To actually squeeze through the manhole at the base and start up the perpendicular climb inside the tube by a steel ladder affixed to one side was an adventure indulged in by many a youth. It was darkness all the way up, except for the light which filtered through the manholes at intervals of 100 feet.

"Once at the top, one crawled through another hole out to a small platform that surrounded the tube. The panorama of land and sea was unequalled. Crawling back through the hold and getting one's feet on the ladder was one of the real dangers of the feat. Especially as there was a fall of 420 feet if one missed his footing."

Lack of recognition

With a Pathe movie newsreel camera rolling, the famed tower was dismantled

(continued on next page)

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Location Audio Key To ZBS Radio Drama

by Dee McVicker

FORT EDWARD, N.Y. Several years ago, Tom Lopez with ZBS Productions braved the Amazon jungle to find out what vampire bats sound like at twilight.

After hiking through thick jungle and wading through drizzling rain, he and his entourage of sound seekers—including a Brazilian guide—finally arrived at a cave vampire bats were known to inhabit.

The cave, Lopez and his crew were told by the guide, also was a ceremonial site for ancient Amazon Indian rituals.

Capturing the screeching sound of the rare bats on Ampex digital tape, Lopez later returned to his studio in Fort Edward, N.Y., and played back the recording with disappointment. Unfortunately, he said, "those darn things sound like any other bat."

Ever so, this expedition became the hallmark of "Dreams of Rio," a radio drama that was named "Best Cultural Program of the Year" in 1987 by the National Federation of Community Broadcasters. And, it was one of many similar expeditions made by Lopez in his sound-seeking adventures for ZBS Productions' radio dramas, which can be heard on public radio and Digital Cable Radio.

No canned sounds

Instead of using canned, off-the-shelf sound for the non-profit organization's audio adventures, Lopez prefers to bring the dynamics of on-location ambient sound to his audience.

"Sounds become another character in the drama," Lopez said. "The quality

and character of particular sounds are enormously important in not only setting mood and location, but in telling the story."

Where he finds these sounds is on the streets, jungles, forests and plains of some of the world's most exotic locations—including Morocco, India, Venice and Scotland. It is these on-location recordings that many claim give ZBS productions a quality unlike any other radio drama.

OFFBEAT RADIO

"As a film-maker or director might look for interesting visual settings, I do the same with audio," said Lopez, the organization's founder and president, who writes, engineers and directs. Although he claims that the Atlantic and Pacific oceans do "sound the same, regardless of what people say," not all city streets and wildlife settings do.

"The Portuguese language, for example, is a different sound than Spanish." Then too, he added, "birds might seem to all sound the same, but they're very different." In short, Lopez pointed out, the reason why listeners envision the Morocco marketplace or other ambient sounds in ZBS dramas is because "that's what was actually recorded and that's actually what's going on."

Pictures in the mind

With this real-life audio backdrop, rare is the ZBS radio drama that needs to

(continued on page 20)

Celebrating Fessenden

(continued from previous page)

in 1915. When the ropes were severed, the huge structure came hurtling down. The metal parts were sold off piece by piece to the pay the debts of the failed company that had financed the maiden broadcast. The newsreel film of the event has been lost.

Today, all that remains of Fessenden's radio station is the concrete tower foundation, the cement-insulator base and the iron socket on which the tube rested. It sits—exposed and unprotected—in the middle of a mobile home park.

In honor of Fessenden's work, the NAB, the U.S. Department of Commerce and the Massachusetts Broadcasters Association presented plaques to the town of Marshfield at the crumbling tower site during a celebration June 14.

Radio station WATD-FM commemorated the event with all-day programming that celebrated the 85th anniversary of the first radio broadcast, and Reginald Fessenden got some long overdue recognition.

Why is Reginald Fessenden not known today as one of America's premiere inventors? That's a question that came up more than once during the Marshfield celebration.

"I think it had to do with lack of PR,"

WATD's Rod Morrison said. "The professor was a dedicated scientist who cared more about his research than self-promotion."

In all, Reginald Fessenden acquired more than 300 radio patents, which he lost in disputes with investors, and which were eventually acquired by RCA for about \$3 million.

"Our tower of dreams and deeds," is the way Fessenden described the remains of the concrete tower base when he and his wife revisited the site just before his death in 1932.

In his obituary, the New York Herald-Tribune had this to say of the man who created radio broadcasting: "It sometimes happens, even in science, that one man can be right against the world. Professor Fessenden was that man. The whip-lash theory passed gradually from the minds of men and was replaced with the (Fessenden) continuous wave one, with all too little credit to the man who had been right."

For more information on the work and life of Reginald Fessenden, see "Inventing American Broadcasting, 1899-1992," by Susan J. Douglas (Baltimore, 1987) and "Fessenden, Builder of Tomorrows," a biography by his widow, Helen M. Fessenden (New York, 1940).

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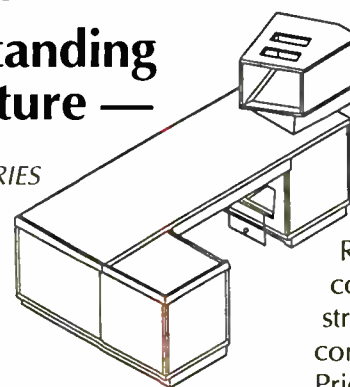
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Solutions to Digital Interfacing

by Mel Lambert

STUDIO CITY, Calif. As synchronicity would have it, I recently came across a couple of very useful pieces of hardware that address some of the points raised in last month's column, which focused on the revised AES3 two-channel digital interface standard.

The first item is actually a pair of simple devices that should dramatically improve the transfer of digital data over medium to long distances, while the second item is a one-in/four-out digital dis-

tribution amplifier.

As I mentioned in July, passing several MHz of two-channel digital data via AES/EBU ports using conventional twisted-pair audio cable—particularly for interconnections of more than several hundred feet—can be problematic. Incorrect source-load impedances and cable capacitance can often reduce the efficiency of such interfaces.

One possible solution

One possible solution would be to use to video-style BNCs with coaxial cable,

rather than three-pin, male/female XLR-type connectors and 75 ohm source and terminating loads. Locating suitable, high-quality transformers isn't without its own set of difficulties, however, not to mention mounting them in a convenient XLR shell.

Fortunately, to save us the hassle, that is exactly what Canare Cable has done in a new pair of convenient interface units. The new BCJ-XP-TR and BCJ-XJ-TR are, respectively, three-pin male XLR-to-BNC and three-pin female XLR-to-BNC matching transformers. Designed to connect directly to the appropriate three-pin, balanced AES/EBU ports on DAT machines, CD players, digital processors, workstations, etc.—or to be inserted in existing cable runs—the new BCJ Matching Transformers look to be very simple to use.

Having converted a standard 110 ohm, balanced input to a 75 ohm, single-ended output, the user is free to use up to 6,000 feet of good quality, 75 ohm coaxial cable, such as Canare's LV-77S or Belden #8281.

These new units also will greatly simplify the use of video distribution amplifiers, patchbays and cabling in facilities that already feature such hardware. Each unit features a quoted signal bandwidth of 100 kHz to 6 MHz, a maximum voltage handling of 5 V, peak-to-peak, VSWR of under 1.1 across the operational bandwidth, and an insertion loss of less than 3 dB.

The pair of BCJ Matching Transformers have a suggested retail price of \$50 per unit, and are available through selected Canare dealers. For information, contact Barry Brenner, GM at Canare/U.S.A., at 818-365-2446; FAX: 818-365-0479, or circle Reader Service 27.

More than one

Users of digital hardware often need to connect more than one recorder or

processor across a single stereo AES/EBU output from, let's say, a digital audio workstation, so that copies of a master production can be recorded simultaneously to several DAT machines.

The original AES3-1985 Digital Interface Standard specified a balanced output impedance of 100 ohms and an input impedance of 250 ohms (which, in theory, would permit up to four loads to be placed across a single output port). The new proposal specifies matching 110 ohm impedances and single transmitter/receiver configurations.

A new interface system from Digital Domain should put an end to these and other interface problems. The FCN-1 Format Converter accepts either professional AES/EBU or consumer-type digital inputs (SPDIF, IEC 958, plus others), and produces four simultaneous, completely isolated outputs. All inputs and outputs are transformer-isolated to prevent hum and digital interference from contaminating the audio signal.

DIGITAL DOMAIN

Other front-panel controls allow the user to pre-set various Channel Status bits on the output data stream, including sampling frequency, emphasis, copy-inhibit, generational status, category code and other vital parameters. (One possible application would be to modify the various Channel Status data from an SPDIF input, for example, prior to being connected to an older-format digital recorder that mutes upon the receipt of certain Copy Inhibit bits.)

Various system options include polarity inversion, digital overload indication, channel reversal and optical-format digital inputs and outputs. Also available are several customized versions, including one unit that features a special 20-bit internal buss architecture for direct connection to compatible workstations.

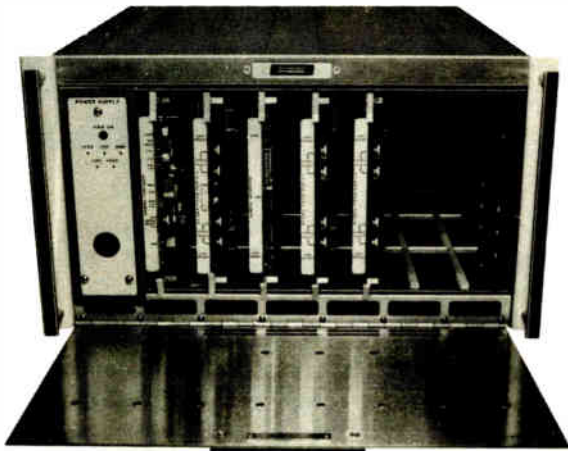
The FCN-1 Format Converter has a professional list price of \$450, and also will be available through selected dealers. For information, contact Bob Katz at 212-369-2932, or circle Reader Service 148.

As more and more broadcasters come to grips with the unfamiliar parameters of digital technology—and how to connect them together successfully—units such as these will help solve those niggling little problems that can make life in the trenches more than a little vexing.

I'll devote some time in this column for occasional news of other interface and processing systems. To have your company's products considered, write to me at RW.

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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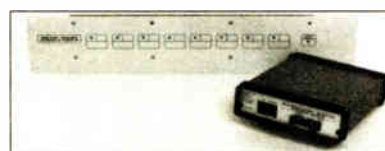
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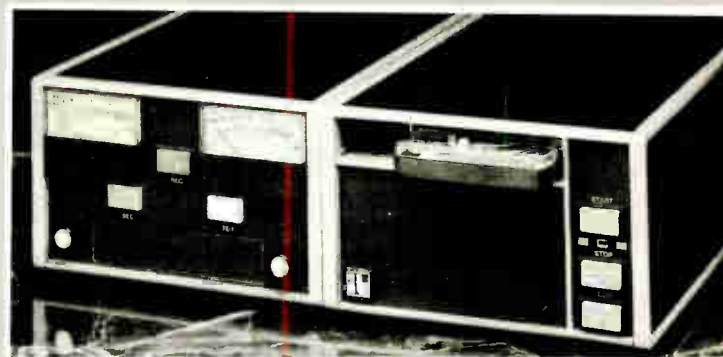
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World Radio History

Location Audio Key for ZBS

(continued from page 15)

narrate a setting. "People, through books, film and their own experiences, are painting the pictures in their minds," Lopez said. "They already have the references."

Lopez cited the production of "Moon Over Morocco," a radio drama that features a Countess among other characters, as one example. Using the audible setting of a courtyard that Lopez recorded while in Morocco, he was able to stage the Countess' villa home.

"It was never described what her villa was like, but every time she was there, I used a recording of the water fountain

"Those darn things sound like any other bat."

splashing water over the tiles, the birds occasionally making a squawking sound and so on," he said. It is this type of audio framework that Lopez tries to accomplish in every scene, so that listeners can associate sound with their own visual experiences.

Lopez also borrows from the visual world to pace the dramas. Television and film, he observed, have created a sort of unconscious pacing that keeps things moving. Using the same editing techniques, ZBS dramas are paced to change

perspective as fast and as effectively as today's visual media.

"The cutting sets the pace," he said. "So even if we have a telephone conversation, we will cut back and forth between callers." Using ambient sound and voice to distinguish between callers, ZBS dramas move listeners through what could otherwise be a lifeless scene in the drama.

This complex layering of sound is accomplished not only by Lopez's unique collection of sounds, but by sound composer Tim Clark—as well as some sophisticated and reliable equipment.

In the field, whether in Morocco or Brazil, Lopez uses a lightweight Ampex 467 DAT recorder to collect interesting sounds. Once burdened with some 20 to 30 pounds of Beta VCR recorder equipment, Lopez switched to the less than five-pound DAT because of its weight, durability and most important, its quality.

Fritz the mic

Lopez also has been known to cart the Ku81, a microphone device developed by George Neumann Corp. of Germany, which creates a three-dimensional sound field likened to the human ear. The device, nicknamed "Fritz," is shaped like a human head with microphones located inside human-like inner ear chambers.

Unfortunately, the device did not function well in the high humidity of jungle settings. "The humidity was something

like 99 percent, water was everywhere and Fritz just started motorboating," Lopez said, describing this audio effect as a vibration of water inside the device's inner ear. Incredibly, he added, "at one point



Tom Lopez, president and founder of ZBS Productions

our ears started doing the same thing."

The Ku81 now is used primarily in the studio by performers, although Lopez did take it on a recent expedition to a local restaurant. Here, Fritz created another problem. Thinking the odd-shaped device was a hoax, the management escorted Lopez and his companion out of the restaurant.

Lopez's next expedition, he hopes, will be more successful. Expected to leave for Bali and Indonesia soon to begin recording sounds for a new series of dramas, he plans to capture this audio collection—although without the help of Fritz.

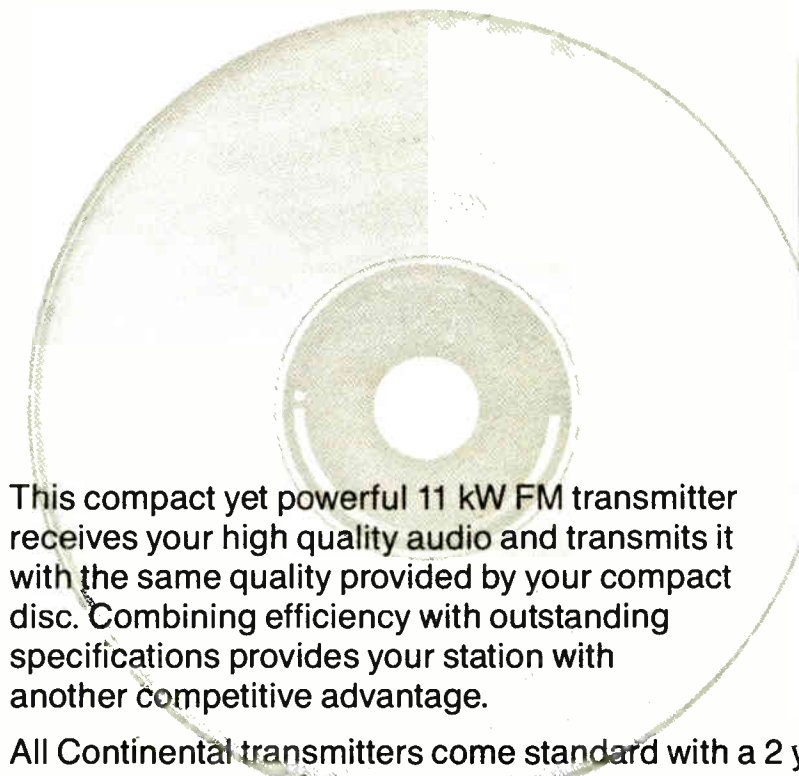
Lopez also is working on several ZBS Production operas. These, like their drama counterparts, are rich with unusual sounds. "They are really sort of

opera cartoons because the birds sing, the trees and flowers sing and even the grass and water sing," he said, signifying that some of his sound-seeking adventures are not far from home.

■ ■ ■

Dee McVicker is a free-lance writer and regular contributor to RW. She can be reached at 602-899-8916.

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Make Your Studio a Safer Place

Left Unchecked, Small Hazards Can Get Out of Hand. Here Are Some Ways to Keep Risks to a Minimum.

by **Barry Mishkind**

TUCSON, Ariz. Let's take a moment out of your busy day and discuss safety for a while. Are you seated? Comfortable? Seat belt on?

As you're no doubt aware, there are federal, state and local laws that affect everything at your facility from audio levels to RF levels to smoke levels. Dozens of agencies from OSHA to the city council want to protect you from all sorts of dangers.

And let's not forget the FCC and its GEP (Good Engineering Practice) Rules. Simply put, GEP means not to put yourself in unnecessary danger at work. A side bonus is that such an operating philosophy reduces equipment damage.

So, what are the areas where you have to be careful? Let's start at the studio, where everything starts (except for the satellite-delivered audio).

Studio considerations

Quick—look under the counter. If your facility was not properly planned, chances are you'll see a two-socket outlet with lots of plug multipliers and extension cords used to cover the needs of all the studio gear.

This practice puts your facility in two sorts of jeopardy. First, there's the dan-

those socket testers periodically, to ensure a broken ground doesn't make any circuit in the building dangerous.

Other studio hazards

Last year we spoke about the OSHA standards for audio levels in the control room. While this may be difficult to fully implement in the face of a determined program director, the station really can be held legally responsible for damaging the hearing of staffers. (For details, refer to *RW*, July 11, 1990 and Aug. 8, 1990.)

Yet, there are other hazards lurking in those old studios. Dirty air filters may merely create allergic reactions. On the other hand, asbestos and fiberglass insulation can get into the air and create real problems.

ECLECTIC ENGINEER

Then, too, smoke, whether from cigarettes or fires, also is a problem needing attention. Many cities have enacted laws that restrict tobacco smoke, necessitating special attention to ventilation in order to protect employees.

A few stations have gone smoke-free and reaped not only health benefits, but found that maintenance problems actually decreased. At the SBE convention a few years ago, one engineer reported on two studios at his station, one AM and one FM—exactly the same except for the smoking policy in each studio.

The non-smoking studio was more reliable and cheaper to maintain than the smoking studio. It was concluded that encouraging non-smoking benefitted everyone all the way around.

Nevertheless, the more immediate danger may come from the fire risk. Every station needs to have some plan to deal with fires, a plan that one hopes will minimize equipment damage in the process.

Some studios use halon gas rather than the more common chemical fire extinguishers. The benefits of halon, which smothers a fire by depriving it of oxygen, is that it causes little harm to equipment. On the other hand, depriving the disk jockey from air could be serious. So, be sure to train the staff on what to do and where to go when activating halon extinguishers.

Another precaution that can be taken is to have a power disconnect for the studio, so all power can be shut off in a hurry. True, you don't want this switch placed where it can be accidentally activated; however, if the disk jockey sees smoke and smells burning, this is a good, quick way to prevent further damage.

Once around the office

By now, you've seen the point that safety comes largely from common sense

actions to deal with potential problems.

For example, you wouldn't leave nails strewn around the parking lot and watch people drive over them all day. Similarly, safety inside the station requires a periodic review of the entire facility to uncover those situations that develop as the

staff tries to make its jobs easier without thinking of the possible consequences.

For example, wires stretched along the floor to reach a socket are not just a way of making the phone reach your desk or providing electricity for your lamp. They

(continued on page 22)

...there are federal, state and local laws that affect everything at your facility from audio levels to RF levels to smoke levels.

ger that a disk jockey's errant foot will unplug something essential, like the console or the remote control. However, while this will put you off the air, there is a worse possibility.

In addition to all those extension cords and multipliers, there are likely a few plugs forced into sockets or, using adaptors, three-prong plugs inserted into two-blade sockets. This could result in either no actual ground, or the hot side of the circuit ending up on the ground side.

What this means is that a person touching the equipment case ends up touching the 120 V supply. It may just tickle the person. On the other hand, it could produce a shock. And that's not safe.

Once, about 20 years ago, I had my finger on the remote control for a tape recorder, ready to start it after a station ID. As I reached for the microphone switch, I brushed the front of the console. Basically, what the audience heard was a rather surprised yelp of pain.

One way to prevent this situation is to design and install a single point ground system, where all the equipment in the building is ultimately tied. This kind of arrangement, known as a "star ground," coupled with adding and using sufficient three-prong outlets, will provide basic electrical safety.

As part of your ongoing maintenance program, it wouldn't hurt to use one of

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Circle 1 On Reader Service Card

Buying a Digital Audio System

by Alan Freeman
Software/Broadcast Engineer
The Management

FORT WORTH, Texas In a past issue of RW, there was an article by a broadcast engineer who also was a knowledgeable computer programmer.

He had somewhat of a difficult time, however, when he set out to write code to interface to a particular DAC (digital audio card). I'm sure he is not alone.

It has been my experience that the folks who build such hardware aren't very familiar with broadcasters' needs. I've worked with several of these cards over the past couple of years, writing ap-

plications for broadcasters. My suggestion to the casual programmer is to leave those headaches to people like me who get paid for that kind of torture.

The cart machine's replacement by a digital storage medium (most likely a computer hard drive) seems inevitable. By using a DAC, you can store analog or digital recordings on a hard disk for random and immediate playback. Interfacing computers to the real world is old hat now, so with a little imagination (and hardware), a single computer can perform as a full-blown automation system.

Audio switching

Most of the digital audio systems (DAS's) currently on the market have a proprietary audio switcher. It provides audio switching and passes the multiple satellite or automation closures to the computer. When a particular closure is received, it is immediately interpreted to play a jock image liner, magic call, station ID, jingle or to start a commercial spot set.

The software tells the system which jock is currently on the air and which liner is next (from slews of liners), all in a matter of milliseconds. The liners, jingles and spots are in a rotation table that uses only one cut number to access many audio cuts (just like a cart with multiple cuts on it). Does this procedure sound familiar once again?

Complex rotation tables for the spots can be set up based on the day, date and weight. This allows for the clients' whole flight order to be set up once. You won't have to switch out cuts every few days. Monday's spot plays Monday only and maybe only this week. Another spot will play the Monday of next week, for instance.

You can even weight the spots so that some get heavier play than others. If you need to drop a spot in the middle of the flight, you just remove the cut number from the rotation table and it's done. You don't have to redo the flight setup. For PSAs, promos, jingles and commercials, you can re-order the rotation without re-

recording the spots.

You can use this feature to control date sensitive PSAs, promos and regular commercial material. Some rotation tables can handle as many as 50 cuts, and the date/day checking is done every time a cut plays, making outdated material nearly a thing of the past.

The different closures for IDs, jingles, magic calls and such are handled as if they were each on a dedicated cart machine (but all with only one DAC). The computer selects and plays different spots so

A single computer can perform as a full-blown automation system.

fast that your breaks will sound nearly seamless. I say nearly, based on the fact that most of these systems use only one audio card, so slots are not overlapped like they would be in live assist play.

The system quickly substitutes missing or out-of-date spots with good material of equal time. An audit trail report will show you the exact second a spot aired. If the spot failed, the report shows the spot used to substitute it.

The choice of most

The DACs that are currently the choice of most of the companies writing this type of software are the ANTEX line—namely the VP-635, SX-8 and SX-10. The VP-635 has a high noise floor and shouldn't even be considered for broadcast use, but the SX-8 and SX-10 are pretty good cards.

Each provides the quality of audio needed to get the job done, even though inputs and outputs are unbalanced. The SX-10 even has digital connections for those using digital consoles. These two cards use several methods in which to store the audio to the hard drive, PCM and ADPCM.

PCM is a 16-bit algorithm that allows for near-CD quality audio at 2x oversampling, but eats up eight mega-bytes per minute in stereo at only 15 kHz frequency response. A medium market station expecting to use this format should be prepared to buy at least a gigabyte or so of hard disk space.

The other option is the ADPCM compressed format. It uses only about two megabytes (Mb) per minute of stereo audio at 12 kHz response. The noise floor is barely noticeable by the time it passes through your processing chain. Most users are content with its sound (listeners don't crank up commercials). Using this format allows a medium market station to use a 680 Mb hard drive. A small market station could use a 340 Mb hard drive, drastically reducing the cost of the system's hardware.

Another feature touted by the ANTEX card is its ability to record while playing. That's fine for mono, but to do the same for stereo you have to have two audio cards or the feature is about worthless.

The simultaneous record/playback feature is a real troublemaker. It allows the user to get away with using the same machine for production that he uses for air. *Big mistake.* Your commercials are the life-blood of your station. If you analyze all the ways of backing these up, there

is only one clear-cut method that dominates. You should buy a production machine with the same size hard drive as the air machine and copy the cuts to the air machine after you record them.

It is foolish to believe that you can do without a backup of this precious commodity. Digital audio systems are cheap enough to buy both a production and an air machine.

Traffic and billing

In selecting a system, be sure that it interfaces to traffic and billing software. If you do not have such software yet, get it now. The DAS's usually use a full log, just like a DJ uses. Manually loading one of these systems everyday is not a holiday.

Be sure that the traffic system is LAN (local area network) compatible and plan on using that feature. The LAN of choice for the DAS's I've seen is LANTASTIC. It's a peer-to-peer system, allowing each computer to share hard disks and data without having an expensive dedicated host. Be sure to plan on an uninterruptible power supply to protect the system from sudden power glitches.

Check to see that the DAS can adapt to different formats (automation, satellite, live assist), without much added expense or extra add-on hardware and software. If you plan to use the system for automation (as opposed to satellite), you most likely will need an automation switcher. Most of the DAS's on the market can handle satellite programming. You probably will need to buy an automation switcher to deal with automation sources, EOMs and sequencing.

You should expect to take about a month or more to get the system hooked up and running properly. Your engineer will need time to install and learn it—and so will you, your traffic folks and your jocks.

Finally, tie all the machines together with a LAN. It will complete the full circle between air, production and traffic/billing. It makes everyone's job easier, and a lot less stressful.

■ ■ ■

Alan Freeman, a software and broadcast engineer for The Management, is chief programmer of its Digital DJ System. For information, call 817-625-9761; or FAX: 817-624-9741.

Making Your Studio Safer

(continued from page 21)

are trip wires waiting to catch someone and knock them over.

Very similar sorts of dangers are loose tiles or carpets that have developed tears and holes that can catch a shoe. Maybe there is broken glass in the area. Or, broken chairs that can catch fingers or tear clothing. Or, nails sticking out of counter tops.

The point is that a station concerned about the health of its employees will search around and seek out problems before they cause harm. It does take time. On the other hand, efforts to promote job safety are appreciated by the staff. And that makes the work environment happier.

Next month we'll visit the transmitter site and see what safety hazards can exist out there.

■ ■ ■

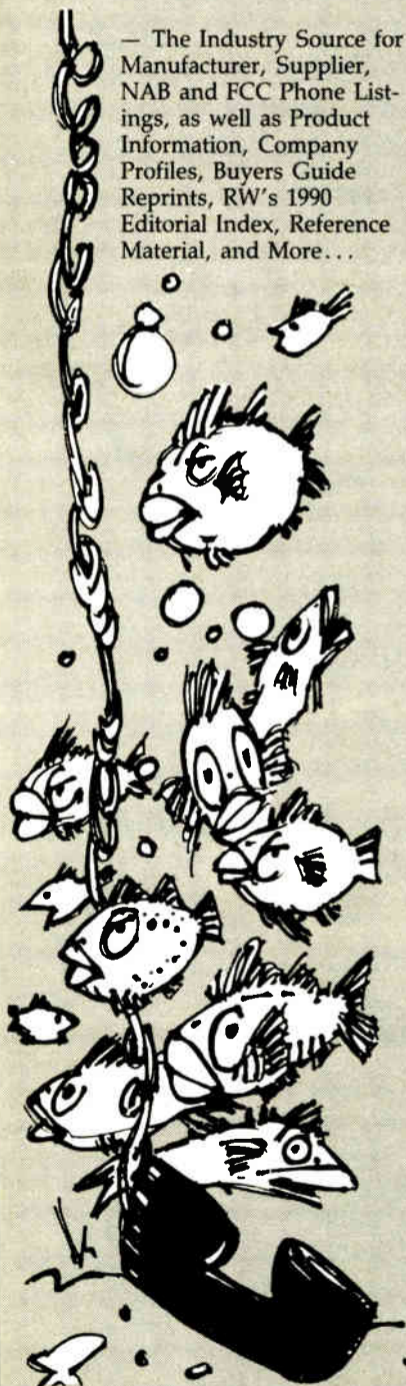
Barry Mishkind, aka RW's "Eclectic Engineer," is a consultant in Tucson. He can be reached at 602-296-3797 or 1:300/11 on Fido-Net or 'barry@coyote.data.com' on Internet.

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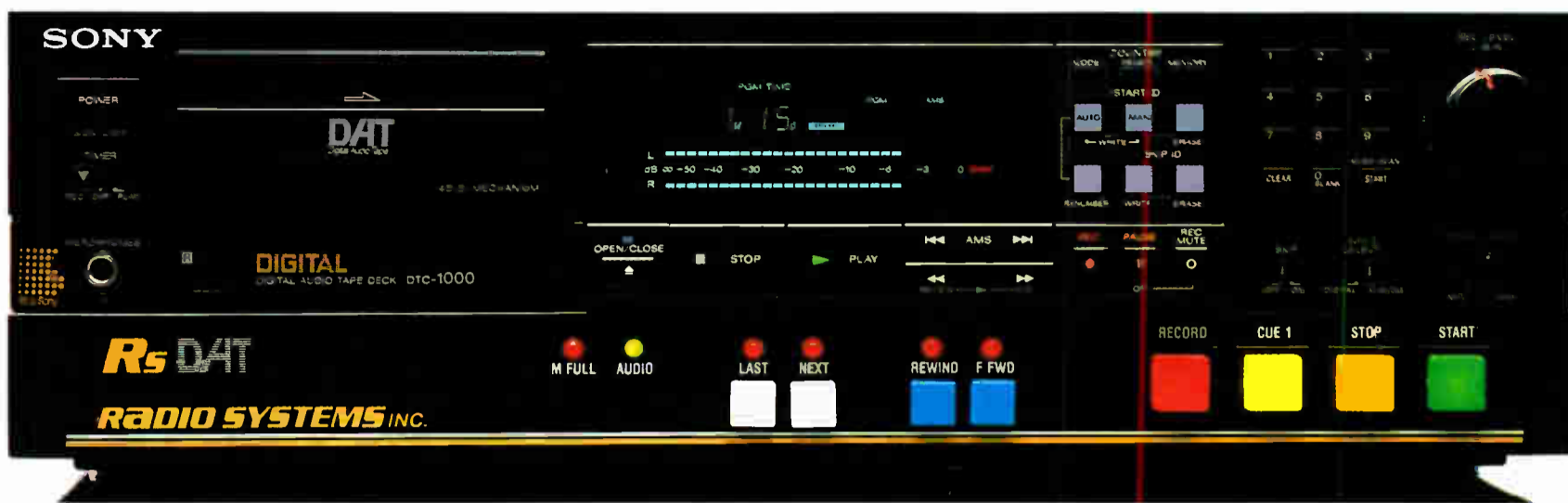
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Protection from Thunderstorms

Lightning Can Wreak Havoc with Transmission; Here Are a Few Things You Can Do About It

by John "Q" Shepler

Part II

ROCKFORD, Ill. You've survived another month. Luckily, the only casualty has been a monitor amp in the transmitter room.

Well, it wasn't really all luck. Both of the violent thunderstorms hit during the hottest parts of the afternoons. That meant somebody was available to dive

into the transmitter room and punch the low power button when the first strikes hit.

It also meant that the power lines were heavily loaded with air conditioners and industrial equipment. Those loads sop up a lot of transient energy on the lines. At 2 a.m. on a cool night, those same lines would be nearly perfect transmission paths for lightning spikes.

Last month we said that the power lines were the first and most common

path into the equipment racks. You might think damage from tower strikes would be more common, but not so. You have to take a near hit to the tower to get energy back into the transmitter. Those power lines stretch for miles and connect to even higher lines. A line hit a mile away can sometimes nail your circuits.

Blocking the power path

You want to suppress those transients before they get into the equipment. The most effective way is to simply break the connections with the power lines. Sounds easy, but then how do you stay on the air? An emergency generator is one common answer.

Many stations have emergency generators to take over during power outages or for disasters. Years ago, the government would even help you install one so they would have control of the airwaves during enemy attack.

Nowadays, a tornado, earthquake or hurricane is a more likely disaster scenario. Still, an emergency generator fueled from oil or gas is a handy backup power supply. If you are so lucky, consider going to emergency power for the half-hour to an hour that the lightning is over your station.

Another type of line isolation is the UPS—or Uninterruptible Power Supply. This is generally a set of batteries charged from the line and an inverter that creates 60 Hz AC from DC. A UPS creates very pure power, cleaner than what comes in on the lines.

But, these are expensive items. A UPS that could handle your entire station may cost more than a transmitter and perhaps more than some entire stations. You might get lucky and at least have your studios in a building with UPS backup. Large multi-million dollar computer facilities do. Otherwise, their use is restricted to providing backup power for PCs and other low wattage devices.

If you can't break the line, then you must filter out the large voltage spikes that ride in on it. Start right at the power entrance. Past the meter should be a fused cutoff switch. Next in line is where you install the surge protector. The protector connects from the one- to three-phase power lines to ground. Only after the surge protector should you install your main circuit breaker panel. Figure 1 shows this arrangement.

What's in it?

What's in a surge protector? Some use spark gaps or gas tubes that work something like neon bulbs or VR tubes. These may provide some protection, but a device called a MOV or Metal Oxide Varistor is more effective.

An MOV is a sintered semiconductor component with two connections. It hooks from the power line to ground. The MOV acts something like two back-to-back Zener diodes that clip the voltage surges. Normally, its voltage threshold is set above the highest normal line

voltage.

The surges from lightning and power transfers are in the form of high voltage spikes that last only milliseconds, but may be 600 V or more with an energy in the hundreds of thousands of Joules.

The MOV conducts only slightly on power line peaks. When its threshold is exceeded, however, it clamps down hard and tries to limit the voltage to only the MOV threshold voltage. The higher the surge voltage, the more the semiconductor conducts, absorbing the energy of the spike in its material. When the peak is past, the MOV stops conducting and cools off.

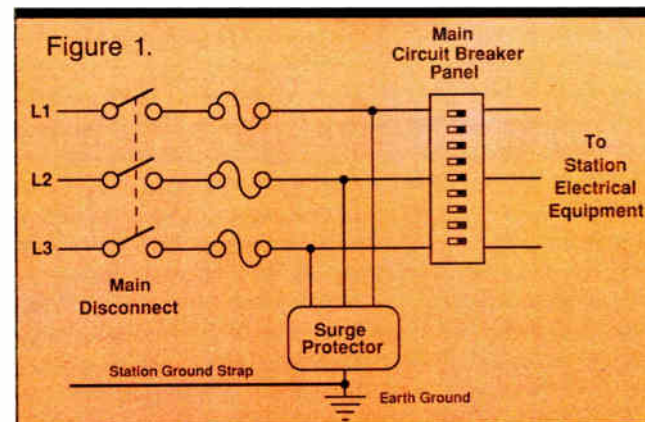
Q-TIPS

You need one large MOV for each line phase. Generally, you buy an electrical box with one to three devices and a terminal block mounted inside. Have an electrician install this—local ordinances may require you to do so, and it's always better for insurance purposes.

The only trick is to make sure the connections are tight and that you have the best ground possible with the shortest leads possible. Long wires act like inductors to fast rising transients. They add impedance that reduces the effectiveness of the suppressor.

Where to buy? Check the ads in RW, your equipment supplier or your electrical supplier. You also may want to call your friends at other stations for their recommendations. Note that the big MOVs are effective, but there are some newer systems that use even faster acting components basically the same way.

How about those plug-in suppressors?

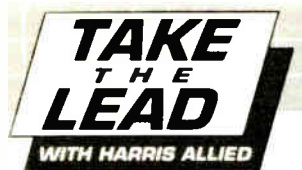


Guess what's inside? Yes, that red disk that looks like a ceramic capacitor is probably a 130 V MOV made by General Electric. Some of the better line protectors have inductor-capacitor filters to further reduce transients, including power line hash.

These individual protectors are good to have for your studios and anywhere you don't have control of the power mains. You also should consider them on any really expensive or sensitive equipment like copiers, processors, control boards and computers, in addition to the primary suppressor.

Hopefully, clamping the power lines with large and small voltage protectors will solve most of your storm damage problems. Next month, we'll look at some special considerations for the RF system.

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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Keeping Towers in Compliance

by Harold Hallikainen

SAN LUIS OBISPO, Calif. This month, we'll take a look at Part 17 of the FCC Rules, which deals with tower lighting and painting.

The FCC (and the FAA) consider these rules very important and recently have issued some large fines for violations in this area. In my review of the rules and violation notices that have been issued, there are really only a few items that seem to get stations into trouble.

So, this month you may want to check your maintenance and inspection procedures to ensure you're in compliance.

Many stations have been cited for a discrepancy between the lighting and marking specifications on the station license and the actual lighting and marking of the tower. Check to make sure the towers and the license agree. In many cases, the FAA has authorized the removal of lighting on relatively short towers, but the station license was never modified.

The FCC will cite the station for operating outside the terms of its license, even though the FAA may agree there was no hazard to aircraft. If you want to change the lighting and marking of a tower, you should first get FAA approval, then apply to the FCC for a license modification.

Section 1747 requires a *daily* inspection of tower lights (inspect at least once every 24 hours). As an alternative, a station may have an automatic alarm system that reports the failure of any lamp. The use of automatic alarm systems appears rather rare in radio. Most stations either do a visual inspection of the lights or observe a remote AC line ammeter. The operator must be able to detect the failure of *any* lamp.

It's difficult to tell if an operator can do this unless you want to climb a tower and unscrew a lamp. This can, however, easily be accomplished by adding a lamp

to the tower lighting system. This lamp would draw current through the current sense transformer, along with all the other lamps on that tower. A lamp failure can be simulated by turning off this lamp.

Most AM stations have a light in the tuning units at the base of each tower. Rewiring this lamp to run off the tower lighting circuit is generally pretty simple. The lamp would then be left on all the time. A lamp failure simulation is accomplished by turning off this lamp. The operator *should* be able to detect this "failure."

INSIGHT ON RULES

FM stations can similarly add a continuously burning lamp after the current sense transformer. 1747 requires an inspection of all control devices, indicators and alarm systems associated with tower lighting at least every three months. Such an inspection should include a check of the ability to detect the failure of any one lamp.

The beacon flash rate also should be checked. The flash rate is to be between 12 and 40 flashes per minute. The duty cycle of the beacon should be about 67 percent (that is, it should be on for twice as long as it's off).

Most stations also use photosensors to turn the lights on and off. These photosensors should turn the lights on when "the north sky illuminance on a vertical surface falls to not less than 376.64 lux (35 fc)." The lights should be turned off when the similarly-determined illuminance is not less than 624.31 lux (58 fc). Get out your light meter and figure out which way is north.

As part of the quarterly tower light control/monitoring equipment inspection, I'd suggest an inspection of all

aspects of the towers. Is the paint still in good condition? Are the tower guy wires tight? Are there any signs of rust on the tower, the guys or the guy anchors? Are the ground system and all ground straps in good condition? Are any lightning gaps clean and properly set? Are base insulators clean and in good condition? Are guy wire insulators in good condition?

The items to be checked will, of course, vary from station to station. It's difficult to remember all the things to check when it's only done four times a year. For this reason, I'd suggest developing a checklist of the items to be checked at *your* station. With each inspection you may find more items to add to your checklist.

Keep it on your word processor and update it as necessary. I compare this "checklist" procedure to that used by pilots. A very experienced pilot still uses a checklist prior to each flight. She/he does not just hop in the plane and say, "Looks OK to me." The completed checklist becomes part of your station log. It shows that you're doing a good job at ensuring compliance with the FCC requirements.

The tower light logging requirements are pretty minimal. It is suggested, however, that stations go well beyond what is required by the rules to demonstrate compliance with the various other requirements. Part 1749 requires only the

logging of tower light failures and repairs. For lighting system failures (any failure, even a side light), the nature, date and time of the failure are to be logged. For repairs, the nature, date and time are to be logged.

I'd suggest going beyond this logging requirement by logging the daily tower light inspection and the quarterly inspections. If the daily inspection involves reading an analog indicator or a digital indication of an analog value (the light line current), the indications should be logged along with the interpretation ("all lights OK"). The posted operator instructions should include detailed instructions on tower light checking, including analog limits, what to do on a failure, etc.

The FAA is to be notified immediately of *observing* a lamp failure that is not repaired within 30 minutes (1748(a)). This notification is required on the failure of any top lamp (flashing or steady) or any other flashing lamp. Failure of intermediate level steady burning lamps need not be reported, though the failure must be logged. Repairs shall be accomplished "as soon as practicable" (1756(a)).

I'd appreciate hearing about any recent FCC inspections at your station. Ideally, I'd like to get copies of any FCC notices, your station response and any other comments.

■ ■ ■

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.

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WORKBENCH

Surplus Can Pay Off

by John Bisset

FAIRFAX, Va. Surplus electronic parts catalogs can be invaluable when making repairs on a budget. Jim Wenstrom of Klamath Falls, Ore., writes to tell of his Tascam 32s, which have seen plenty of action.

The selector switches that choose Input, Sync and Repro kept burning out. Most of the front panel switches are located on one PC board and the replacement cost nearly \$100 from the factory. It appeared that the problem with the original switch bank was that the contacts were made of very thin copper and one portion of the 4PDT section switched 24 V.

After about six months, the section would burn out. The surplus catalogs came to the rescue when Jim located several switch banks made by ALPS, the same manufacturer of the switches used on the Tascam.

Jim located one switch with three 4PDT sections and one DPDT section. Though it wasn't a direct replacement in terms of the mounting screws lining up, the switch pins did fit the PC board.

The only down side to using the "surplus" replacement was that the new

switch bank was not of the interlocking type, however, the price savings made this feature inconsequential—the "surplus" switch cost only a dollar. Jim Wenstrom can be reached at 503-882-4656.

★★★

Small market engineering can be an art in itself. Not only are engineers required to find creative ways to solve problems that many of us take for granted, but the economics usually dictate making use of equipment with fewer bells and whistles.

Take the low-end stereo console. To economize, input switching (which provides independent left-only, right-only and mono feeds, as well as a stereo feed) often is eliminated. This can really befuddle the jock who gets a single-channel dub from another station. Unless the tape machine has a means of summing the single channel into two, you're stuck. Or are you?

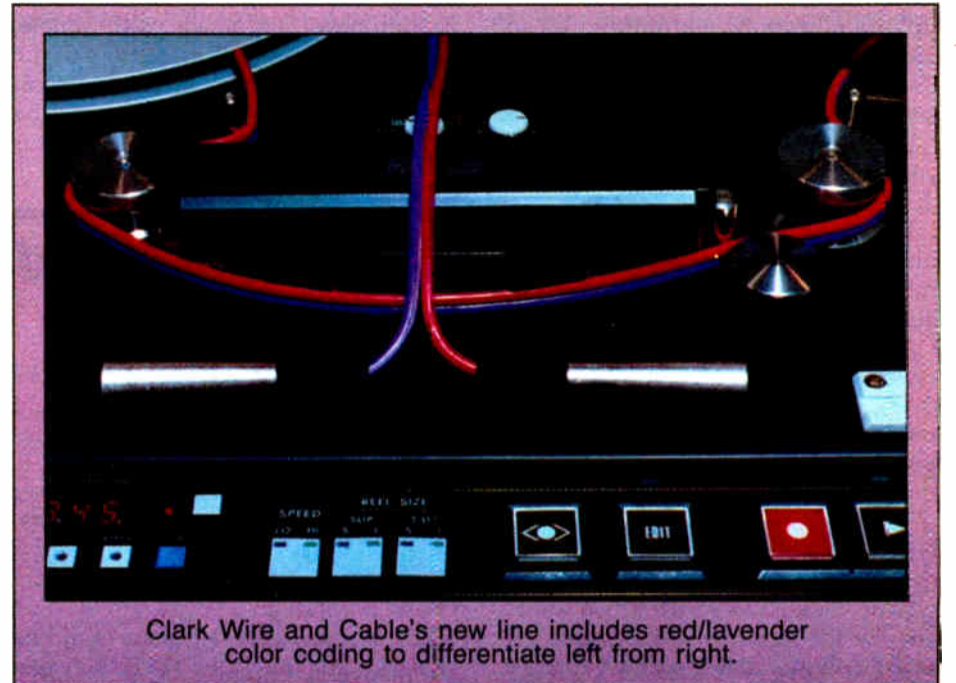
Promotion Director Bob Steele of WWTR, Ocean City, Md., offers a simple and cost-effective solution. In addition to wiring your regular left and right tape outputs into the console, bridge across each and run them to the "8" inputs of two other faders.

The next time a single channel dub is

received, if it's left only, you simply punch up the left fader—which has been wired to both the left and right inputs of the "B" selector switch—and make your dub. It's simple, fast and cheap (the only cost is a couple of feet of shielded

ice 54 for information on Clark Wire and Cable's new line of audio cable. Clark's red/lavender color coding makes grabbing the right cable easy.

First, the cables are fastened to each other. They quickly strip apart where needed, but



cable). Bob Steele can be reached at 301-289-4545.

★★★

Speaking of wiring tape machines—or an entire studio—circle **Reader Serv-**

otherwise, make for a neater installation.

Second, the colors were selected so that red is used for right and lavender is used for left. Clark's two-channel Ribbon Stereo cable also comes in black/gray and red/green. The cable also comes in three- and four-channel ribbons. At \$220 for 1,000 feet, this cable is a best buy for 22 gauged shielded cable.

So put some color in your life, as well as your studio. Susan Clark, president of Clark Wire and Cable, can give you more information, as well as free samples: 708-272-9889. It's always a pleasure to talk with people who know their product, and Susan adds a bubbly perspective to what was once a drab product.

After wiring your reel-to-reels with Clark's Ribbon Stereo wire, check that outboard power supply. On the MCI JH-110B, the rear mounted muffin fan does a great job of cooling the transistors as well as sucking dust and other contaminants into the supply.

As this airborne gunk coats components, their ability to transfer heat lessens. As the fan's filter clogs, whatever ventilation it provided lessens. Lose the fan entirely and it won't be long until you lose the supply. But fear not—a can of 70psi by Chemtronics can come to the rescue. Make sure you take the supply outdoors, since you'll be amazed at how much dust you'll blow out.

Even the best of cleaning can't always prevent mechanical failure. Ed Henkel, WGAY/WWRC, writes about low output power on his FX-30 exciter. The power light was flashing, indicating an over-temperature condition. The problem? A stalled cooling fan.

Unless you have a spare exciter, a spare fan is a must—especially if your exciter has seen a few years of service. Ed Henkel can be reached at WGAY/WWRC in Washington: 301-587-4900.

■■■

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

Ownership Revisions Repeat the Past

by Lex Felker

WASHINGTON At a recent open agenda meeting, the FCC adopted a controversial Notice of Proposed Rule Making looking toward revising its radio station ownership rules.

As I watched the meeting unfold, I was overcome with the strangest sense of "deja vu," because it reminded me of an earlier attempt to revise these rules that occurred during my stint at the Commission.

FELKER'S FORUM

Because of its desire to foster both economic competition and competition in the "marketplace of ideas," for decades the Commission has been concerned with excessive broadcast concentration. In the radio medium, FCC rules currently restrict concentration both locally and nationally.

Common ownership

Locally, two (or more) radio stations in the same service (AM/AM or FM/FM) cannot have common ownership if their principal city contours overlap. Nationally, Commission rules also limit to 12 (or 14 for minority-controlled firms) the number of stations in the same service under common ownership.

The Commission has been mindful of the need for some flexibility in the application of these rules to accommodate station sales and ownership changes in parent corporations, etc. Consequently, short-term waivers of these rules have been granted. But I am not aware of any permanent waivers being granted, regardless of the circumstances.

Of course, over the past 20 years the broadcast landscape has changed dramatically. Radio listeners have a greater number of alternatives from which to choose, and non-broadcast media are competing vigorously, both for advertisers' dollars and for audiences' attention. Therefore, the potential harm of increased broadcast concentration has diminished, while the benefits—both to listeners and to broadcasters—are more significant than might have been the case previously.

In recognition of this possible reversal in the costs and benefits

of its present ownership rules, the FCC is examining the possibility of relaxing both its local and national restrictions, especially as they relate to AM stations. Among the options being considered for modifying the national rules are raising or eliminating the AM cap and allowing ownership of AM stations in lieu of FM within some overall station limit.

Options to consider

Likewise, a number of options will be considered in relaxing the "duopoly" rule, including evaluating concentration of AM ownership on the basis of audience share rather than on a simple station count. The Commission also announced its intention to examine non-ownership arrangements among stations, including time brokerage agreements, and questioned whether policies should be adopted to govern these practices.

This is not the first run the Commission has made at scaling back its broadcast ownership restrictions. In the early 1980s, Chairman Mark Fowler proposed a roll back in the local and national caps, including the prohibitions on common ownership of radio and television properties in the same market.

An extensive record was developed in that proceeding that provided substantial empirical evidence in support of the proposition that many of these rules had outlived their usefulness. The Commission under Dennis Patrick found the record sufficient to pare back the ownership restrictions, but not to eliminate them. (That Commission also revised the "cross interest" policies to permit, among other things, time brokerage agreements among competing broadcasters.)

The competitive and technological conditions that exist in today's broadcast radio marketplace are far different from those that existed even 10 years ago. And tomorrow's digital broadcast service offers the prospect of even greater such changes.

In this environment, it may no longer be necessary, and indeed may be counterproductive, to continue to model the industry's organization based on conditions that existed decades ago. Despite the controversy surrounding the action, the FCC has taken an important step in re-evaluating its ownership rules.

■■■

Lex Felker is VP/Technology for Time Warner Telecommunications and a former chief of the FCC's Mass Media Bureau.

Comrex Offers Remote Tools

by Bruce and Jenny Bartlett

ELKHART, Ind. Somebody's thinking about you.

Audio equipment manufacturers are making products designed specifically for the needs of the broadcaster.

Consider remote broadcast equipment. Many companies are producing devices tailored exactly to this purpose. In this issue, we'll focus on one such company—Comrex—to show examples of current remote equipment.

Since the company began in 1961, Comrex equipment has come to be used worldwide. National Public Radio routinely employs Comrex gear for its remote reporters. The company's products fall into four major types: telephone interfaces, frequency extenders, sports mixers, and cue equipment. Let's check out each type.

To interface your mixer with telephone lines, you need a telephone coupler such as the TCB-1A or TCB-2A. You could use the coupler on a remote to send audio from your mixer to the studio via phone lines. The coupler connects your mixer to the telephone line by transformer coupling and holds that line.

LINE OUT

This switched-hold connection lets you hang up the telephone during program feeds. The telephone works normally. In the coupler is an audio connector for your mixer's signal and two telephone jacks for a telephone and the phone line.

Programming can be sent or received on the phone line, but not both at once



Comrex PLX cellular interface

unless you use a telephone hybrid such as the Comrex TH-1 or TH-X. The hybrid (or balancing unit) lets you put callers on the air by mixing caller audio with studio audio.

Extend your frequencies

A frequency extender lets you send high-fidelity audio on a standard dial telephone line. It's an encoder/decoder that allows telephone lines to achieve broadcast quality.

Normal phone lines sound tinny because of their narrow bandwidth: about 300 Hz to 3 kHz. When you use a frequency extender, an encoder at the remote location shifts all frequencies up by 250 Hz. In this way, 50 Hz is shifted up to 300 Hz, so it passes through the phone line filters. In the decoder back at the studio, all frequencies are shifted down 250 Hz. This restores the missing



Comrex SLX sports mixer

2½ octaves to the low end of the program.

There's help for the high end, too. A 5 kHz signal can be shifted to 3 kHz on a separate phone line. After restoring and combining the two lines at the decoder, you have audio from 50 Hz to 5 kHz. A third phone line gets you up to 8 kHz.

Comrex makes frequency extenders for one, two or three phone lines, permitting response from 50 Hz up to 3 kHz, 5 kHz or 8 kHz, respectively.

Why not use equalized phone lines instead? They cost more and may take at least two weeks to install. Also, according to Comrex, these lines are not available at all inter-data points, or beyond your telephone area code. A standard line and extender lets you cover an event with less advance notice.

When Illinois Bell laid additional fiberoptic cables to increase its traffic-handling ability, equalized phone lines were hard to get. In response to this, WCKG-FM (a classic rock station in Chicago) turned to standard dial-up

phone lines with Comrex frequency extenders.

In a sports remote, KOMO-AM in Seattle switched to a Comrex extender when the satellite link became noisy due

Many companies are producing devices exactly tailored for remote broadcasting.

to an earthquake. They used Comrex in another remote when the satellite feed was accidentally pulled. The station was told that the Comrex multi-line system sounded every bit as good as a satellite feed, so now they use the frequency extender exclusively.

A frequency extender can be com-

bined with a telephone hybrid, as in the Comrex PLXmicro and TH-X.

Sporty mixers

A frequency extender encoder with noise reduction is built into the Comrex sports consoles. The STLX model incorporates a two-line extender; the SLX has a single-line extender.

Designed specifically for sports or news broadcasts on the road, the sports consoles include several useful features: four mixing channels, a built-in telephone interface, custom monitor mix with station talkback on each headphone, AGC, aux in and out for external PA feeds or monitors and a battery pack.

A cue system transmits program and instructions from a transmitter to a pocket receiver. Typical uses are for electronic newsgathering or satellite newsgathering field control.

The Comrex cue transmitter is the model CTA, a 1 W rack-mount unit that you install in your studio, remote van or press box. It accepts both program and cue signals and sends these to the LPQRA pocket receiver. Cue instructions automatically duck the program.

Resembling a Walkman, the LPQRA cue receiver comes with a belt pouch and earphone and has a response up to 6 kHz.

Thanks to Lynn Distler, VP of marketing at Comrex, for this information. You can reach Comrex at 508-263-1800.

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



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Phase Linear 400 stereo 400 W pwr amp, \$400. P Rebmann, WEZY, 1412 E Lime St, Lakeland FL 33801. 813-682-4191.

McIntosh MC-2500, black, fact sealed, \$3475; (2) MC-240, \$1075 ea; (3) MC-40, (2) MC-225, \$575 ea; Grand Integra M510, \$2975; (2) Spectral DMA50, \$1475 ea; Yamaha B-2 V-fet, \$475; Luxman M4000, \$650/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Magnecorder amp & portable mixer; Ampex amp & spkr; call for prices. J Schramm, 205-826-0390.

Dynakit SCA35 integrated amp/preamp, \$125; Shurwood S5000 stereo tube amp/preamp, \$125; Bogan DB130 mono integrated tube amp/preamp, \$75; all excel cond. W Kremer, Kremer Kraft, 301 SW 16th St, Ft Lauderdale FL 33315. 305/524-5652.

Bozak CMA-150-2 rack mount pwr amp (4), 150/150 into 8, rebuilt, new PS condensers, smooth hi end for CRM bi-amp monitoring, no fans, excel cond, \$450 ea; BGW Systems 500/D rack mount pwr amp, 450/450 into 4 ohms, rebuilt, new PS caps, call soon & will throw in spare amp module, \$500; (2) Halfer P500 VMOSFET pwr amp, 400/400 into 4 ohms, smooth sound, \$1000/pair; all FOB Miami. P Appleton Studios, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

CBS Labs dual 1x8 audio DA, \$200. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

McIntosh MC-60 (2), 60 W mono pwr amp, tube type, \$800/pair. D Kronquist, D&D Prod, 7028 W 70th Ave, Armda CO 80003. 303-425-6851.

Marti PGM-20 line amp, \$40. P Wells, KJOY San Diego, 619-238-1037.

McIntosh 250 pwr amp, excel cond, BO. Pinetucket Rcrding, 205-826-0390.

Want to Buy

Denon POA8000 (2); Sansui B2301, BA5000, C2301. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

McIntosh tube tuners, amps, preamps, tubes, working or not, literature, manuals. R Glenn, WJGR, 1718 Shanna, Wimama FL 22598. 813-634-1940.

Altec 287-F/287-W, any cond; also, WE amps, Marantz & Ampro vacuum tube audio amps, Westrex cutter amps. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 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.

ANTENNAS & TOWERS

Want to Sell

ERI FML 3-bay tuned to 103.1 FM, 6 yrs old, \$2500. C Cooper, WOSM, 4720 Radio Rd, Ocean Springs MS 39564. 601-432-1032.

Motorola 22' fiberglass 2-way antenna, \$200/trade for ham rig. J Schloss, KICD, 2600 N Hiway Blvd, Spencer IA 51301. 712-262-1240.

EIA Flanges 3-1/8" rigid coax line, (20) 20' pieces, 50 ohm, stored indoors, \$200 ea; 3-1/8" rigid coax line w/Marmon type flanges (10) 20' lengths, \$180 ea. L Bruce, WBMX, 3 Fenway Plaza, Boston MA 02215. 617-236-6841.

Vacuum CAP ATUS used in 4-tower 50 kW DA, as group or individually, BO; 50 kW 4-tower CSP phasor w/control panel & all vacuum capacitors, new in '83. BO. J Bisset, Multiphase, Falls Church VA. 703-379-1665.

190' self-supporting tower, 150' to platform w/40' of 45G, BO. A Baron, 211 Front, Lynden WA 98264. 206-354-5252.

Andrew HJ8-50B 3" 350' heliax, new \$5600
#87R 1-5/8" EIA conn,
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Coaxial Cable, 1-5/8", gas fed, 280'; (1) piece w/connectors, \$1400; Jampro 4-bay, 92.1 MHz, w/standard leg brackets, purchased new in Dec. 1989. BO. G O'Rear, WZEW, POB 2608, Mobile AL 36652. 205-432-0102.

Gates/ERI FMA-8B 8-bay horiz on 94.5 MHz, complete, BO/trade on low pwr FM xmit. F Hollon, Rt 1 Box 72, Plymouth IL 62367. 217-392-2340.

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Shively 6810 1-bay 10 kW FM antenna w/ radome, tuned to 92.7 MHz, excel cond, used 7 months, \$900. M Gollub, WMJS, POB 547, Prince Frederick MD 20178. 301-535-2201.

ERI G8CPS-6AC-3, (5) bays on 102.1 MHz, \$1600/bay. J Maples, WMYU-FM, 8419 Kingston Pike, Knoxville TN 37919. 615-693-1020.

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350' tower, 24" face, 7 yrs old, w/lights & beacon, gd cond, you disassemble & transport, \$10,000. C Shank, KSKU-FM, 106 N Main St, Hutchinson KS 67501. 316-665-5758.

Celwave ECFM-2, 2-bay educ, tuned to 94.5, \$600 incl shipping in US. J Alsip, KSCQ, Box 1528, Silver City NM 88002. 505-538-3396.

Rohn 55G, 310', lighting & guy wire, 4.5 yrs old, avail 9/91. B Williams, WBLG-FM, POB 900, Bowling Green KY 42102. 502-843-0107.

Xmission line parts selection, 3-1/8", new & used, coaxial switches, ELLs, bullets, couplers, over 200' of xmission line on spool, call for list. B Valerius, KCCZ TV-4, 1305 N Airport Rd, Cedar City UT 84720. 801-586-5938.

Hughey & Phillips A-2 lighting system incl beacon, obstruction light, 350' conduit, wire & controls, \$2250. P Lierman, KCSP, 601 W Collins Dr, Casper WY 82601. 307-265-5414.

1-5/8" coax, 425', gd cond, no leaks; 250' 100-pair phone line cable. K Grice, KMZE FM, 2728 Williams Ave Box D, Woodward OK 73801. 405-256-3692.

ERI CP-3 bay, suitable for Class A, tuned to 103.1, retunable, \$250; Gates ATU boxes (2), 3'x3'x3' aluminum w/winner & outer door for pole/effce mounting, w/feeder clamp & ammeter switch assembly, \$200 ea. F McCoy, 2118 W Warner, Chicago IL 60618. 312-712-3529.

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Jampro JHCP 6-bay FM brdcst antenna, tuned to 100.3, 20 yrs old, gd cond, recently removed, BO; ERI G5 4-bay FM antenna, on 100.3, used less than 6 mths, excel cond, BO. B Harris, KXL1, 5350 S Roslyn St #210, Englewood CO 80111. 303-741-5654.

Used 3-1/8" xmission line components: dielectric thru-line section; to N adapters; bullets & 48" line section; various solder flanges; female Heliax flange. J Bisset, Multiphase, 703-379-1665.

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Valley People pwr rack w/(2) Grain Brain limiters & (2) Kepex expanders, \$1150/BO; (2) dbx 180, balanced. B Walker, Soundscapes, 501-661-1765.

Sony PCM-501 ES digital audio processor. D Stortz, KFJQ, 85 Founders Ln, St Louis MO 63105.

Shure SE-30 3-input mixer/gated compressor, w/rack mounts, gd cond, \$150. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

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Tone processor (2), 25 Hz, \$375. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

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UREI BL-40 modulimiter manual & schematics, will pay postage & copy charges. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

dbx 941/942 Type II NR encode/decode module. R Burton, Audio Rents, 7237 Santa Monica Blvd, Hollywood CA 90046. 213-874-1000.

Vintage tube amps, preamps, ECs, compressors by Altec, Collins, Marantz, McIntosh, RCA, WE, etc. W Kremer, Kremer Kraft, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5652.

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

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Schaefer 903A automation system, re-built, (4) ITC 750 R-R, (2) Audiophile IIA, keyboard, printer, remote panel w/50' cable, BO. B Bolton, WCBH, Casey IL 62420. 217-932-4900.

Harris System 900, (5) Otari ARS-1000 R/R, (4) Go Cart 24-cart Carousels, (2) ITC Delta II PB carts, (2) Micropolis disk drives, system controller, (4) Audicord PB carts, Audicard R/PB cart, gd working cond, just removed from service, BO. J Bisset, Multiphase, Falls Church VA. 703-379-1665.

Schafer 8000 computer automation controller w/Lear-Siegler ADM-3A CRT terminal, logging printer, (2) blue Schafer racks, SMC Carousel, many parts, all manuals & documentation, can run 24 total sources, \$1200. G Gaskey, KWHQ, 261 Main St, Weed CA 96094. 916-938-3828.

Format Sentry w/Commodore 64, \$2500; (2) IGM Go Cart 24, \$2000 ea; (3) Audicord S Series cart PB, \$500 ea; (4) Otari ARS-1000 reel reproducers, \$850 ea; reel sensor, \$100; (2) racks for above, \$300 ea; or complete 6-yr-old system, \$11,000+shipping. B Toole, KGVO, 127 N Higgins #107, Missoula MT 59802. 406-721-1290.

BE Control 16, 3,000 events w/(2) 42-tray & (1) 78-tray IGM 60 Cart IIs, (4) Scully playdecks if desired, (3) racks incl CRT, printer, spares, you ship, BO. D Brown, KVLE-FM, POB CC, Page AZ 86040. 303-641-3225.

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IGM 48-tray stereo instacarts (3), plus cables, on-air, \$4250 ea/\$12,000 all. T Hansen, 805-438-3221.

SMC MSP 12, complete satellite/music auto system, dual cart PB, dual SMC 452 stereo cart Carousels, CRT, 2000-event memory, used 6 months, half price. D Carpenter, KKSR, Box 699, St Cloud MN 56302. 612-253-9600.

SMC DP-2, (4) Carousels, (4) reel decks, new SMC Otari deck, all assoc equip, BO; SMC 450-800 nearly new Carousel, BO; SMC DT-4 card encoding data terminal w/CRT, BO. C Springer, KSEC, POB 890, Lamar CO 81052. 719-336-2206.

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Panasonic AK-30 (2), w/broadcast grade Plumbicon, gd cond, BO. D Brennan, Brennan Enprns, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

Panasonic AG-450 S-VHS camcorder (2), new cond, all access, \$1200 ea firm+UPS. R Larson, Larson Prod, 3 Braden St, PI ME 04769. 207-764-3770.

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Early TV cameras for collection, studio & portable, also need tripods & camera heads. A Weiner, WREM, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

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CART MACHINES

Want to Sell

ITC SP stereo 3-cue cart deck, gd cond, \$500. P Rebmann, WEZY, 1412 E Lime St, Lakeland FL 33801. 813-682-4191.

Audicord 3-deck mono PB; Audicord mono R/P; mint cond; ITC R/P premium delay, mint cond; ITC R/P stereo w/tones; (5) stereo Audicord cart machines. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

Sparta cart-delay machine, like new, \$500; Spotmaster 505, (2) R/P & (1) play only, gd cond, \$200 ea. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

BE Spotmaster (2), stereo, primary, secondary, tertiary cue tones, auto fast forward, low hrs, excel cond; 3200 PS R/P, \$1600; 3200 PS play only, \$850; \$2250/both. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

ITC ESLIV, gd cond, you ship, \$500/BO. C Cullett, WGAN/WMGX, 200 High St, Portland ME 04101. 207-774-4561.

ITC 3D triple-play deck 1 cue, w/matched WRA record amp, rebuilt & updated pwr supply, heads, bearings, etc, free PR&E interface box if needed, \$2150 FOB Miami. P Appleton Studios, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Sparta Century (3), w/parts machine & extra boards, \$300/all. B Mayben, WKXJ, POB 91, S Pittsburg TN 37380. 615-837-5544.

UMC 11-113 mono repro, 3 tones, \$325; (2) ABCO wire cart racks on floor stands, hold 500 carts, \$175 ea; set LEL alignment gauges for Ampro cart decks, \$15. P Wells, KJQY San Diego. 619-238-1037.

ITC 99B stereo w/ELSA, \$2800. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

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ITC Premium series stereo R/P (2), mint cond. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

ITC Delta Stereo PR99 stereo P (8), (1) 99-B R/P stereo, vgc, \$7000/all. D Solinske, WSUN, 877 Executive Cntr Dr W, St Pete FL 33702. 813-576-1073.

Gates Criterion I stereo P only, gd cond, \$75. E Reihl, 1715 Illinois Rd, Northbrook IL 60062. 708-272-7125.

Tapecaster 700P (2), (1) w/new motor, (1) w/new relay board, gd cond, \$250 ea. A Ishkanhan, 9723 Riggs Rd, Adelphi MD 20783. 301/439-7222.

Telex 36 deck, uses NAB carts, rack mount, 4-trk mono, new in box, no electronics, \$150; Viking 500, 12 V NAB tape player, 4-trk stereo, w/PB amp, like new, \$50. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Spotmaster 500C PB cart machine, works, as-is, no manual, \$300 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

Cartridge tape winder, works, as-is, no manual, timer broken, \$60 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

CASSETTE & REEL-TO-REEL RECORDERS

Want to Sell

Otari MX5050, older unit in excel cond, \$300+shipping. B Mayben, WKXJ, POB 91, S Pittsburg TN 37380. 615-837-5544.

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Berlant Concertone tube stereo 1/2 trk, 2-speed, excel cond, \$500/BO; Tandberg 5-tube stereo rcrdr w/aux record amp, excel cond, \$250/BO. W Kremer, Kremer Kraft, 301 SW 16th St, Ft Lauderdale FL 33315. 305-524-5522.

Scully 270 (5), some aren't working, \$550/all. M Kestler, KAWZ FM, 208-733-3133.

Numerous recorders avail incl: UHER, vintage Edison tape voicewriters, Avent w/Dolby, Norelco Square, Grunding, Webcor, Cylinder; Sony dupl, master(3) slaves, hi-speed, excel cond; call for prices. J Schramm, 205-826-0390.

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Studer/Revox HS-77 Mk IV 2 trk, 15/75, highly-modified, ultra-analog audiophile mastering, excel cond, \$1375/BO/Trade; HS-77 Mk IV FT mono, 10 hrs use, as new, \$475/BO/Trade; port case for A77 w/moon spkrs & pwr amps, excel cond, \$375. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Tascam 32 R-R/PB (2), w/remot control, in steel blue custom-designed racks, 1.5 yrs old, excel cond, \$1100 ea. G Livingston, WCCO/WQRT, Star Route, Salamanca NY 14779. 716-945-1515.

Telex 300 R-R duplicator, cassette slave, rack cabinet, manuals, like new, allparts, BO/Trade. D Bebee, 685 S Roys Ave, Columbus OH 43204. 614-279-6163.

Audiotronics AV123-4TS 1/4 trk R-R duplicator; Infonics RR-1(73M) FT; Infonics RR-2(74M) 2 trk; all gd cond, \$200 ea. R Meyers, Benchmark Comm, 4700 SW 75 Ave, Miami FL 33155. 305-264-5963.

Ampex 350/351/400, compl machines plus heads, motors, transports, electronics, \$25-\$250/Trade. J McLane, ODDEO, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

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dbx 105X 2-chnl type 1 NR, balanced I/O, 16 chnls avail, \$150/2 chnls. M Baykian, Research Kitchen, 6689 Orchard Lake Rd #151, W Bloomfield MI 48322. 313-737-0751.

Otari 7308 1" 8 trk deck, 15/30 ips, low hrs, excel cond, w/remot, \$4500; Ampex 612, stereo/mono, PB only, \$50. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

Scully 280-B, FT in Russlang cab, pwr supply prob, gd cond, w/manual, \$275; Pioneer RT-701 1/4" rcrdr (2), 7.5 & 3.75 ips, fair/gd cond w/manuals, \$100 ea. C Hendrix, WMNF, 1210 E Milking Blvd, Tampa FL 33603. 813-238-8001.

Sony/MCI JH110 B/C 2 trk w/complete spare boards set, gd cond, \$2000. S Beverly, Flamingo Prod, 210 NE 57th St, Ft Lauderdale FL 33334. 305-771-2947.

Berlant Concertone Stereo 33 open reel deck (2), vintage; Dokorder 7" open reel. Ivan, WCUA, 301-984-1800.

Nakamichi 1000-ZXL computer-controlled cassette deck, w/NR-100 Dolby C, rack mount w/rosewood case, low hrs, excel cond, \$1375/BO/Trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Tascam DA-50 DAT rcrdr, \$1800. J Reans, Sunday Prod, 3301 3rd St, Motine IL 61265. 309-797-2510.

Telex 6120 stereo cassette duplicator, 1x3, \$2500. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Sony TC-650 1/4-trk stereo deck w/remot, gd cond, \$375. D Meyer, Meyer Prod, 7425 Sepulveda #33, Van Nuys CA 91405. 818-785-2324.

Ampex 601 1/4" tube-type, 1/2-trk in Samsonite luggage case, working, \$700/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02187. 617-969-9966.

Otari ARS1000, new in box. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

Ampex 440-B stereo audio tape rcrdr, in Russlang console, excel cond, \$1500/BO; Studer C-37, tube stereo, never used, in Studer console, BO. R York, Jewel Records, 1594 Kinney Ave, Cincinnati OH 45231. 513-522-9336.

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Ampex 600, 601, 602, (10) units, (2) for parts. BO. V Baker, POB 889, Blacksburg VA 24063. 703-552-4252.

Ampex AG-440B 1" 8-trk console, gd cond, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

Revox A-77 stereo R-R, \$250; Revox A-700 stereo R-R in cabinet, \$300. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

Otari 5050B 1/2-trk, new, \$2500/BO. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

Broadcast Supply Rax 100 cradle mounts (3) for MK 5050ll, used 6 months, \$40. B Lord, Lord Bdgct, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Want to Buy

Ampex 351 rcrding head stack, any cond. J Schloss, KICD, 2600 N Hiway Blvd, Spencer IA 51301. 712-262-1240.

Otari 5050 Series, FAX info to 203-634-1478. J Pescatello, WMMW-AM, 900 E Main St, Meriden CT 06450.

Tascam/Teac 501 record/reproamp & 705 transport service info, schematics, will pay postage & copy charges. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

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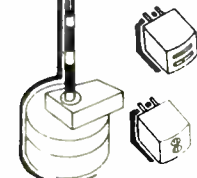
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Scully 280B 2-trk stereo, \$1700; 4-trk 1/2" w/dbx NR, \$2750; FT w/tension control, \$1200; FT w/tension control & servo motor, \$1350; all excel cond & in Russlang consoles. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

Scully 284-B 8-trk recorder, \$5000. H Sewell, Oakridge, 2001 Elton Rd, Ft Worth TX 76117. 817-838-8001.

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Ampex MR-70, gd cond. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 305-866-5401.

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

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CD's

Want to Sell

Sony CDK-006 CD juke boxes (2), interfaced to Sentry Systems FS-12C Format Sentry, w/spare interface, documentation, software, cabling, no computer, \$2500 ea; Format Sentry, \$2500; sell togeth or sep. R Sherman, WKBM, 32401 S RI 53, Wilmington IL 60481. 815-476-5655.

Technics SL-P1200 brdcst CD player, cue to music, cue wheel, oversampling D/A, excel cond, \$400. J Addie, WFMT, 303 E Wacker, Chicago IL 60601. 312-565-5033.

Adult contemporary library w/2200 songs on CD & cart, incl 93 Golddiscs & 230 misc CDs, add'l 170 songs dubbed on Scotchcart IIs, \$7500; country library w/1500 songs on 66 CD Golddiscs & 500 add'l Scotchcart IIs, \$6000; both used 6 months. B Lord, Lord Bdgct, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

COMPUTERS

Want to Sell

Tallgrass TG3135 external 35 meg hard drive & 45 meg tape back-up, software, interface card, manuals, \$500. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

Wang 2200 LVP-X, 32 meg internal hard drive, 8" floppy drive, (3) terminals, gd working cond. M Young, WJON/WWJQ, POB 220, St Cloud MN 56302. 612-251-4422.

Amiga 2500, 3 meg RAM, 40 meg hard, IBM Bridge Board, stereo mon, Super Gen brdcst genlock, incl \$3000 of brdcst software, mint cond, \$3800; Tamron Fotovix, xtra lens, mint cond, \$1250; Whellit Cart w/smooth fluid head, excel cond, \$400. T Noorlyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

OkiData Laserline 6 laser printer, emulates HP Laserjet, utility software, manuals, \$300+shipping. V Gray, 6840 Sterling, Raytown MO 64133. 816-358-8929.

CONSOLES

Want to Sell

JBL 7510 automated mic mixers, rack mount, (1) w/8 inputs, (1) w/12 inputs. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

BE boards (2), (5) stereo carts, R-R. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

Ambassador mono 5 fader SS console w/step attenuators, modules, pwr supply, new/accurate manual, needs work, \$450/BO+shipping. M McCarthy, McCarthy Radio Eng, 708-640-8965.

Sparta A-10B monaural console, mint cond, \$300; Ampex AG-350 monaural FT in console, gd cond, \$300; Crown 801 monaural FT portable w/matching spkr/amp, \$200. B Weiss, KLSI, 3101 Broadway #460, Kansas City MO 64111. 816-753-0933.

Classic British Helios 24/16/24, c. '70s, many updates/models w/full documentation, (9) separate pwr supply w/wood rack cab, mahogany desk, \$9500/BO/Trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Shure M67 mixer & M875 production master w/lne inputs & cue system, gd cond, \$200/set. S Kowalski, WXXL, 337 S Northlake Blvd # 1067, Altamonte Springs FL 32701. 407-339-1067.

Arrakis 150SC stereo console (2), 6 mixing positions, 12 input, built-in mon amps, many other features, like new, \$1250 ea; (2) BE 4M50A mono consoles, 4 mixing pos, built-in cue & mon amps, like new, \$500 ea; Audio Technica Consolettes AM-500 stereo, 6 mixing pos, 9 input, other features. B Cook, 1412 S 21st St, Colorado Springs CO 80904. 719-594-9464.

RCA BC19A stereo consolette, 4 chnls, no manual, needs work, \$350. W Nauman, WLWJ, 400 J Royal Commerce Rd, Royal Palm Beach FL 33411. 407-793-5555.

CONSOLE . . . WTS

McCurdy 8500 custom 10 mixer dual stereo brdcast console, \$4995. D Vernier, KUNI, U of N Iowa, Cedar Falls IA 50614. 319-273-6400.

Opamp Labs 2008-4E, 20 input, 8 subs, stereo mix out, gd prod board, very clean, \$3500. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

2005 AD road board w/spares, 16-chnl, \$450 FOB Miami. P Appleson Studios, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Shure M-67 mixer (2), gd cond, \$100 ea. G Jablonski, WHMI, POB 887, Howell MI 48844. 517-546-0860.

Audionics 200VC mic compressor modules (3), for 200 series consoles; Audionics 201PEQ mic equalization modules for 200 series consoles (2), w/personality plug-in modules, xtra plug-in incl; all work fine, gd cond, w/documentation. H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

BE 55150 w/digital timer, well maintained. Ivan, WCUA, 301-984-1800.

Ramsa WR-8428 16x4x16x2, as new cond, \$7500/BO. F Baker, Sound Post, 7250 Thorapple River Dr, Caledonia MI 49316. 616-698-0866.

Pacific Recorders ABX-26 prewired complete prod room w/furniture by PRE, \$36,000; Pacific Recorders BMX18 prewired complete control room w/furniture by PRE, \$25,000; call for details. D Solinske, WSUN, 877 Executive Cntr Dr W, St Pete FL 33702. 813-576-1073.

RCA 686, tube-type, dual chnl, w/tubes & manuals, can be used in stereo, \$1000/BO. T Heathwood, Heritage Radio Classics, POB 16, Boston MA 02167. 617-969-9966.

MCI/Sony JH110-C-8 8-trk 1" factory console w/Auto Locator III & manual, excel cond, \$2000, you ship. R Leonardi, Voices, 212-935-9820.

Tapco Catalina C-12 mixer, 12x2x2, \$525; Fostex 450 8-chnl mixer, \$650. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Sony MX-20, 8 in/4 out mixing board, gd cond, no cover, \$425. D Meyer, Meyer Prod, 7425 Sepulveda #33, Van Nuys CA 91405. 818-785-2324.

Autogram AC-6 stereo console, never used, mint cond, \$3500. Wayne, Broadcasters Unlimited, 903-581-0606.

Rusiang console, turntable pedestal, equipment rack, cart rack, oak, NEW. Call Mark, 914-425-2225.

Want to Buy

Langevin AM4A w/docs. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

Stereo Gates or Harris console for rebuilding. J Schloss, KICD, 2600 N Hiway Blvd, Spencer IA 51301. 712-262-1240.

Mono 8-12 fader, late working model console, preler BE 8 or 10M150/200 or equiv. FAX specifications to MRE, 708-439-1464.

Autogram AC-8A or Harris 80 8-chnl. J Aguilar, XEKMX, Avila Camacho 137, Guadajara, Jalisco Mexico. 36-570-384.

Langevin AM4A w/docs. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

DISCO & SOUND EQUIPMENT

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Studio Sound S-305 passive filter sets, matched pair, consec #, rack mount, very rare, \$275 ea. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

UREI electronic crossover w/API rack frame, (4) 518-L & (2) 518-H cards, w/Automated Processes pwr supply, \$300 FOB Miami. P Appleson Studios, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Neumann PEV 3-band EQ, discrete transistor, xformers I/O, \$225/trade. J McLane, Oddeo, 115 W Gutierrez, Santa Barbara CA 93101. 805-963-3941.

Snake 16 phantom-pwrd inputs w/xt 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, \$775/BO/trade. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Denver recording studio for sale, 6000-sq-ft bldg, 25,000-sq-ft land, some equip, owner may carry, serious inq only. F Arthur, Arthur Prod, 6466 S Forest St, Littleton CO 80121. 303-220-0889.

Dukane 3A235 1/3 octave sound reinforcement syst EQ (2), \$250 ea; UREI 530 stereo octave EQ, \$250. S Kozak, 351 Pinewood, Bay Village OH 44140. 216-871-5897.

Dukane 100 W tube-type pwr amps; Altec-Lansing 9844 studio mon. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

Casio 510 stereo keyboard, gd cond, \$300; Fisher reverb, (2) amps w/(3) springs ea, \$125 ea; Echo Plate #2, 4-6', gd CF, \$500/trade. H Sewell, Oakridge, 2001 Elton Rd, Ft Worth TX 76117. 817-838-8001.

Peavey MB-1 mid-bass cabinets, \$600/pair; Peavey MB-2 mid-bass cabinets, \$300/pair; Peavey 4FH-2 bass cabinets, \$600/pair; Eastern Acoustic Works 2x15 bottoms w/JBLs, \$800/pair; Eastern Acoustic Works PA cabinets w/(2) 15", (1) 12" & (1) 2" compression drivers, \$1500 ea/(4) for \$5000. B Wilson, 212 S Side Ave, Campbellsville KY 42718. 502-789-1505.

Community Zoid mid-range enclosures, \$150 ea empty; Allen & Heath 24x9 mon board w/case, \$2200; (8) Community monitors, hold 12" & 1" compression driver, \$700; Crown DC-300A, \$450; Peavey MK4 24-chnl board, \$1500; Genie 24' super lifts for light trussing, \$1600/pair. B Wilson, 212 S Side Ave, Campbellsville KY 42718. 502-789-1505.

Klipsch horns in road cases, pair of spkr, 4 pieces, will handle 300 W/chnl, excel cond, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

Roland SRV-2000 midi digital reverb, mint, \$475; pair UREI 809A studio time align mon, \$1250; Valley People Dynamite compressor, 2 chnl, \$395. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

CRL SMP-900 AM stereo matrix processor, \$1000. M Young, WJON/WVJQ, POB 220, St Cloud MN 56302. 612-251-4422.

CBS Volumax 400 peak controller, \$150. L Wagner, ARN, POB 1788, Orlando FL 32802. 407-299-1299.

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RCA BA 43/46 & 45 audio processor, working when removed, w/rack mount chassis frame, \$65. J Cunningham, KEOR/KHKK, Rt 2 Box 113B, Stonewall OK 74871. 405-265-4496.

Valley 400 mic processor (3), never used, \$300 ea. W Bergman, WIZD-FM, POB 850, Plover WI 54467. 715-344-6050.

Harris Solid Statesman FM limiter, working, as is, no manual, \$100. C Hendrix, WMNF, 1210 E Milking Blvd, Tampa FL 33603. 813-238-8001.

CBS Volumax 4110, w/manual, excel cond, \$150+shipping/trade for Ashley SC-50 compressor. S Mahaffey, Mahaf Prod, 3592 N Delsea Dr #12, Vineland NJ 08360. 609-692-3439.

Mod Sciences CP-803 composite clipper incl rack mount, excel cond, w/documentation; Orban Optimod 8100A/XT2 6-band limiter chassis, excel cond, w/manual; CBS Audimax 4450A stereo AGC, gd cond. H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

CRL SGC-800 2-band stereo AGC w/Dynatex; CRL SEC-800 4-band stereo comp/limiter; CRL SMP-900A AM stereo matrix processor; all equip brand new, incl manuals & custom modification instruction list & parts. Shannon, WENS, 7201 E Hillsborough Ave, Tampa FL 33610. 813-620-9100.

Orban 418A stereo limiter, excel cond, \$375. M Gollub, WMJS, POB 547, Prince Frederick MD 20178. 301-535-2201.

CRL FM-2, SEP-800 stereo 4-band compressor, SMP-800 stereo modulation processor, stereo prep processor, BO. C Springer, KSEC, POB 890, Lamar CO 81052. 719-336-2206.

Howe Phase Chaser w/manual, \$600. B Downs, KTSR, Box 3246, Bryan TX 77805. 409-846-1150.

CRL complete 3-piece AM processor, AM-4 APP40, SEC400A, PMC300A. G Knop, 803-497-0460.

Gates Solid Statesman, \$275. P Wells, KJQY San Diego, 619-238-1037.

Orban Optimod 8000A w/Chris Hood audio mods & manuals, sounds grt, \$1700. S Schweiger, WXL0, 146 Worcester Ctr, Worcester MA 01608. 508-752-1045.

Want to Buy

Ashley SC-50 in gd cond, need badly. S Mahaffey, Mahaf Prod, 3592 N Delsea Dr # 12, Vineland NJ 08360. 609-692-3439.

Orban Optimod 9100A. J Aguilar, XEKMX, Avila Camacho 137, Guadajara, Jalisco Mexico. 36-570-384.

EXR EXIV exciter, buy/trade. B Walker, Soundscapes, 501-661-1765.

Optimod 8000A, will pay cash, leave message at 703-276-0125.

MICROPHONES

Want to Sell

Neumann U-87 (2), w/wind screen & shock mounts, \$1250 ea; Sennheiser MD 441U, w/case, \$200; all excel cond, like new. S Kowalski, WXXL, 337 S Northlake Blvd #1067, Altamonte Springs FL 32701. 407-339-1067.

Crown PZM 30GPG (2), w/PX-18B pwr supplies, like new, \$400 both. B Weiss, KLSI, 3101 Broadway #460, Kansas City MO 64111. 816-753-0933.

Telefunken/Schoeps CM-61 tube mic, very rare, uses std 6AU6 plug-in tube, w/o cables/pwr supply, mint cond, \$975/BO. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Shure/Telex W1520/58 wireless hand-held w/SM58 mic (2), 177.8 & 193.8 MHz, brand new, \$500 ea; (4) Turner 253 desk page/2-way mics, brand new, \$35 ea; Turner +2 transistorized desk 2-way mic, little use, \$25. E Davison, 135 N Illinois, Springfield IL 62702. 217-787-0800.

Sony ECM-50 lavalier mic, \$50. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

RCA 77-DX vintage ribbon mic, excel cond, BO. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

AKG 414B ULS condenser, shock mount, new, \$995. P Accardi, Evangelistic Ministries, 1521 Upper Fords Pond Rd, Clarks Summit PA 18411. 717-587-2382.

RCA/Altec/Telefunken: RCA 44-BX, 77-D, BK-5, KU3A 10,0001, SK-46, WE 639, Altec M-11 system, Altec M30 tube mic, Altec M49 & M50, (2) absolutely mint Telefunken U47's, will trade for other high quality mics & equipment. Tracy Eaves, 615-821-6099 (evenings).

Want to Buy

EV or other dynamic shotgun mics in working order, no condenser mics. D Neiburg, POB 194, Laurel MD 20725. 301-490-3015.

Telefunken/Schoeps CM-61 tube mic pwr supply & cable. R Katz, Allegro Sound, 15015 Ventura Blvd, Sherman Oaks CA 91403. 213-859-5543.

Altec, Normann, RCA, Sony, WE vintage mics. W Kremer, Kremer Kraft, 301 SW 16th St, Ft Lauderdale FL 33315. 305/524-5652.

RCA 44 & 77 mics, any cond. R Kaufman, Pams Prod, POB 462247, Garland TX 75046. After 3PM: 214-271-7625.

RCA 44BX/77DX; WE & RCA velocity mics. D deForrest, 7441 Wayne Ave #10-D, Miami Beach FL 33141. 305-866-5401.

MISCELLANEOUS

Want to Sell

Moseley Assoc CSA-3 DC amp modules (2); Moseley Assoc MMA-1 mod mon adapter. H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

Gentner SPH-4 hybrid elec phone patch, 2 yrs old, mint, \$450 FOB Miami. P Appleson Studios, 1000 NW 159 Dr, Miami FL 33169. 305-625-4435.

Inflatable logo, over 20' tall, can be modified for your station, w/fan & transportation crate, like new cond, call for details. B Weiss, KLSI, 816-753-0933.

Harris 994-8524-001 motor-driven RF contactor, DPDT, 30A at 1 MHz, new; Harris 994-4703-003 motor-driven rheostat, 300 W, new. G Jablonski, WHMI, POB 887, Howell MI 48844. 517-546-0860.

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

Engineer w/8 yrs exper seeks position as chief/assistant in AZ, CA or UT, exper in AM stereo + directional & FM. Allen, 1854 Granada Dr, Riviera AZ 86442. 602-758-7829.

Anncr w/15 yrs exper seeks position in TX, AR, MO or KY, news prod & sales exper also. T Horan, 501-337-7218.

ATTN Syracuse area stations, looking to come back to area, 15 yrs exper in announcing, talk, news. W Byers, 321 16th Ave NE, Jamestown ND 58401. 701-251-2336.

P-B-P w/7 yrs exper, relocating to NH/MA 9/91, prev positions in SD, PD, MD, GM & OPS, salary not biggest factor, last 6 yrs at same sm-kt AM. A Ward, 602-855-9672.

CE, 4 yrs exper, studio construct, hi-pwr FM, directionals, programming, jock, seeking eng or combo position anywhere E of Mississippi. Paul, 904-654-1697.

Smart Eng, detail oriented, exper w/remotes, audio, prod, equip repair, seeking position at NYC-CT area broadcaster. D Schwartz, 5 Peveril Rd #3, Stamford CT 06902. 203-965-8340.

Anncr w/over 1 yr exper, striving to succeed, anything FT in OK, MO, KS, AR or TX. Richard, 918-256-6164.

Multi-faceted GM-GSM team seeks troubled station to turnaround, we'll return your operation to fiscal soundness in xchange for equity and/or purchase option. Ed, 301-722-5499.

Detail-oriented indiv, exper w/brdcast eng, remote recording, audio prod & equip repair seeking staffper diem pos at NYC/CT facility. D Coe, 5 Peveril Rd #3, Stamford CT 06902. 203-965-8340.

Recent grad w/degree in comm/radio/audio prod, exper & ambitious about all aspects of brdcasting. Tina, 26 Mace Pl, Lynn MA 01902. 617-599-1582.

Quality air talent wants to work for your winning team, 6 yrs exper incl programming, prod, copy & script writing, voices, etc. Randy, 704-596-4864.

Versatile 5 yr pro seeks stable sports dir/sales/anncr pos w/midwest station, PBP, sales, prod, news, will relocate. Robert, 319-652-6640.

Modern/new rock PD, fresh from successful AM turnaround, early 20s. Bree, POB 10247, Pittsburgh PA 15232.

Recent college grad w/4 yrs tech exper in college radio seeking commercial station pos in Rockland Cnty/NYC. D Gablas, 914-735-6844.

Helicopter pilot seeks traffic reporter pos in major market or ENG, member AFTRA, w/CBS O&O 11 yrs as eng, can supply Bell 47G on lease back. G Knop, 803-497-0460.

25+ exper in all phases of radio, sm & med markets, seeking station mgmt pos in FL or S GA. B Sutton, POB 1065, Hobe Sound FL 33475.

25 yrs mgmt exper in all phases of radio & TV, seeking mgmt pos in Scentral FL. Bill, 813-471-2723.

HELP WANTED

AM/FM or Combo wanted. No money down or equity position desired. Turnarounds or distressed OK. Anywhere in US. Will make it worth your time! B Simonson, 208 Blake, Galesburg MI 49053. 616-665-7140.

Electronic Engineer Wanted

A manufacturer of broadcast equipment located in the Southwest seeks a person with a strong background in analog and digital electronics with emphasis in audio engineering. Must have experience with DSP and a strong background in analog audio design. Experience in broadcasting and broadcast equipment manufacturing preferred. Company has excellent reputation and good benefits. Send resume only to: Radio World, POB 1214, Falls Church, VA 22041, Attn: 91-07-01 RW.

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



Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

RadioWorld
5827 Columbia Pike, Ste 310
Falls Church, VA 22041

Select from these categories for best ad positioning:

- Acoustics
- Amplifiers
- Antennas & Towers & Cables
- Audio Production (Other)
- Automation Equip.
- Brokers
- Cameras (Video)
- Cart Machines
- Cassette & R-R Recorders
- CATV-MATV Equip.
- CD's
- CD Players
- Computers
- Consoles
- Disco-Pro Sound Equip.
- Financial Services
- Limiters
- Microphones
- Miscellaneous
- Monitors
- Movie Production Equip.
- Receivers & Transceivers
- Remote & Microwave Equip.
- Satellite
- Software
- Stations
- Stereo Generators
- Switchers (Video)
- Tapes, Carts & Reels
- Tax Deductible Equip
- Test Equipment
- Transmitters/Exciters
- Tubes
- Turntables
- TV Film Equip.
- Video Production Equip.
- Video Tape Recorders
- Positions Wanted
- Help Wanted

Display Rates for Classified Advertising Effective January 1, 1991

	1x	3x	6x	12x
1-9 col inch (per inch)	\$55	53	50	45
10-19 col inch (per inch)	50	48	45	40
Distributor Directory	90	85	80	75
Professional Card	60	55	50	45
Classified Line Ad		\$1.50 per word		
Blind Box Ad		\$10 additional		

To compute ad costs: Multiply the number of ad inches (columns x inches) by the desired rate schedule for your per unit cost. Example: a 3" ad at the 1x rate is \$165, at the 3x rate \$159, at the 6x rate \$150, at the 12x rate \$147, etc.

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 \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

Mail To: BROADCAST EQUIPMENT EXCHANGE
PO Box 1214, Falls Church, VA 22041

MISCELLANEOUS . . . WTS

Shallco 320Q-2B3-6 rotary stereo faders (8), w/ cue defctnt, \$30 ea. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Station spring cleaning, wide variety of items & parts avail, write for list. E Monksie, Hall Comm, 24 S Queen St, Lancaster PA 17603.

Electrovoice Baronette sprk cabinet, w/ or w/out sprk, BO. D Geis, Geises, POB 991, Gualala CA 95445. 707-884-4833.

Jerrold TV modulator, chnlrs 2 & 4, call for details. J Schramm, 205-826-0390.

ABC network decoder, BO. J Curtis, KLSQ/KFRO, 481 Loop 281 E, Longview TX 75606. 214-663-3700.

ADC 1/4" patch bay, 52 pt, normald, \$30. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Audico manual cassette loader (3), \$800 ea/\$2150 all. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

Trillium Panther II 10-line 32-phone system, w/20 phones, DSS & manuals, 3 yrs old, \$3800. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Jobo CPE-2 small findiv color film & print photo processor, access, Jobolift, \$450/BO; Edison Standard B cylinder phonograph, 1905 model, plays 2 & 4 min cylinders, works fine, w/H & C reproducers, BO; Toyo/Omega 45E 4x5 view camera, 16.8 210mm lens, many access, gd cond, BO. V Gray, 6840 Sterling, Raytown MO 64133. 816-358-8929.

Rotron Blowers for Eloom, CCA, CSI, McMartin, Harris, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St., Omaha, NE 68164 402 493 1886 FAX 402 493 6821

Etaflor elevated floor, 1382 sq ft, 2'x2' squares for studio, all hardware incl, gd cond, \$1200+shipping. K Eyerman, Trelb Brdcasting, POB 18181, Columbus OH 43216.

Gentner FBTRB prewire bay (loupas), (8) \$225; Gentner GEC-FB-100 Flexiblock, SIE-MF2250, (50) \$10; Jim Long digital D-axis 320 MEG, w/Apple IICX, for digital editing, used 6 mths, \$7500. B Lord, Lord Brdcastg, 13313 SE 208th St, Kent WA 98042. 206-631-2374.

Grampan cutter head, 1D feedback (tandberg); patch bays (4) 24 inputs single, also patch cards; Edital block for recorders 1". Mr. Oliver, 212-874-7660 in afternoons.

Cannon plugs, 3 prong, male & female, new tubes & resistors cheap; Lafayette TE22 audio gen; Sencore transistor & diode tester; manuals for Ampex, Puitex, others. Mr. Oliver, 212-874-7660 in afternoons.

Lead screw for Presto 6N cutter, 120 lines; Edital 1" block for splicing tape; Audiohead alignment tape 7.5-15 ips 1/4" tape; Dynakit PAS II pre-amp. Mr. Oliver, 212-874-7660 in afternoons.

Want to Buy

Early radar equip for collection. A Weiner, WREM, 14 Prospect Dr, Yonkers NY 10705. 914-423-6638.

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

Broadcasting yearbooks, 40s & 50s, must be vgc; programming digest LPs from 70s; WLS silver dollar survey LPs from 60s; John Ride r textbooks-no manuals. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

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

MONITORS

Want to Sell

Belar FMM-2 FMS stereo, SCM-2 SCA, RF amp. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

UREI 813B & Bryston 4B studio monitors & amp. R Tiegen, Plum Sound, 335 Merrimac St, Newbury MA 01950. 508-415-5653.

Harris STM-1B AM stereo mon, C-Quam, excel cond, BO. B Bailey, KJEF, POB 1248, Jennings LA 70546. 318-824-2934.

BE AS-10 AM stereo C-Quam mon w/manuals & boxes. Shannon, WENS, 7201 E Hillsborough Ave, Tampa FL 33610. 813-620-9100.

Belar FMM-2, FMS-2, SCM-2, SCA, stereo & RF amp, purchased '86. J Phillips, WZOM, 408 Clinton, Defiance OH 43512. 419-782-8591.

McMartin 3000A digital freq mon, never worked properly, gd for parts, as-is w/manual, \$50 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

Want to Buy

CCA AMMD service info, will pay postage & copy charges. P Hess, WPPJ, 134 Derwent Dr, Pittsburgh PA 15237. 412-366-1249.

Any older McMartin mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

MOVIE PROD EQUIP

Want to Sell

Neumade Super X 16mm rewriter w/foot pedal, \$375. Katherine, Linden Inc, 229 N Henry St, Alexandria VA 22314. 703-549-4424.

RECEIVERS & TRANSCEIVERS

Want to Sell

Marti RR30/150 dual freq receiver, \$500. M Young, WJON/WXJO, POB 220, St Cloud MN 56302. 612-251-4422.

GE MPI (2), handheld 2 W, 2 chnl VHF, w/charger & xtra batteries, \$100 both. P Russell, Bowdoin College, Brunswick ME 04011. 207-725-3066.

Scientific Atlanta 9640 video receivers. J O'Neill, 713-621-2800.

Realistic PRO-34 hand-held scanner, 200 chnl, receives to 960 MHz, nicads & chgr, like new, \$200; Bearcat BC 220 scanner, 20 chnl, VHF hi, low, UHF, aircraft, gd cond, \$100. M Martin, KWNO, POB 466, Winona MN 55987. 507-454-2918.

High quality micro-miniature 67 kHz SCA decoder, about 1" square, prewired and ready to install, \$15. D Jackway, Background Music Eng, 5742 Fair oak, Springfield MO 65810. 417-881-1846.

Ford '86 car radio, AM/FM stereo, w/factory connectors, never used, no cassette, \$90 incl UPS ground. L Spivey, WLLS AM/FM, Hwy 231 S, Narford KY 42347. 502-298-3268.

AM STEREO RECEIVERS
Portable, Home/Studio, Auto
RADCO GROUP
708-513-1386

REMOTE & MICROWAVE EQUIP

Want to Sell

Burke TC-8 remote control system w/computer interface, purchased new in Nov. 1989, BO. G O'Rear, WZEW, POB 2608, Mobile AL 36652. 205-432-0102.

Moseley SCG-8 FM subcarrier gen & SDC-8 FM subcarrier demodulator, 110 kHz, like new. P Bailion, Miles City Brdcasting, 1218 Pioneer Bldg 336, St Paul, MN 55101. 612-222-5555.

Potomac Inst RMP-19D-210 digital remote meter panel for use w/AM-19, AM-19D, PM-19 & PM-112 antenna monitors, excel cond w/manual; Potomac Inst DAP-11 digital antenna monitor processing system for auto logging of antenna monitor directional parameters, w/PTR-11 printer & manuals, H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

FOR YOUR NEXT REMOTE EVENT RENT THE
GENTNER EFT-3000
3-line frequency extender package with
Shure SM-7 studio mics.
For more info call: Dwight Weller
WELLER AUDIO-VISUAL ENGINEERING
P.O. Box 4040, Baltimore, MD 21093
(301)252-8351

TFT 7771 composite STL rcvr (2), separate mainframes, config'd for auto switch-over, work OK; Mod Sciences CLD-2501 composite line drivers (2), separate rack mounts; all excel cond, w/documentation. H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

Hnat-Hindes telephone interfaces (2), vgc, \$150 ea. G Arroyo, WONQ, 2483 John Young Pkwy, Orlando FL 32804. 407-687-9345.

Moseley MRC-1600 remote control system, CRT terminal, (2) modems, set up for subcarrier but incl telephone link interface cards, \$2850 complete/BO. G Gaskey, KWHO, 261 Main St, Weed CA 96094. 916-938-3828.

Harris/Ferranon Microstar 23 GHz digital STL, 2-hop system w/repeater, (3) 15 kHz analog & (2) 20 kHz digital audio chnlrs or video & (3) analog chnl, w/Sony PCM audio processor, factory aligned in May, \$15,000/BO. J Bisset, Multiphase, Falls Church VA. 703-379-1665.

MA-COM MA12XC 12 GHz portable/fixed microwave system, w/xmtr, receiver & portable horn antennas, \$800. N Borenstein, 5406 Hayes St, Hollywood FL 33021. 305-961-7747.

COMREX RENTALS
1, 2 and 3-Line Systems
Call Steve for details
Silver Lake Audio
(516) 623-6114

Shure ST6000 teleconference unit, can connect mixer to telephone line for call-ins, \$350. Alan, Calvary Baptist Church, 1380 Valley Forge Rd, Lansdale PA 19446. 215-368-4444.

Moseley TRC-15AW studio & xmtr remote cntrl, gd cond, \$500/BO. R Cowell, KNTR, POB 308, Ferndale WA 98248.

Want to Buy

Marti RPT-40 xmtr, freq 148-172 MHz, (1) RX R30/150, J Aguilar, XEKMX, Avila Camacho 137, Guadalupe, Jalisco Mexico. 38-570-384.

Moseley STL system for FM. T Noordyk, WSHN, Box 190, Fremont MI 49412. 616-924-4700.

SATELLITE EQUIPMENT

Want to Sell

Fairchild Dart 384 digital audio satellite receiver w/downconverter & 100 degree LNA, \$4000. R Cowell, KNTR, Box 308, Ferndale WA 98248. 206-384-5117.

Fairchild 384 digital satellite rcvrs (2), (1) w/15 kHz card, (1) w/7 kHz card, 10 months old, call for price. Jonathon, KNTL, 405-789-1140.

Moseley PCL-505 STL; Moseley RPL-3A remote pickup, 166.250 MHz; Moseley MRC remote control; Mark 4' STL dishes. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

Scientific Atlanta 7550 satellite rcvr used 18 months on Transtar ACII format, like new, BO. J Curtis, KLSQ/KFRO, 481 Loop 281 E, Longview TX 75606. 214-663-3700.

IGM EC, compl for satellite, half price. J Phillips, WZOM, 408 1/2 Clinton, Defiance OH 43512. 419-782-8591.

Scientific-Atlanta 7550 satellite, Unistar ACCI format, 18 mths old, receiver, BO; Scientific-Atlanta DAT receiver (2), 7.5 kHz 2-chnl cards, (1) brand new, (1) used, BO; ABC network decoder, grt cond, BO. J Curtis, KFRO/KLSO, POB 4299, Longview TX 76606. 903-663-3700.

SOFTWARE

Want to Sell

Fairchild Dart 384 digital rcvr w/15 & 7.5 kHz prog modules, 3 kHz voice cue module, new cond, \$4900. J Mandly, WHTB-AM, POB 1400, Fall River MA 02722. 508-677-0505.

BROADCAST EQUIPMENT EXCHANGE

Now Appearing In Every Edition of RADIO WORLD

STATIONS

Want to Sell

AM & FM radio stations for sales in Central Arkansas, selling or or part, some financing. 501-376-0880 week days, 501-470-1525 nights/weekends.

LPTV, CPs in Cincinnati, OH, ADI29, & Lexington, KY, ADI70, gd UHF chnl, excel coverage, favorable tower rental. James, 720 Fairhill Dr, St Matthew KY 40207.

2500 W AM near Huntsville, ALA. Studio & properties incl, \$175,000. Call Doyle Hadden, 407-365-7832.

FM w/C1 upgrade. Texas Panhandle, \$95,000 cash or best offer. Includes antenna, tower & transmitter for upgrade. M Jones, 314-431-1216.

Subchannel available & tower space for rent by station serving 3 markets in E & W IL, Grade A signal, new 1000' tower w/100,000 W H & V, new xmtr, call for rates. S Bridges, KFNIH, 3218 Mulberry Ave, Muscatine IA 52761. 319-263-2442.

Class A FM in SW NM, 2.5 yrs on air, grt equip, close to trout fishing & wilderness, profitable now, \$175,000. John, KSCQ, Box 1528, Silver City NM 88062. 505-538-3396.

Financial assistance needed for new Class A FM in WY, 3-county coverage, consider investor/partner, need 35K to complete. J Dunker, Box 34, Fort Bridger WY 82933. 307-782-3481.

Want to Buy

Radio preacher looking for sm market AM/FM, need a no down-payment arrangement & owner financing, will consider dark & lease agreement. Rev P Fleming, POB 1792, Torrington CT 06790. 203-482-9355.

Group owner seeks troubled/dark stations & EPs fast closing, finders fee paid, forward engineering details, equip lists & price. Republic Broadcasting, 300 Heyburn Bldg, Louisville KY 10202.

Principal wants to purchase AM and/or FM, CP or dark, any situation considered. L Henley, 204 Preston Ct, Opelika AL 36801. 205-749-1521.

Exper brdctr looking for FM/AM station w/tille or no money down, prefer New England or southeast. L Haber, 617-246-5634.

STEREO GENERATORS

Want to Sell

CRL SCA-300A mod gen, like new, BO. J Claybrook, WERC/WMMJ, 530 Beacon Pkwy W, Birmingham AL 35729. 205-942-9600.

Gates 99406533-001 stereo gen modules (2), for use w/TE-3 FM exciter, w/documentation, H Ginsberg, WMEE/WQHK, 2915 Maples Rd, Ft Wayne IN 46816. 219-447-5511.

CCA SG-1D stereo gen, \$125. M Gollub, WMLJ, POB 547, Prince Frederick MD 20178. 301-535-2201.

Want to Buy

Catel SM-220 stereo gen schematic & operating manual. H Thomas, Thomas Eng, 522 F St, Bakersfield CA 93304. 805-323-5655.

Optimod 8000A, will pay cash, leave message at 703-276-0125.

SWITCHERS (VIDEO)

Want to Sell

JVC KM2000U switcher, 8 inputs, DSK, RGB chroma keyer, 13 wipes, auto transition, \$4000. H Larson, Matrix TV, 615 Tank Farm Rd, San Luis Obispo CA 93401. 805-544-2445.

TAPES/CARTS & REELS

Want to Sell

Scotchcart II (700), 4.5 & 5.5 min w/bldies format, \$1.75 ea/\$1100 all; (3) A-Line 200 space cart racks, \$90 ea/\$250 all. J Uribel, WIQB/WNRS, 3001 Brassow Rd, Saline MI 48176. 313-662-2881.

Pepper-Tanner & TM Prod library records, variety avail. P Wells, KJQY San Diego, 619-238-1037.

MARATHON PRODUCTS COMPANY

Audio Cartridge Rebuilding Division
Rebuilding/reloading, like new, all brands, any length up to & including 3.5 minutes, \$1.75 ea. FOB our plant, 48 hrs delivery.
New NAB Marathon cartridges prices on request.
35 Years professional experience!
Lifetime member AES R.D.MYERS Sr.
Manufacturers of Audio Devices, Continuous Tape Mag.
69 Sandersdale Rd.,
Charlton, MA 01507
1-508-248-3157 or 1-508-853-0988

Circle 106 On Reader Service Card

Scotchcart II (400), all/part, \$2.50 ea; (400) Audipak carts, \$1.50 ea. B Downs, KTSR, Box 3248, Bryan TX 77805. 409-846-1150.

Scotch 176 10" reels (34), 2500'x1/4", used once, \$125/BO. D Pulwers, Daves Price Audio, 310 N Howard St, Alexandria VA 22304. 703-751-9346.

A&D Cartridge Rebuilding Service

We clean, load & pack. Serviced within 10 work days! Work guaranteed!
3706 Vold Ct., Eau Claire, WI 54701
(715) 835-7347

Polyline 7" empty computer-style reels, small holes/small hub, \$28/100+\$6 UPS; Capital Audiopak carts, used, factory loaded 3.5-4.5 min lengths, assorted, \$23/10 lot+\$6 UPS. N Mishan, Mishan Entrprs, POB 335, Lynbrook NY 11563. 516-582-1338.

TEST EQUIPMENT

Want to Sell

General Radio 1606-A RF bridge, late prod serial #1700, grey panel, excel cond, \$475. A Smith, Adams & Smith, 25 Stonehedge Rd, Lincoln MA 01773. 508-841-2209.

HP 1741A 100 MHz dual trace storage scope, \$888; Paratronics 5000 logic analyzer w/pods, \$475; HP 8444A tracking generator, \$1250; HP 5341A counter, \$1200; HP 8445B preselector, \$1100; HP 1717A variable klystron pwr supply, \$67. G Wachter, KFYI, 631 N 1st Ave, Phoenix AZ 85003. 602-258-6161.

Heath IG-5218 sine-square wave audio gen, gd cond, w/manual, \$40; Heath SM5218 VTVM w/manual & leads, gd cond, \$25. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

Senacor SC61 wave analyzer, \$1550; LC75 Z meter, \$400; FC71 freq counter, \$650; HP 239A oscillator, \$385; HP 331A noise & distortion, \$500; HP 400E voltmeter, \$200. B Adene, McKenney Brdct Serv, Rt 3 Box 205, Russellville AR 72801. 501-967-5451.

Technical Material 18K-A 18 kW dummy load, \$695. R Smith, KFGSA, 1122 Via La Cuesia, Escondido CA 92029. 619-739-1835.

UREI 452A waveform, xmission measuring set, w/audio oscillator & voltmeter, \$150. R McDaniel, KJRG/KEOZ, Box 567, Newton KS 67114. 316-263-5150.

B&K 1405 oscilloscope, \$100; Loftech TS-1 oscilloscope/meter/freq counter, \$175. P Cibley, Cibley Music, 138 E 38 St, NY NY 10016. 212-986-2219.

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Any 3-speed TT, more compact the better. B Vorhies, WMRA, Box 669, Harrisonburg VA 22801. 703-433-1495.

Broadcast TT (6), some preamps, you ship. R McDaniel, KJRG/KOEZ, Box 567, Newton KS 67114. 316-283-5150.

Fairchild disc rcrding equip, #740 & similar, Presto, Rek-O-Kut, RCA, etc; also, accessories, incl amps, limiters, heads, manuals, needles. K Gutzke, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

TV FILM EQUIP

Want to Sell

RCA Film Island, TK29B camera, (2) TP66 16mm proj, TP7 35mm slide proj, hw hrs, new tubes, like new, BO. D Brennan, Brennan Entrprs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

VIDEO PROD EQUIP

Want to Sell

Consolidated Video Systems 504R digital time base corrector, split screen effect, signal correction, xtra boards & options, excel cond, cabinet ready for rack mount, BO. Pinelucket Rcrding, 205-826-0390.

Runco Cinema Beam III video proj, adjust size to 9" x 12", RF, composite, SVHS inputs, remote cntrl, Zenith chassis, \$2000; Laird 1450 charac gen, 6 fonts, italics, 100 page memory, 35 NS resolution, \$2000. H Larson, Matrix TV, 615 Tank Farm Rd, San Luis Obispo CA 93401. 805-544-2445.

Want to Buy

Pinnacle 2120 DVE, still store. H Larson, Matrix TV, 615 Tank Farm Rd, San Luis Obispo CA 93401. 805-544-2445.

VIDEO TAPE RECORDERS

Want to Sell

Sony AV 3600 helical scan, portable R-R in carrying case, near mint cond, BO. Pinelucket Rcrding, 205-826-0390.

JVC KA-3U Betacam back for KY series cameras, M-format, BO; JVC RM 70U remote cntrl for 34" VCRs, perfect cond, BO. D Brennan, Brennan Entrprs, 3596 Lorna Ridge Dr, Birmingham AL 35216. 205-823-0088.

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